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Empiricistic Philosophical Stories

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EMPIRICISTIC PHILOSOPHICAL STORIES

by

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ABSTRACT

This essay is intended to be a philosophy of impersonal experience. It has three chapters. Chapter 1 is intended to show that sensing experience is not a relation between a senser and what is sensed but rather is the result of a causal interaction among entities which are independent of sensing. These entities are material substances. Thus, while sensing is idealistic, it is caused by material substances. Chapter 2 is intended to present an adequate ontology which fits the idealistic theory of sensing in chapter 1. Its theme is that the components of sensings can be treated as individuals or properties, etc. in terms of their various kinds of positions. Chapter 3 is intended to show that such indirectly sensible only entities as electrons are material substances.

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CHAPTER I: SENSING

INTRODUCTION

This chapter is intended to show that nothing prevents a concept of material substance from being cooperatively joined to an idealistic theory of sensing and that several problems from fragmented experience can be neatly solved if they are joined. The theory is that material substances which are not themselves sensible cause such changes in sensers as themselves cause there to be sensings. As causing sensings, material substances are independent of sensings -- they would exist even were there no sensings and they would exist even were there no sensers. Sensings, on the other hand, are not independent of sensings. The name of this theory is causal idealism.

There are four parts in the chapter. Part A is intended to prove the general idealistic conclusion that nothing which composes what is sensed can also compose anything which is independent of sensing. Part B is intended to show that Berkeley had no good arguments supporting his idealistic theory, BI, that sensibility is a necessary condition of existence. Part C discusses why and how the general idealistic theory that sensing is not a relation between what senses and what is sensed should be cooperatively joined to the concept of material

substance as something which is independent of sensing to yield the causal idealistic theory that a sensing results from a causal relation between a material substance and a senser (tho the material substance is not therefore itself sensed). Part D presents a means for distinguishing direct from indirect sensing by making use of the concept of material substance.

PART A

1-a. Here is one good argument to the idealistic conclusion that nothing which composes what is sensed can also compose something which is independent of being sensed. The strategy is to assume its negation, add two normally accepted features about things which are supposed to be both sensible and independent of being sensed, and infer an impossibility for situations involving the relativity of sensing.

At the outset, this should be noted. In the chapter's introduction it was indicated that 'material substance' is to be used as refering to that which is independent of being sensed by causing there to be sensings. But no cause, nor any of its components, is identical with its effect, nor with any components of its effect. And it follows trivially that nothing which composes what is sensed can be identical to something composing what is

is one way of saying that I shall not be treating sensing as a relation. Sensing is experience and that is all.)

b. It will now be shown that in situations of sensing relativity sensed objects can be both multiply accessible and spatially unitary precisely if they are not treated as being independent of being sensed. This will be shown by actually doing it with the causal idealistic treatment. This has a negative aspect in that it will anticipate discussion which has not yet been presented and will hence be somewhat confusing. But the topic is ripe now. Now it needs to be shown that the impossibility which results from assuming that what is sensed is also independent of being sensed can be avoided by rejecting that assumption. It might be helpful for the interested reader to review this subsection after he feels himself in command of the concepts of causal idealism.

Finding a sense in which such a sensed object as a is multiply accessible is the same as finding some means for justifying our treating a which is sensed before the senser's move as being numerically identical with a' which is sensed after the senser's move even tho a and a' are not qualitatively identical. What has been shown in the previous subsection is that this goal cannot be reached thru assuming that a and a' are independent of being sensed.

The causal idealistic approach is to distinguish

even if his attention remains focused on that direct real thruout. This, because a and a' differ in size. That is, a has some components which if combined with any of the components of a' would result in a composite with a shape-size different from the direct real because different from both a and a'; and similarly for a'. For example, if the direct real is a sphere of some radius and if we imagine combining the entire right half of a with even the most promising component of a', at best the composite would resemble the result of pasting together the right half of a billiard ball and the left half of a bowling ball. But in this case the direct real is not spatially unitary.

Direct realists will feel that this is a sleight of hand -- that whatever can be said about the direct realistic interpretation of this relativity of sensing can also be said about any interpretation of it. Thus, either a solution to this problem has been obscured or else it has none and is, hence, a bogus problem.

This is not correct. It is not the case that nothing at all is both multiply accessible and also spatially unitary. (This will be shown in the next subsection.) It is only the case that nothing which is independent of sensings can also be sensed as multiply accessible and spatially unitary.

Before the senser's move, the direct real must

be assumed to share components with a and after it with a' (because it is multiply accessible). Also, it must be assumed to retain possession of those components which it once shared with a even after the senser's move, even after a' is what is sensed (because the direct real is independent of being sensed). Similarly, it must be assumed to have possession of those components which it will share with a' even before the senser's move, even while a is what is sensed (because the direct real is independent of being sensed). A more concise way of expressing this idea is that the components of a are assumed to be numerically identical to those of the direct real; and so are the components of a'. Thus, because it is assumed to be independent of being sensed while yet sharing components with what is sensed such as to be multiply accessible, a direct real must also be assumed to have a very large number of components which, when combined, in no way shares a shape-size with anything relevant that has ever been sensed. For example, when the shape-size is that of a billiard-bowling ball. In short, under those assumptions it is impossible for a direct real to be spatially unitary.

This argument was inspired by Price's discussion on pp. 35-36 of Perception. I believe it captures the sound spirit of all that variety of arguments from illusion which never got completely off the ground -- namely, that if it is assumed that we sense what is independent of being sensed then it must be concluded that

nothing which exists independently of sensing has a single identity. However, it does not imply either (a) that when a reasonable man believes he is not sensing things existing independently of his sensings he also believes his senses are deceptive or (b) that when he believes his senses are deceptive he also believes he is not sensing things existing independently of his sensings. So, it avoids the kind of challenge which Austin delivers against Ayer's argument from illusion on page 8 of Sense and Sensibilia. Rather, it has been implied that a reasonable man would never believe that what he senses are things which exist independently of being sensed because if he did then he would have to believe that none of those things could have single identities.

(The expression 'what is sensed' seems to indicate something, an object, besides the sensing itself or its components which is related to sensers via the sensing relation and which is therefore independent of being sensed. For idealists, this is an unfortunate fact about our language because 'what is sensed' is an extremely useful expression in discussions about sensing. In what follows, grasping the linguistic bulls by their horns, I shall use 'what is sensed', 'sensed object', 'sensing of an object', etc. to refer to things which are not independent of being sensed. Namely, to components of sensings. This parenthetical comment is important. It

is one way of saying that I shall not be treating sensing as a relation. Sensing is experience and that is all.)

b. It will now be shown that in situations of sensing relativity sensed objects can be both multiply accessible and spatially unitary precisely if they are not treated as being independent of being sensed. This will be shown by actually doing it with the causal idealistic treatment. This has a negative aspect in that it will anticipate discussion which has not yet been presented and will hence be somewhat confusing. But the topic is ripe now. Now it needs to be shown that the impossibility which results from assuming that what is sensed is also independent of being sensed can be avoided by rejecting that assumption. It might be helpful for the interested reader to review this subsection after he feels himself in command of the concepts of causal idealism.

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between what is sensed and what causes there to be the sensing of what is sensed. (Remember the parenthetical comment which closed the previous subsection.) On the basis of the qualitative similarity between a and a' and on the basis of their sharing the same distances and directions from other objects in the environment it is inferred that there is a single thing which differentially causes them to be sensed. That is, it is inferred that there is a single thing, a material substance, which is multiply but unitarily productive of sensed objects: the material substance produces sensings which are different but qualitatively similar depending on how the material substance is related to the senser who has those sensings. Sensed objects then are multiply accessible in the sense that their being sensed is caused by multiply but unitarily productive material substances. Hence, that a and a' are treated as being the same thing (though qualitatively different) is derivative on their being treated as having a common cause (though their being treated as having a common cause is derivative on their being sensed as qualitatively similar).

(There is no question that this is like going around the house to get to the barn. We want to say "Things like a and a' are the same because, damn it, they are the same...now stop arguing about it." But there is equally no question that they are not qualitatively the same. So we then want to say that this is simply because a is in a different relation to the senser when it is

sensed as a'. If this were so, there'd be no puzzle and we could legitimately stop the inquiry. But, if it were so, then a which is a sensed object would also be independent of being sensed. And this leads to an impossibility. That is, sensory realism leads to an impossibility. So we look for a grounds within sensory idealism to justify treating a and a' as numerically the same. Causal idealism is one such ground.)

Within an (idealistic) approach to sensing in which nothing which is sensed is held to be independent of being sensed there is no attempt at treating the components of things like a and a' as intercombining. For, when a is sensed a' does not exist. (Except in the sense that it is numerically identical with a through sharing a common cause -- but nothing which is qualitatively identical with a' then exists.) Nonetheless a and a' can be treated as being spatially unitary. The components of a will combine with the correlative components of a' to yield a composite which shares its shape-size with a' so long as the material substance which causes a to be sensed is then in the same relation to the senser as would be the material substance which would cause a' to be sensed if a' were sensed. Since there is assumed to be a single material substance cause of both a and a', this amounts to no more than saying that the components of a' will combine to form a'. And similarly for a. And so on. And it is in this sense that causal idealistically treated sensed objects have single

shape-sizes even in situations of sensory relativity.

c. The argument of subsection 1-a is intended to challenge only realistic theories of sensing -- only theories which assume that what is sensed is independent of being sensed. Now I have heard philosophers suggest that that kind of argument should be handled, not by a causal idealistic approach, but rather by a theory which begins and ends by distinguishing sensing from perceiving in this manner. Sensing experience should be distinguished from perceiving experience such that only in perceiving is there imposed on experience a system of concepts requiring that, for example, a one foot diameter sphere experienced at one distance from an experiencer "contains" its being assumed to appear differently than does a one foot diameter sphere experienced at another distance from the experiencer. And vice-versa.

Two things should be noted about this response. The first is that it does not assume that what is sensed (or perceived) is independent of being sensed (or perceived). Thus, it is not so much a response to the challenging argument as it is an idealism which is alternative to causal idealism.

The second thing is that, while the sensing-perceiving distinction might be a good one, this kind of no-reference idealism has three weaknesses which causal idealism does not have. (a) In order to treat such

considered and shown to be mistaken.

A final point of interest is that even if it were shown that causal theories of sensing are not viable, this would show only that sensibility is a necessary condition of knowable existence. That is, it would still be possible for there to be things which are unsensible and independent of sensings -- tho, this could not be known.

3. There are four major Berkeleyan challenges which have been levelled against the materialistic causal theory of sensing which I have called causal idealism. In this section they will be considered and shown to be mistaken.

a. The causal idealistic theory is that our knowing the existence of non-sensible material substances results from an inference from ideas qua caused which are sensings. But sometimes our sensings are hallucinatory and sometimes they are dreams. And in neither case would a causal idealist want to claim that those sensings are caused by what exists independently of sensings and unthinkingly. But if some sensings are not caused by material substances, it is possible that none of them are. Thus, material substance qua cause of sensings is not needed in order to account for the existence of sensings and, as anyway an obscure concept, should be ignored.

major challenges were presented by Berkeley or are variations on his themes. His primary theme is that sensibility is a necessary condition of existence. This theme is supported by secondary ones which attack causal theories of sensing.

An argument to BI, that sensibility is a necessary condition of existence, to which Berkeley refers time and again is that the notion of material substance qua unthinking and unsensible involves an internal inconsistency. Its general idea is that since what is meant by 'object' is that which senses or is sensible, talk of non-sensible objects is inconsistent unless it refers to the sensers of objects. But only objects exist. Thus, existence can be consistenetly ascribed to that which doesn't sense only if it is sensible:

> For as to what is said of the absolute existence of unthinking things, without any relation to their being perceived, that is to me perfectly unintelligible. Their esse is percipi...whosoever shall find in his heart to call it [the Principle that sensible objects have an existence distinct from their being perceived] in question may, if I mistake not, perceive it to involve a manifest contradiction. For, what are the forementioned objects but the things we perceive by sense? and what do we perceive besides our own ideas or sensations? and is it not plainly repugnant that any one of these or any combination of them should exist unperceived.[1]

Again, Berkeley links what is impossible of being conceived with what is impossible of being sensed:

> Hence, as it is impossible for me to see or feel anything without an actual sensation of

> that thing, so is it impossible for me to conceive in my thoughts any sensible thing or object distinct from the sensation of perception of it. In truth, the object and the sensation are the same thing, and cannot therefore be abstracted from each other.[2]

In subsequent discussion, he supports the claim that any object is identical with some sensation/idea by considering the claim that one can imagine a book, for example, existing unsensed in a closet:

> But what is all this, I beseech you, more than framing in your mind certain ideas which you call books and at the same time omitting to frame the idea of any one that may perceive them? But do not you yourself perceive or think of them all the while"[3]

Thus, the argument seems to be that if there is an identity between unsensing objects and ideas qua sensations then there is no sense in which it can be said that unsensing objects exist but are not sensible. Thus, if the conditional is true, any thesis which asserts the existence of unsensing and unsensible objects is, since contradictory, false. I shall christen this Berkeley's <u>argument to contradiction</u>. (A variation of this argument can be found in the latter part of the first dialogue between Hylas and Philonous.)

Now there is no doubt that a contradiction results from claiming that sensible things are non-sensible. That is, there is no doubt that sensibility is a necessary condition for the existence of sensible things. But it isn't obvious that Berkeley's materialistic opponents have been denying this. Rather, they seem to have claimed

that that which exists independently of being sensed interacts (with or without the mediation of other things which exist independently ob being sensed) with sensers, who also exist independently of being sensed, such as to produce ideas or sensible objects which are what is sensed by those sensers. (The parenthetical comment which closed subsection 1-a is applicable here.) But those things, material substances, which exist independently of being sensed are themselves neither ideas nor sensible.

Thus, when a materialist (Locke,[4] for example) ascribes existence to non-sensible things, he is not thereby ascribing sensibility to that which is non-sensible unless he also claims, as Locke does claim, that non-sensible things have sensible features or that they have features relevantly resembling sensible qualities. Rather, he is claiming that sensible things, ideas, are caused by the interaction of things which themselves are not sensible. And insofar as the effect of any cause is dependent on its cause, the materialist goes on to claim that ideas are dependent on material substances -- i.e., material substances are independent not only of being sensed but also of there being any sensings at all.

A materialist might then claim something along the lines of there being two viable and useful senses of 'object'. On the one hand, it refers to those unsensible things, material substances, which cause what is sensible.

On the other hand, it refers to that, or a component thereof, which is sensible, ideas. In effect, both Berkeley and the (non-contradictory) materialists agree that only ideas are sensible. They part company insofar as the materialists, and only they, claim that unsensible and unthinking substances exist and are known to exist because only such substances, as interacting single or multiply with sensers, could reasonably be held to cause ideas or sensible objects which would not exist unless caused.

(Both Berkeley and Locke, usually, agree that all and only ideas <u>are</u> sensible objects and then dispute about whether or not some of them, gotten by reasoned inference from those which are gotten thru sensing, are about things which cause those of them gotten thru sensing.[5] This, rather than agreeing that some ideas are <u>about</u> sensible objects and then disputing about whether or not ~~there~~ are others of them which are not about sensible objects but which are about things which cause those of them which are about sensible objects. Thus, they both agree that sensing is not a relation. As has been previously said, this practice will be followed thruout the essay.)

Hence it is that whether or not the argument to contradiction shows the concept of material substance to be unviable depends on whether or not a causal theory of sensing is viable. In the remainder of this part of the chapter Berkeley's challenges to those theories will be

which involve unsensible material substances. One concerns the production of sensings. This occurs when a sentient material substance is so changed that it/he has a sensing. It is the kind of thing which might be called epiphenomenal -- a sensing, which is not a material substance, is produced simply from there being a change in a sentient material substance. This production involves the change in the material substance as having power or necessitation over the sensing. Let us say that the necessitating relation whereby a sensing is produced from there being a change in a material substance is causality-2. (For a sense in which descriptions of a sensing might be inferable from descriptions of a change in a material substance, see subsection 11-d of chapter 3.)

The second causal relation which involves material substances need not concern the production of sensings. It occurs whenever two material substances so interact that one or both of them are changed regardless of whether or not either is sentient. This interaction involves one of the material substances as having power or necessitation over the other. Let us say that the necessitating relation whereby one material substance changes another is causality-3.

It is because one material substance causes-3 a change in a sentient material substance that a sensing is caused-2. It will be convenient to say that when

The argument is not valid and its major assumption is not true. First, if veridical sensings can be distinguished from non-veridical ones independently of reference to material substances, which is assumed on all sides, then reference to material substance can be justifiably restricted to cases involving only veridical sensings. Second, there might be good reason for assuming that veridical sensings are caused by material substances even though it is accepted that unveridical sensings exist as uncaused by material substances. Furthermore, one could no infer from the possibility that no sensings are caused by material substances to there being no need for reference to material substances as causing sensings in order to account for the existence of at least some sensings. Indeed, one could not infer even from the actuality of some sensings' not being caused by material substances to the possibility of all sensings' not being so caused. Finally, if those (non-veridical) sensings which are not directly caused by material substances are nonetheless caused by, among other things, remembered sensings which were caused by material substances then one cannot begin this argument even with the assumption that some sensings are actually not at all caused by material substances.

The final remark above is controversial and I shall not pursue it. It is enough that I have shown the conditional statement "If some sensings are not caused by material substances then it is possible that none of them are" to be false and the inference from that statement to

this occurs the first material substance is a cause-2 of the sensing. In the example of subsection 1-a, both a and a' share a common- cause-2. On the other hand, when a material substance acts causally but no sensings are produced, it is a cause-3.

(Again, it might be helpful for the interested reader to review this subsection after he feels himself in command of chapter 3 where such sub-atomic entities as electrons are identified as material substances. But it should be admitted that nowhere is there offered a more detailed examination of the concept of causality. However, I hope that the causal idealistic concepts can be understood simply from the various contexts in which they are employed thruout the essay. I have tried not to offend what has been discovered in the standard examinations of causality.)

Now causal idealism can escape the introductory challenge simply by noting that material substances involve a type of causality which is different from the type of causality involved by things which are sensed. In effect, causal idealism can grant that it is an insight of major importance that the type of causality which obtains between sensible things is only that of signifying constant conjunction which ascribes nothing of power or necessitation to antecedent relata. And furthermore, that this type of causality cannot be ascribed to relations in which one of the relata is unsensible. But causal

since they are caused by undulatory motions of a medium (say, air), causal idealism must claim existence for the undulatory motions of air qua material substance. But, since any motion at all is sensible only by the senses of sight and touch, it follows that sound is sensible only by sight and touch. And this is absurd.

Again, the argument is not valid and one of its assumption is not true. Causal idealism does not identify sound with the motion of air (which, under certain available conditions, is itself a sensing's component). Nor does it identify the motion of air as the relevant cause of sound. Rather, it identifies an unsensible material substance as the differential cause of those sensings which we call air and it also identifies an unsensible material substance as the differential cause of those sensings which we call sounds -- the material substance referred to is, presumably, the same in both of these particular cases. On the other hand, it is true that for causal idealism that which differentially causes those sensings called sounds is itself not heard and yet only it is said to exist independently of being sensed.

Thus, for causal idealism air is not a material substance and sound is neither identical with the undulatory motion of air nor is it caused in the relevantly fundamental way by that motion. And, even if we consider sound as caused only by the motion of air we need not infer that sound is sensible only by sight and touch -- though, admittedly, we would be obliged to infer (if we bothered) that,

considered in this manner, its cause is sensible only by sight and touch. (See the following subsection.)

c. If causation is a sensible relation involving sensible sequences of the behavior of one or many objects such that sensers can treat an antecedent stage of one of the sequences as signifying what subsequent stages are yet to come then the causal relation cannot obtain between two types of relata, one of which is unsensible. Thus, material substances cannot be both unsensible and also the causes (qua signifiers) or anything.

It is most necessary for causal idealism to withstand this challenge. And, clearly, its only recourse is to distinguish a causal relation which involves a material substance from those causal relations which involve only what is sensible.

Thus, let us say that the signifying relation which exists between such antecedently and subsequently acting sensible objects as impacting billiard balls is causality-1. It involves nothing of power or agency between the impacting ball and the impacted ball. It involves only that descriptions of the subsequent motion can be inferred from descriptions of the antecedent motion in a lawful manner because the phenomena they describe are constantly conjoined.

On the other hand there are two causal relations

which involve unsensible material substances. One concerns the production of sensings. This occurs when a sentient material substance is so changed that it/he has a sensing. It is the kind of thing which might be called epiphenomenal -- a sensing, which is not a material substance, is produced simply from there being a change in a sentient material substance. This production involves the change in the material substance as having power or necessitation over the sensing. Let us say that the necessitating relation whereby a sensing is produced from there being a change in a material substance is causality-2. (For a sense in which descriptions of a sensing might be inferable from descriptions of a change in a material substance, see subsection 11-d of chapter 3.)

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idealism goes on to point out that this is not the only type of relevant and viable causality. Berkeley, for one, must grant this. After all, it is just some such necessitating or "vertical" causality to which he appeals in explaining God's presenting ideas to men.

d-1. Causal idealism requires a concept of necessitating causality. But all concepts of causality require that the antecedent relatum involves something with a feature in virtue of which the subsequent relatum follows from it. Of all the known features, it is a thing's motion which is the most likely candidate feature for this task. But it is assumed that the feature, extension, has no existence external to sensing minds. Thus, insofar as a thing's having motion presupposes its having extension, it would be contradictory to assume that a material substance both moves and is external to sensing minds.

Now , that extension in fact has no existence external to sensing minds can be seen via an argument from sensory relativity. Very small animals, mites for example, must be supposed able to see their own feet as having definite extensions. However, men do not have this ability concerning the feet of mites. But, if extension exists external to sensing minds then the feet of mites both have and don't have certain definite extensions. And this is impossible.

Thus, extension does not exist external to

sensing minds. Thus, material substances cannot both exist external to sensing minds and also have a feature which presupposes their having extension. Thus, it cannot be the motion of a thing external to sensing minds in virtue of which effects follow from it. And, lacking further candidates, there is no feature of material substances as external to sensing minds in virtue of which they cause effects.

11. This is a complex argument and will therefore be treated piecemeal. Beginning with the argument's second paragraph, it is first relevant to remark again that the idealism which results from a causal theory of sensing asserts no identities between any sensed properties and those unsensible features of material substances which cause the sensing of objects with sensible properties. In other words, neither the causal-2 nor the causal-3 relations are asserted to be identical with the identity relation. Even if the relevantly causal feature of a material substance were to be, more or less, qualitatively identical with the caused property of some sensible object (though this is hard to conceive), what is sensed is not the same as what causes it to be sensed.

Thus, where a variety of factors (including sensory ability) in addition to the features of material substances cause-2 what is sensed, that extended feet of

mites, for example, are sensed by one senser but not by another can be explained by reference to some or all of the remaining factors while it is assumed that what is sensed by the one senser is caused-2 by, among other things, features of the material substances. Furthermore, nothing so far considered prevents our assuming that that (or something qualitatively identical to it) which is sensed by one senser would also be sensed by any other relevantly placed senser who happened to have equally competant sensory ability <u>because</u> the relevant causal-2 features would be numerically identical in the two cases.

Hence, this argument from sensory relativity does not establish that there can be no things which exist external to sensing minds and cause them to have sensings of extended feet of mites. Nor does it show that because sensed properties must be accepted as partly dependent on such relative factors as sensory ability that those properties cannot also be dependent on such non-relative factors as the features of material substances. In short, that there is a relativity concerning the sensing of mites' extended feet by different types of sensers is irrelevant to there being a relativity concerning the causal feature of the material substance in virtue of which any senser has such sensings. It is irrelevant to that feature's being either external to or not external to sensing minds regardless of what other features it presupposes. Though the sensing of their

extended feet is not external to the minds of mites while it is external to the minds of men, the causes-2 of those sensings are external not only to the minds of men but also to the minds of mites.

111. Continuing with the argument's first paragraph, it is not true even that one's assuming a thing to be, in some sense, in motion requires his also assuming it to have something which cannot belong to that which is external to sensing minds.

That this is true can be seen initially because there is the actual and successful practice of treating such not directly sensible things as electrons both as being in motion and also as being external to sensing minds. They are treated as being external to sensing minds because they are not capable of being directly sensed. They are treated as being, in some sense, in motion because of what will eventually be introduced as a variety of the argument from fragmented effects: there are certain things which are directly sensed which can only be the effects of something assumed to be in motion -- tho nothing relevant is directly sensed to be in motion.

The idea behind the argument's first paragraph is that, for one of several good reasons, it would be a mistake to ascribe to that which is independent of being sensed (alternatively, external to sensing minds) a

causal feature which is itself not independent of being sensed or presupposes that thing's having something which is not independent of being sensed. On the face of it, this means that no feature which has been sensed can be ascribed to a material substance as that in virtue of which it produces effects. Under the face of it, however, this is not the case. That which causes something is independent of it: it could exist even tho that which it causes doesn't. Now three senses of causality have been distinguished. Causality-1 involves relata both of which are sensed. But since any cause is independent of its effect there is nothing preventing there being a sense in which any causal-1 feature can be ascribed to that which is independent of being sensed. This, since a sensed effect which is normally of a kind which is produced by a sensed cause could also be of a kind which is produced by an unsensible cause. And even the causal-1 sense of the relevant feature involves its being independent of the sensed effect.

Concerning such a causal-1 feature as motion, there is a sense in which it can be ascribed to that which is independent of being sensed. Again, presenting the suitable discussion here might be confusing because it anticipates what is yet to come. But, again, the time is ripe now.

The sensed motion of a billiard ball's impacting with another billiard ball exemplifies a causal-1 feature. But suppose that something causes-2 our sensing those

balls themselves in something like the way movie films cause our sensing impacting images on a screen. Then there is a cause of there being the sensing of the first ball in motion and also a cause of there being the sensing of the second ball in motion. And thus, it is the cause of there being the sensing of the first ball in motion which fundamentally causes there being the sensing of the second ball in motion because that first cause-2 interacts causally-3 with the cause-2 of there being the sensing of the second ball such that that second cause causes-2 the second ball to be sensed as moving. (Here the movie analogy disappears.) Insofar as, for some reason, it is still held that it is the motion of something which causes the second ball to move there is then a sense in which the first cause-2 moves.

Suppose that, for some reason or another, in some situations the first cause-2 does not produce sensings altho it does cause-3 the second cause-2 to be so changed that the second ball is sensed to move. And suppose that, as is the case, future effects can be predicted thru our counterfactually assuming that the first cause-2 also does cause our sensing the first ball to be in a motion describable by certain laws. Then, if we want to make those predictions, there is good reason to make this counterfactual assumption. In effect, we would then be treating the first cause-2 as taking the place(s) of the first ball.

(This sub-subsection's complex theme will crop up again in section 7 of this chapter, in subsection 6-b of chapter 2, and it will finally be presented as a sort of guiding principle and climax to chapter 3 in its subsection 9-b. Hopefully, by then its whys and wherefores will have been straightened out.)

PART C

4. This part of the chapter is intended to show that the concept of material substance can be cooperatively joined to an idealistic theory of sensing. The joining is cooperative in the sense that it solves what shall be called the argument from fragmented experience. This argument, whose theme is not original, will be examined through considering two modern discussions which, intentionally or not, imply mistaken positions about the old theme.

Before this is done, it is appropriate to draw an explicit distinction between material substances and material objects. Following the previously employed custom, material substances are to be treated as the independent and unsensible causes of there being sensings. On the other hand, anything which is sensible is a component of a sensing. (See the parenthetical comment which closed subsection 1-a.) These components can be individuated in a number of ways simply by considering

their having single or multiple positions and by considering them to share or not share their positions. (The details of this sort of treatment will be presented in chapter 2.) Let us say that a spatial sensing's component which is treated as having a single and non-shared position is a material object. A material is a variety of individual. It is a thing whose qualitative identity with another thing does not entail its numerical identity with that second thing.

The argument from fragmented experience goes like this. Only if a senser is omniscient and never sleeps or otherwise looses attention of anything that is ever sensed would that which is actually sensed constitute an orderly and coherent world. But, though our world is orderly and coherent, there are no sensers of this type -- or, if there are, none of us is he. Thus, our world is not constituted only by what is actually sensed. Unsensible thing(s) must be called upon to supplement of membership of sensibles-only in order that a coherent world be constituted. Such things are those which, if they did exist as related to sensings in a definite manner, would, together with sensings, constitute a coherent world.

Berkeley, for example, would presumably accept this argument and then offer God as causing sensings in candidacy of doing what sensings cannot do alone.

Now the argument from fragmented experience

depends on the explication of "an orderly and coherent world". I propose to present an adequate explication of this expression by considering two mistaken claims made, respectively, by Strawson and Quine.

5. Strawson assumes that, as a matter of fact, there is a definite system of space which we all have and use. This system is relational in the sense that all its features are definable on the relations of distance and direction which obtain among all things in space.

But he makes a further assumption about this actually employed system: Space is unified in the sense that each component in the distance and direction relations is reidentifiable. (In causal idealistic terms, this means that each material object must be reidentifiable.) Since nothing can be identified as numerically the same at different times unless it endures, so Strawson goes on to say, from the first to the second identifyings, it must therefore be assumed that each material object endures from one sensing to the next. Thus, under certain circumstances, because a numerical identity must be accepted between two qualitatively identical material objects at the extremities of non-continuous sensing, so also must the endurance of that material object during the non-continuous sensing be accepted. Strawson claims that, did we not accept this, since the space system of one sensing would share no members with that of another

sensing not continuous with the first it would follow that the two systems would be independent such that no members of the first one would be related by distance and direction to any member of the second. And this, he thinks, is absurd.

Now, on the face of it this flies square into contradiction if 'material object' be defined as above -- namely, as a certain component of a sensing. That which is unsensed, and during non-continuous sensing every antecedent material object is unsensed, cannot be said to endure if a necessary condition of its existence in the first place is its being sensed. Since Strawson holds sensing to be a relation between sensers and things independent of sensing he might use this line of argument as a reductio against causal idealism. That is, it seems that it is impossible for causal idealism to treat space as unified, though, so it is agreed, it is desirable so to treat space.

If the space system is to be preserved as unified within the context of causal idealism either material substances must be posited as those things among which distance and direction fundamentally hold or else a sense must be presented in which material objects can be reidentified even while not enduring such that distance and direction can hold fundamentally among them.

While the endurance or not of material substances

is not brought into question by fragmented experience there is an overwhelming reason for not treating material substances as the fundamental relata in the relations of distance and direction. Distance and direction as we know them are sensible relations. Hence, it is not very clear how they could hold for things which are unsensible. (Sub-subsection 11-a-iii of chapter 3 is relevant here.) Yet, they would have to be were they to hold among unsensible material substances.

On the other hand, if subsection 1-a shows the unacceptability of the concept of direct reals then during situations of fragmented experience there are no plausible candidates for endurance other than material substances. Now if we assume that that which is sensible, including material objects, is the product of the interaction of sentient material substances and other material substances, a simple and plausible solution to the problem is forthcoming.

First, remember that a material object is not identical with either of, say, two relevantly interacting material substances taken individually nor with both of them taken jointly. It is an effect-2 of an effect-3 of their interaction. Thus, when the component of a sensing which is that material object is temporally fragmented from a qualitatively identical component of another sensing at least one of the relevantly interacting causal material substances is removed from a

situation in which the sensing of that material object would result were all the relevantly interacting causal material substances properly situated.

This suggests that if material objects are treated as that which would compose sensings were the relevant material substances relevantly situated then there is a sense in which a material object can be reidentified even when not a component of a continuous sensing -- i.e., even though not enduring. This sense is derivative on the endurance of the material substance which differentially causes-2 the sensing of that material object when it is sensed. We cannot say that the material object was there to be sensed all the while because, as it is only an individuated component of a sensing, this would be contradictory. But we can say that the material substances were "somewhere" all the while such that had the senser been relevantly situated so also would the material object have existed all along.

Furthermore, and this is the point, insofar as it can be said that the existence and identity of an effect-2 is wholly a function of what causes it (which, if causation-2 and -3 are accepted at all, seems innocuous) and insofar as it can be said that the material substance endures which causes-2 a material object to be sensed when it is, then it follows that a material object can be reidentified as numerically identical with one previously identified even though, if experience were fragmented, that

material object did not endure from the first to the second identifying.

It should now be clear that it was wrong to assume, with Strawson, that endurance is a necessary condition of reidentifiability. At least, the endurance of a material object as a component of sensings is not necessary for its reidentifiability. The endurance of material substances, on the other hand, is necessary for the reidentifiability of the material objects which they cause-2 to be sensed. Without this, there could be no numerical identity between the causes of sensings at two times between which experience is fragmented.

Hence it is that the unity of the space system of material objects should be based on, not the endurance of material objects but rather, the endurance of the material substances differentially causing-2 them to be sensed when they are. Insofar as there is a numerical identity between the differential causes-2 of components of fragmented sensings and insofar as the identity of what is caused-2 depends wholly on its cause, there is also a numerical identity between the material objects.

(Notice that if, somehow, it is qualitatively identical but numerically different material substances which cause-2 the sensings of qualitatively identical material objects between which experience is fragmented there would be no sensory means by which to judge. Thus, we must continue to employ the usual grounds for asserting

a numerical identity between sensed objects at the extremities of fragmented experience -- say, qualitative identity and the sharing of a space-time path. The discussion in this section simply explicates the concepts of numerical identity and reidentifiability where those usual grounds indicate our applying those concepts is appropriate.)

6. Quine offers a reconstruction of what Hume might have said in criticism of the use of material substance to serve any purpose at all. Our sensings, so the argument goes, are only momentary stages which follow one another. Where a term for identity is available, the difference between, say, ostensively indicating different stages of water and different stages of river while pointing in the same manner at two times is that in the second case, but not in the first case, an identity is asserted between the objects of the two pointings. This is supposed not only to solve Heraclitus' problem, but also to reconstruct Hume's claims about where people go wrong concerning material substances: "Momentary impressions, according to Hume, are wrongly identified with one another on the basis of resemblance. Then, to resolve the paradox of identity among temporally disparate entities, we invent time-consuming objects as objects of the identity."[8] Evidently, we'd be better off recognizing that the asserted identity among irreducibly different

things is only a device for distinguishing identifying a certain portion of a sensing as e.g. a water from identifying that same portion as a river.[9]

If we take Quine seriously that we are considering numerically distinct "momentary impressions" then it would be folly to assert a numerical identity between them. This, because by hypothesis they are not numerically identical.

But causal idealism does not even consider doing this. As was shown in discussing Strawson's need for reidentifiable entities, causal idealism infers from the partial, but only partial, coherence between two impressions between which there is an attention gap to something in virtue of which they, as related to that thing which is inferred, are completely coherent. For example, if qualitatively identical components of impressions between which there is an attention gap share a space-time path then it is inferred that they are numerically identical in virtue of their sharing a common cause-2. But causal idealism does not argue that therefore a component of an impression (alternatively, sensing) at one time must be intermediately time-consuming in order that no paradox result from asserting, as should be done, a numerical identity between it and a component of an impression at another time fragmented from the first. And tho causal idealism accepts that there can be no numerical identity between components of sensings between which

experience is fragmented unless something endures from the first sensing to the second, it does not conclude that therefore what endures is a sensing's component. Rather, it concludes that in order to assert a numerical identity between the components of noncontinuous sensings, which should often be done, we must assume the endurance of that thing which differentially causes-2 those components to be sensed.

In short, while it is components of sensings which are the objects of our assertions of numerical identity in these circumstances, it is unsensible material substances which are the time-consuming entities. (It might now be relevant for the interested reader to review subsection 1-b above.)

PART D

7-a. The concept of material substance will now be used to distinguish direct sensings from indirect sensings. I have in mind the difference between, for example, sensing a foot race as opposed to sensing with tracks in cloud chambers. (In section 5 of chapter 3 it will be shown that what results from the typical treatment of tracks in cloud chambers cannot very accurately be called even the indirect sensing of something. That is, only direct sensings can, with complete accuracy be called sensings.

But detailing this now would be too much tangential to our present concerns. Thus, for the present I will emphasize that ordinary sensings are direct by employing the expression 'direct sensing' where before I have employed 'sensing'.)

Not much can be said in general terms about a direct sensing except that it is sensory experience and that it need not involve anything else. This is not true of indirect sensing. In general terms, an indirect sensing is a direct sensing coupled with an inference employing a license which involves an assumption about causality.

The assumption about causality which is involved in indirect sensing might be called the argument from fragmented effects. The components of some direct sensings are complete in a way that other components of direct sensings are not. The latter are those which must be considered as having been caused, even though nothing else directly sensed qualifies as being the cause, if such components are to compose a world which is coherent. This holds typically if their behavior is truly described by the effects-clause of a well entrenched statement about sensible things also making reference in its cause-clause to other things. When such other things are not directly sensed, the effects-components are considered to be fragmented from their causes. In order that the effects

components be treated as composing a world which is coherent, reference is made to the not directly sensed causes from which they are fragmented. Refering to the causes in this way is indirect sensing.

The argument from fragmented effects is similar to the argument from fragmented experience in that they both make reference to that which acts causally but does not compose a direct sensing in order that things which do compose direct sensings be treated as composing a world which is coherent. The argument from fragmented effects differs from the argument from fragmented experience in that it applies to only some components of direct sensings rather than to all of them and in that it does not ground the application of the concept of numerical identity.

The customary paradigm of indirect sensing concerns tracks in cloud chambers. The indirect sensing of electrons by means of such tracks as involving an argument from fragmented effects can be expressed in this manner:

> A gas is supersaturated with water vapor to form a cloud. Normally, the atoms of that gas are uncharged and hence do not interact with the water vapor. But a track in the cloud is a line of condensed water vapor. Now assuming constant temperature and pressure, etc., the water vapor would condense only if the gas atoms served as condensation centers for the water vapor. And they would so serve only if they were charged. Given that they were initially uncharged, they would become charged

> only if interacted with by something which has a charge. Thus, when tracks form in the cloud it is inferred via an argument from fragmented effects that whatever firing device (say, a heated copper wire coil behind a perforated screen) is attached to the cloud chamber has emitted a thing which has a charge. That is, it is inferred that a charged electron has been fired thru the cloud.

Indirectly sensing with cloud tracks therefore involves a two-step causal inference. First, it is inferred that the gas atoms change the water vapor. Second, it is inferred that the electron changes the gas atoms. On the other hand, some indirect sensings involve only a one-step causal inference. An example of this is sensing with a zinc sulphide scintillator. For convenience, in what follows I shall assume that indirectly sensing with tracks in cloud chambers involves only a one-step causal inference. For example, that electrons are inferred to change the water vapor without the mediation of the gas atoms' being changed. It will be seen that this distorts nothing of consequence.

b-1. Some things which are indirectly sensed can be directly sensed. A simple example of this would be one's viewing only the left hand pan of a balanced scale and infering that the right hand pan is occupied by a thing which weighs five grams. A less simple but more historically significant example would be Leverrier's viewing the perturbed orbit of Uranus and infering via Newtonian mechanics the orbit and mass of Neptune. In such cases

as these, what is indirectly sensed would be directly sensed were certain conditions changed. Say, the senser were to direct his eyes to the scale's right hand pan or, say, he were to direct his telescope to a different part of the sky, and perhaps, increase its magnifying power. That is, in these cases there would be a relevant component of a direct sensing were those conditions changed. And in this sense, it can be said that, for example, Neptune composes a subjunctive direct sensing as opposed to its composing an actual direct sensing even when it is actually only indirectly sensed.[10]

A generalized description of this kind of indirectly sensed thing will now be presented. What springs to mind first to say is that that which composes a subjunctive direct sensing is the cause of, for example, the perturbations in Uranus' orbit. That is, a component of a subjunctive direct sensing is what is indirectly sensed by means of a certain argument from fragmented effects and that component is concluded to cause the perturbed behavior of an actual direct sensing's component. In the terms of causal idealism, however, this would be only partly correct.

It would be only partly correct because according to causal idealism all direct sensings are the causal-2 product of the effects of the causal-3 interaction between material substances. And no component of a

direct sensing, whether subjunctive or actual, is a material substance of a cause-2 of another direct sensing's component. Thus, it can be only partly correct that some component of an actual direct sensing is caused by some component of a subjunctive direct sensing. But this is partly correct because the causal statement which is used as the inference license in an argument from fragmented effects, as being about sensible things, involves the concept of causality-1, or signification, rather than causality-2 and -3.

In general terms this is what happens in cases of indirect sensing where what is indirectly sensed composes a subjunctive direct sensing:

> An indirectly sensed thing, a, which composes a subjunctive direct sensing is a thing whose material substance differential cause-2, A, is such that when A interacts causally-3 with a sentient material substance, B, in certain circumstances no effects are produced which cause-2 actual direct sensings. But when A interacts causally-3 with a certain other material substance, C (where C does interact with B to cause-3 such changes in B as themselves cause-2 actual direct sensings which have behaving material object, c, as a component), A causes-3 such changes in C that c appears or behaves differently than it does when C interacts with B without being acted on by A.
>
> a will be a component of an actual direct sensing when A interacts with B in different circumstances or when A interacts with some other (type of) sentient material substance.

The important thing to remember here is that according to causal idealism even in cases where that which is indirectly sensed composes a subjunctive direct

sensing the argument from fragmented effects not only implies a reference to what composes a subjunctive direct sensing but also indicates the need for a reference to the unsensible causes-2 of there being either actual or subjunctive direct sensings. Cases of indirect sensing should call to mind that one sensing exists in a sequence to signify another sensing in that sequence with which it is constantly conjoined only because of the interaction between the unsensible causes of the two sensings. This should be called to mind because when we consider at one time a thing to compose a subjunctive direct sensing we are starkly faced with the problem of being able to reidentify it at another time as something which composes an actual direct sensing. And this is just the kind of problem which is faced when an argument from fragmented experience is considered -- i.e., when causally-2 and -3 acting material substances are introduced. After all, with some telescopes Uranus exists as directly sensensible to have a perturbed orbit even tho Neptune does not exist as directly sensible. But with other telescopes both of them exist as directly sensed. And this is why the concept of material substance is used to distinguish direct sensings from even those indirect sensings of things which compose subjunctive direct sensings.

ii. Some things which are indirectly sensed cannot, for one theoretical reason or another, be directly sensed.

This is true of electrons. In such cases, what is indirectly sensed would not compose any direct sensing no matter what theoretically possible conditions were changed. Thus, an electron, for example, does not compose a subjunctive direct sensing.

Now the need for employing the concept of material substance to distinguish these cases from direct sensings is more immediate than is that need for distinguishing direct sensings from indirect sensings of things which compose subjunctive direct sensings. Since such things as electrons do not compose subjunctive direct sensings it cannot be said that the track in a cloud chamber by means of which an electron is indirectly sensed is even caused-1 by the component of some subjunctive direct sensing. Thus, without the concept of material substance it might be impossible to specify exactly how such cloud tracks are caused. After all, since electrons are not directly sensible they cannot participate in causal-1 or signifying relations. And what kind of causality is left for them to participate in?

But the difficulty is easily overcome by using the concept of material substance and assuming that all direct sensings are the causal-2 product of the effects of the causal-3 interaction between material substances. In general terms this is what happens according to causal idealism in cases of indirect sensing where what is indirectly sensed does not compose a subjunctive direct

sensing:

> An indirectly sensed thing, A, which does not compose a subjunctive direct sensing is a material substance which causes-3 no changes when interacting with a sentient material substance, B, which themselves cause-2 any direct sensings. But when A interacts causally-3 with a certain other material substance, C (where C does interact with B to cause-3 such changes in B as themselves cause-2 direct sensings which have behaving material object, c, as a component), A causes-3 such changes in C that c appears or behaves differently than it does when C interacts with B without being acted on by A.

c. The important difference between indirectly sensible only entities and indirectly sensible entities which are also directly sensible is that the former are material substances while the latter are not. The former cause there being direct sensings while the latter compose them, whether subjunctively or actually. (I expect that this feature will stir up controversy. Perhaps the reader will delay final judgment as to whether or not it is justified until he has finished chapter 3. For it is in chapter 3 that this feature is discussed in detail.)

A related point of importance is that when an argument from fragmented effects is used to imply the existence of something which is not directly sensible, it implies the existence of things which are independent of being directly sensed. But even here it is different from arguments from fragmented experience because it is not concerned just with grounding the use of the concept

of numerical identity.

A third thing of importance is that even though sensing with a telescope, for example, is like indirect sensing in that it employs an instrument, fundamentally it is not like indirect sensing because it does not necessarily employ arguments from fragmented effects. Thus, such sensings have been treated simply as examples of direct sensing.

The final thing of importance from this discussion is that arguments from fragmented effects begin with an assumption about effects-1 and end with a conclusion about causes-2 and -3. Now the parenthetical comment which closed the third paragraph above is relevant here. But the discussion in sub-subsection 3-d-iii above is more relevant. There it was noted that material substances can be treated as being in motion even tho not directly sensible because, for predictive purposes, they can be treated as taking the place(s) of directly sensible things which are actually not directly sensed. This means simply that ordinary predictions involving causal-1 relations do not cease being applicable to the world just because the antecedent relata of those relations do not exist so long as those relations are dependent on causally-3 acting things which do exist. (For one psychological reason and another, the usual thing that is done in these cases is to ascribe the causal feature of

the absent cause-1 to the present cause-3.) In short, since causality-1 depends on causality-2 and -3, it is not mistaken to use this dependence to ground one's infering, retroductively, things about causes-3 from assumptions about effects-1.

FOOTNOTES

1 A Treatise Concerning the Principles of Human Knowledge, sections 3-4.

2 Ibid., section 5.

3 Ibid., section 23.

4 "If anyone will examine himself concerning his notion of pure substance in general, he will find he has no other idea of it at all, but only a supposition, of he knows not what support of such qualitites which are capable of producing . . simple ideas in us." An Essay Concerning Human Understanding, II, xxiii, 2.

From this statement, nothing follows concerning the resemblance or identity between the produced ideas and the producing substance. Thus, a critic cannot infer, on the grounds of resemblance or identity between producing substances and produced ideas qua sensible objects, that the substances themselves are sensible. But, if one could make this inference, then, to ascribe non-sensibility to a material substance which has sensible qualities which produce ideas would be contradictory.

Locke for one, however, does not avoid this mistake. He has already said: "First, our senses, conversant about particular sensible objects, do convey into the mind several distinct perceptions of things...which when I say the senses convey into the mind, I mean, they from external objects convey into the mind what produces there those perceptions." Ibid., II, i, 3.

5 Berkeley says "...what are the forementioned objects [all sensible objects] but the things we perceive by sense? and what do we perceive besides our own ideas?" Op. cit., section 4.

Locke says "It [the term 'idea'] being that term which, I think, serves best to stand for whatsoever is the object of the understanding when a man thinks." Op. cit., Introduction, 8.

6 See Perception, (London, 1961), pp. 72-73.

7 Individuals, (London, 1959), pp. 28, 44, 64, 66.

8 "Identity, Ostension, and Hypostasis", From a Logical Point of View, (Cambridge, 1961), p. 74.

9 Ibid., pp. 65-68, 73-74.

10 Notice how easily the concept of subjunctive direct sensings can be extended to solve the riddle of whether or not a sound is made by a felled tree in a deserted forest -- or of whether or not the forest exists if deserted. Thus, the sound qua component of a direct sensing exists, tho only subjunctively, because its material substance differential cause-2 exists. And similarly for the forest itself. Neither, however, exists as the component of any actual direct sensing and so doesn't exist as a heard sound does or as a seen forest does. (Some components of sensings cannot exist subjunctively. One's feeling pain from a pin prick as opposed to feeling the pin exemplifies this.)

CHAPTER II: ONTOLOGY

INTRODUCTION

A standard criticism of idealistic theories of sensing is that the standard ontological concepts, such as individuals and properties, will not apply to the entities of those theories. This usually takes the form of challenging that ordinary language will not translate into idealistic language.

This chapter is intended to present an ontology of what is sensed which will fit with causal idealism. Thus, it is intended to show how the standard ontological concepts can be applied to the components of sensings. This will be presented in part A. The chapter is also intended to show how the ontology of causal idealism entails coherent positions-solutions to three fairly major ontological issues being currently discussed. This will be presented in part B.

The approach of the chapter does not concern language translating. It concerns ways of treating the components of sensings with respect to their various kinds of positions. No reference is made to extra sensory entities except material substances. That is, no reference is made to platonic entities. Neither is reference made to linguistic entities.

PART A

1. In this chapter, inquiry will be restricted to sensings with spatial components -- each such component has a distance and direction both from every other such component and from the point of view of the sensing's senser. Thus, inquiry will be restricted to visual and tactile sensings.[1]

At the outset it should be noticed that the components of visual and tactile sensings are determinates and sets of them. The components of visual sensings are shaped and sized colors (alternatively, colored shapes and sizes) and those of tactile sensings are shaped and sized hots and colds (alternatively, hot and cold shapes and sizes).

Consider visual spatial entities, a and b, which do not share spatial positions but which are the same shade of red, for example. They exactly resemble one another in the sense that they share all non-relational features. Thus, they can be distinguished one from the other only by reference to such relational features they have which do not depend on the non-relational features they have: position in space and time. In this situation, we can but we are not required to assert a numerical non-identity between a and b. Whether we do or not depends on how we treat them.

Consider a spatially fragmented visual entity P

which is composed of all and only the visual entities which exactly resemble a and b. Hence, P simultaneously has multiple spatial positions and there is no entity which exactly resembles any component of P which has a spatial position different from some spatial position had by P.

Now, and here's the point, both a and b can themselves be treated as representing P. That is, a can be treated as calling attention to and standing for P, which it also composes; and similarly for b. (This accounts for such ordinary occurrences as a man's pointing alternately in the direction of separated pink ice cubes while saying "This is the same (color) as that" and while intending more than "This exactly resembles that".) In this sense, both a and b can be treated as representing P, a spatially fragmented entity. Hence, under such a treatment, a, for example, does double duty: as a standard, it is used to identify the various components of a certain spatially fragmented entity; as a representative, it is used to draw attention to that fragmented entity.

It is to be assumed that entities are numerically identical if and only if they share both all relational features and all non-relational features while they are qualitatively identical if and only if they share only all non-relational features. It follows that if both a and b are treated as representing P then they have been treated such as to be numerically identical because, in effect, they have both been treated as P, a thing which

is spatially fragmented. Let us say that such spatial entities which can have multiple spatial positions are material qualities.

Notice that asserting a numerical identity while pointing alternately to a and b is just like asserting a numerical identity while pointing alternately to the head of a dog and to its tail except that in the first case the indicated entity is spatially fragmented and in the second case, not. And notice that this treatment avoids the absurdity of asserting that, since a is at some distance and direction from b with which it is numerically identical, a is at some distance and direction from a. In short, that both a and b can be treated as the same material quality is derivative on there being a fragmented entity, P, which they both compose and both represent.

On the other hand, we are able to assert a numerical non-identity between a and b if we treat them simply as entities which have different but single spatial positions. (The sense in which a, for example, has a single position although it is an extended entity is that between any two of its components there is a continuous path lying wholly within a.) In this case, since they fail to share a relational feature they fail to be numerically identical. Let us say that such entities which cannot have multiple spatial positions are material objects.[2]

In short, material qualities are spatial entities

which can have multiple spatial positions (alternatively, paths) by being entities which are spatially fragmented; material objects are spatial entities which can have only single spatial positions (alternatively, paths).

2-a. A multitude of things have been said about the distinction between individuals and properties or between particulars and universals. And a multitude of criteria have been offerred for distinguishing them. I believe that, whatever else is acceptable to specific theories, the single criterion by means of which to distinguish them which is universally acceptable is this. For things which are properties, their being qualitatively identical entails their being numerically identical; for things which are individuals, their being qualitatively identical does not entail their being numerically identical. In this essay, this criterion, call it C-1, will be used to make the individual-property distinction.

Now material objects have just been identified as entities with single spatial positions precisely in order that it not be necessary for material objects which are qualitatively identical to be also numerically identical. It follows that material objects are individuals.[3] (Notice that their being qualitatively identical does not preclude material objects from being numerically identical. They would be if they occupied the same position. Of

course, in such a case it would not be correct to speak of "them" in the first place.) On the other hand, material qualities have just been identified as entities with multiple spatial positions precisely in order that it be necessary for material qualitites which are qualitatively identical to be also numerically identical. It follows that material qualities are properties.

And hence it is that under criterion C-1 an individual-property distinction can be applied to spatial entities simply on the grounds of whether or not a spatial entity has a single or multiple positions. And hence it is that a component of a sensing can be treated either as a property or as an individual depending on whether or not it is treated as representing a spatially fragmented entity composed of all entities qualitatively identical to it with respect to some feature.

b. It is sometimes held that individuals are those entities to which the numerical-qualitative identity distinction applies whereas properties are those entities to which it doesn't apply. This, because it is unclear how numerical as opposed to qualitative identity is involved when only properties are considered -- all properties which are qualitatively identical are also numerically identical and all properties which are qualitatively different are also numerically different.

Of course, this criterion need not be incompatible with C-1. It could be that the qualitative identity of properties is held to entail their numerical identity precisely because for them it is held that those identities are in no sense different.

But this criterion obscures the fact that one and the same thing can be treated either as a property or as an individual depending on whether or not it is treated as representing that fragmented entity composed of all other entities qualitatively identical to the first one. That is, depending on whether it is treated as a material quality or as a material object. Thus, the numerical-qualitative identity distinction will apply to a thing which is a property in virtue of its being treated as representing a fragmented entity which it composes because that same thing could have been treated as a material object-individual.

Hence, as it is somewhat misleading to say that a property is a thing to which the numerical-qualitative identity distinction does not apply, C-1 will continue as the accepted criterion.

3. In discussions where individuals are treated as having single spatial locations and properties are treated as having multiple spatial locations it is customary to extend this by treating individuals also as having shared (sharable) spatial locations. Thus,

material objects would be treated as having single and unshared positions while material qualities would be treated as having multiple and shared positions. In this section a reason for doing this as well as a means for accomplishing it will be presented.

a-1. First, however, it should be recognized that varying the theme used by J.W. Meiland to defeat the bare particulars thesis will not accomplish what this custom requires.

Meiland's argument goes like this. If it is only a contingent matter of fact that only a single spatial individual can occupy a single spatial position then it is possible that that position be simultaneously occupied by two individuals. In that case there would be two bare particulars at a single spatial position. But it is equally possible that, in an observationally identical situation, that position is occupied by only a single individual -- in which case there would be only one bare particular there. There being no other grounds than observational ones for determining whether one or two bare particulars are at a single spatial position, it follows that there are no grounds sufficient for determining whether one or two individuals really are ever at a single spatial position. Thus, even if the bare particulars theory accounts for the numerical identity and difference of individuals it does so only

at the price of rendering it impossible ever to determine whether a situation involves one or two or more individuals. And this is absurd. In the absence of other candidates, it must be accepted that it is not just a contingent matter of fact that only a single spatial individual can occupy a single spatial position. That is, it must be accepted as necessary that only a single spatial individual can occupy a single spatial position if we wish to determine whether or not more than one spatial individual occupies a single spatial position at any one time.[4]

ii. Consider those individuals which are identified via C-1 as material objects. They are components of sensings which have single spatial positions. But those components which are in fact treated as material objects under C-1 could equally be treated as material qualities, as properties, simply by treating them as representing a certain spatially fragmented entity which they compose.

Now this fact about the two ways of treating components of sensings does nothing to ameliorate the force of Meiland's argument. But it does indicate that Meiland's argument applies to components of sensings rather than to individuals. Meiland's argument really concerns whether or not what exists at a single sensed location can be treated as two qualitatively identical

components of a sensing without introducing the impossibility of determining how many such components exist there. It doesn't matter to the fact that this is impossible whether what exists at a single location be considered as being a material qualitity or as being a material object. Thus, in this sense it must be accepted equally of material qualities and material objects that no two of them which are qualitatively identical can occupy the same place -- on pain of its being impossible to determine how many sets of determinates exist there.

And hence it is that Meiland's argument does not establish that material objects have unshared positions as opposed to material qualities' having shared positions. (As far as I know, Meiland did not intend that his argument should be extended in this way. I invented that extension for the purpose of setting the context for the next subsection.)

b. Section 1 of this chapter began by considering components of visual sensings. That is, by considering determinates of the determinables, color and shape and size. But it would be mistaken to hold that a visual material quality can share its position in virtue of the fact that a color can exist where a shape or size does.

The components of our visual sensings are not just

colors or just shapes. They are shaped (and sized) colors; they are colored shapes. There is no such thing in a visual sensing as an uncolored shape or an unshaped color. Thus, it is a shaped color which is a material or a material object, depending on whether or not it is treated as representing a certain fragmented entity which it composes. That is, a color is not a material quality. And neither is a shape. Rather, material qualities are composites composed of, for example, shaped colors.

(Let me take this opportunity to introduce 'redness' as denoting a fragmented composite which is a material quality. And, 'red' as denoting a certain shaped color. Thus, redness is composed of all the reds which compose past, present, and future visual sensings. Thus, redness itself composes visual sensings.)

But this discussion indicates how material objects might be treated such that they cannot share their positions while material qualities might be treated such that they can share their positions. First, it should be noted that a determinate which composes a visual sensing can share its position with a determinate which composes a tactile sensing because they are determinates of different determinables. Second, it should be noted that when we attend to what exists at a single position as being a set of multiple determinates, as being a red and scalding

for example, certain predictions which are more or less useful to our lives can be made which cannot be made if we attend to what exists at that position as two sets of single determinates, as being a red and a scalding. Third, it should be noted that, mainly through the habit of living predictively, we in the mainstream of western culture have for the most part forgotten that it is nonetheless possible to separate the sensings (and their components) of one sense organ from those of another sense organ. That is, to change the world by sensing clears or cools or babblings instead of sensing brooks. However, that we <u>can</u> do this is brought home whenever we deal with properties. For example, when we say "This pink ice cube is the same as that pink ice cube."

Hence it is that what composes, say, a visual sensing at a single position not only can be treated either as a material object or as a material quality but also can be considered as joined with what composes a tactile sensing at that position. And doing so is predictively fruitful -- though doing so is not necessary. In short, a red, for example, can be treated as composing nothing but a visual sensing. But it can also be treated as composing the set of things which exists at its position when, as is generally the case, more things than it exist there. (Of course, only one of these treatments is applicable at any one time.)

On the other hand, since no position can be occupied by more than one determinate of a single determinable, the number of things which can exist at a single position is quite limited -- since the number of different determinables is quite limited. And if the set of determinates which exists at a single place is treated as including either a determinate from every determinable or the negation of that determinable (water's being odorless exemplifies this), then no other determinate or set of them can simultaneously be there. That is, such an entity is one which cannot share its position.

In order to square with the normal custom, let material objects, individuals, now be treated as those entities which not only have single positions (and hence, for which qualitative identity does not entail numerical identity) but also have unshared positions. To effect this, let it be stipulated that material objects are sets of determinates with a member from every determinable or the negation of a determinable. (Of course, it remains possible to treat sets with single members such that qualitative identity does not entail numerical identity for them -- but it serves no practical purpose.) It follows that material objects (spatial individuals) are the entities about which we can predict so relatively easily. Which also square with custom.

Continuing with this, let material qualities now

be treated as those entities which not only have multiple positions (and hence, for which qualitative identity entails numerical identity) but also have shared (sharable) positions. To effect this, let it be stipulated that material qualities are sets of determinates with single members.

That a material quality be treated as a set of determinates with only one member may seem unduly restrictive. However, there are two good reasons for the restriction. First, it square with most practice. Generally, things like redness or scaldingness are thought of as properties rather than things like redness-scaldingness. (However, see subsection 5-a below.) Second, it prevents our having to adopt ad hoc measures for preserving material qualities' being able to share their positions. If it were desired to treat, say, tableness as a material quality while yet preserving that it could share its position, it would have to be required that tableness is composed of sets of determinates themselves composed of all the determinates at single positions except, for example, heatedness.

4-a. I think it is relevant to pause here and develop two consequences of this chapter's previous discussion.

The first consequence comes from considering material objects to be sets of determinates. And it concerns a fairly ordinary way of stating a causal

relation about sensing. Ordinarily, it is said that such a thing as ice causes a senser to feel cold when it touches him. And since ice continues to be seen even after it is removed and no longer felt, we tend to think that ice endures tho feeling it doesn't. Then we tend to infer that this is true no matter what sense organ is considered. And we wind up thinking that ice is something independent of sensing which causes us to sense itself.

Section 1 of chapter 1 was intended to show that something must be wrong with such an argument because its conclusion leads to an impossibility. Now it can be seen exactly where the argument goes wrong. It goes wrong in treating ice, a material object, as causing a sensing. But a material object is nothing more than a set of determinates at a single position which compose the sensings from various sense organs. That is, ice is numerically identical with a set of determinates which includes a cold as one member: ice is, among other things, a cold; not, causes cold. (Rather than challenging the concept of material substance, I feel that Hume and Quine should have expressed their grievance in something like this fashion.)

This is not to deny that this situation can be treated as involving causality-1. After all, that one sees a white and semi-transparent cube to be approaching

his arm does signify that shortly his arm will feel cold. But it is to deny that what is seen, what composes a visual sensing, is causally responsible for what is felt, what composes a tactile sensing, in any way which involves power or necessitation. And it is to deny that ice is a visual thing which causes some tactile sensings. Ice is a visual and tactile thing -- though white, semi-transparent cubes are only visual things. When ice does not touch a senser, its tactile component exists only as composing a subjunctive direct sensing. (See Appendix 1).

b. The second consequence comes from considering sensings to be composed of sets of determinates which, as grouped at a single position, are a material object and, as ungrouped, are several material qualities (if they are also treated as representing a certain fragmented entity which they compose). And it concerns the ordinary treatment of individuals as having or possessing properties.

Now it is not the case that such a material object as a red pencil composes the material quality redness. And it is not the case that the redness composes the material object red pencil. Rather, the determinate, red, which is at a certain place composes a spatially fragmented material quality, redness, which exists at that and at other places and each of whose components is qualitatively identical to this red. And that red can be treated as representing redness. But that same red

When certain otherwise incoherent phenomena require our employing an argument from fragmented effects, that argument can conclude either with a reference to a component of a subjunctive direct sensing or with a reference to something which composes no direct sensing -- depending on whether or not it is theoretically possible for that thing to be directly sensed. Now arguments from fragmented effects are concerned with dispositions and their conditions. For example, a track in a cloud chamber is a fragmented effect because it is permanently possible for them to form there. Furthermore, it is assumed that they do so only if some specific condition obtains. But that condition is not directly sensed.

The immediate inclination is to ascribe a causal disposition to that which is not directly sensed. There is no problem with doing this if that which actually is not directly sensed nonetheless would be sensed under different and theoretically possible circumstances. This, because there is then no problem with treating that thing as a set of determinates, although now composing only a subjunctive direct sensing, and hence as capable of being involved in a sequence of sets of determinates. And, after all, any disposition, including a causal one, is simply a sequence of sets of determinates.

But there is a problem with ascribing a causal disposition to that which is not theoretically capable

from collecting them as material qualitites. This is the collecting of things which have already been individuated as material objects into what shall be called material groups. Thus, a pencil is a spatial entity which cannot have multiple positions and cannot share its spatial position because it is a material object. But there are many such material objects -- each one relevantly qualitatively identical to the next and distinguished from it in virtue of their having different spatial positions. Now they can be collected for the sake of verbal, or other, expediency into a material group. Such material groups can be, and normally are, referred to by a common noun.

A material group is different from a material quality because even though it is also a spatially fragmented entity and its components all are qualitatively identical (though only in relevant respects) those components must first be individuated as material objects before they qualify as components of the material group. It follows, of course, that generally no two material groups can simultaneously share their spatial positions.

b. There is another kind of spatial entity which has been considered lately and which is similar to and of about as much complexity as are material groups. These are the entities -- more or less following Quine's

practice, they shall be called <u>massses</u> -- which are like material objects in that normally no two of them can simultaneously share the same place because they are normally composed of all the determinates that are at any place simultaneously (and they are always composed of multiple determinates) but which are like material qualities in that any one of them can, and generally does, occupy multiple places. Water and sugar, as normally treated, are this kind of spatial entity. Massses differ from material groups in that the sets of determinates composing the former need not be but those composing the latter must be first treated as material objects before they are treated as composing what they, respectively, compose.

6-a. A material object can change in these two ways. The set of determinates which is the material object prior to the change can be qualitatively identical to the set of determinates which is the material object after the change or not. In the first case, the material object would have changed its position but retained its membership as a set of determinates. In the second case, the material object would have changed its membership as a set of determinates. So long as the change being considered is permanently possible for that material object, given the relevant conditions, let us say that the first kind of change is a <u>non-qualitative</u>

disposition of the material object while the second kind of change is a qualitative disposition of the material object. Insofar as a change, whether actual or permanently possible, is a sequence of sensed things (a sequence of sets of determinates), it follows that no disposition is a material quality because a material quality is not a sequence.

As an example of a qualitative disposition, consider those white, mealy, garlic-smelling sets of determinates which are treated as the material object, white phosphorous chunks. It is permanently possible for them to dissolve in turpentine and to burst into flames at thirty degrees C. These permanent possibilities are qualitative dispositions of chunks of white phosphorous. Whether or not a numerical identity is asserted between the white phosphorous which existed prior to, say, a ten second bath in turpentine and that white phosphorous which exists afterwards depends on whether or not exact qualitative identity is held to be necessary for the numerical identity of material objects. It can but it need not be. Whether or not the numerical identity is asserted might also depend on whether or not the change is reversible.

As an example of a non-qualitative disposition, consider that all material objects move unacceleratedly or rest unless acted on by an unbalanced force. (However,

this does not hold for such spatial entities as shadows.) In such cases, the memberships of these entities as sets of determinates is undisturbed. Since their moving or resting in those conditions is permanently possible for them, their having inertial mass is a non-qualitative disposition of material objects.

Let us say that qualitative and non-qualitative dispositions both are effects dispositions.

Now mass is a non-qualitative disposition only when it is treated in its passive aspect -- only when that to which it is ascribed is affected by a force imparted by something else. But, the second thing could impart a force in virtue of its own motion and mass. And this time, mass is the permanent possibility for a moving material object to cause a reaction which is equal to the product of that material object's mass and (de)acceleration. That is, mass can also be treated in its active aspect. Let us say that the permanent possibility for a set of determinates to cause-1 a non-qualitative change in some other set of determinates is a causal-a disposition.

Immediately, it is suggested that there is a second kind of causal disposition -- one which is the permanent possibility for a set of determinates to cause a qualitative change in some other set of determinates. An example of this would be a fire's making water hot and boiling. Let us say that this is a causal-b disposition.

Let us say that causal-a and -b dispositions are both causal dispositions.

b. All of the dispositions just presented involve sets of determinates and only them. That is, dispositions are sequences of sets of determinates regardless of whether a membership is changed and regardless of whether a cause or an effect is considered. Dispositions are ways of treating what is sensed just as are material objects, material qualities, material groups, and massses. Indeed, treating what is sensed as a disposition involves treating it also as containing a material object. That is, one subset of determinates from each stage of a sequence of sets of determinates which is a disposition is individuated as a material object and, generally, a numerical identity is asserted between the relevant material objects which exist at each stage of the sequence. (Exceptions occur when a qualitative disposition involves such a change in the membership of a material object as a set of determinates that a numerical identity cannot be asserted between what originally had the disposition and what subsequently has it.) The disposition is then said to belong to that material object in about the same way as material qualities belong to that material object.

There is now the opportunity for somewhat clarifying an issue raised in sub-subsection 3-d-iii of chapter 1.

When certain otherwise incoherent phenomena require our employing an argument from fragmented effects, that argument can conclude either with a reference to a component of a subjunctive direct sensing or with a reference to something which composes no direct sensing -- depending on whether or not it is theoretically possible for that thing to be directly sensed. Now arguments from fragmented effects are concerned with dispositions and their conditions. For example, a track in a cloud chamber is a fragmented effect because it is permanently possible for them to form there. Furthermore, it is assumed that they do so only if some specific condition obtains. But that condition is not directly sensed.

The immediate inclination is to ascribe a causal disposition to that which is not directly sensed. There is no problem with doing this if that which actually is not directly sensed nonetheless would be sensed under different and theoretically possible circumstances. This, because there is then no problem with treating that thing as a set of determinates, although now composing only a subjunctive direct sensing, and hence as capable of being involved in a sequence of sets of determinates. And, after all, any disposition, including a causal one, is simply a sequence of sets of determinates.

But there is a problem with ascribing a causal disposition to that which is not theoretically capable

of being directly sensed. For such a thing is not a set of determinates and hence not capable of being involved in a sequence of sets of determinates.

The inclination now is to say "But when such a causal disposition as charge is ascribed to those things which are inferred via an argument from fragmented effects as applied to cloud track phenomena, many predictions which could not otherwise be made are accomplished -- thus, your explication of causal dispositions as sequences of sets of determinates must be wrong." But this response would be correct only if there were no other way of accounting for the predictive accomplishment. And there is.

Let it be assumed that there are any direct sensings at all only because of there being an interaction among material substances one of which is sentient. Certain sequences of what is sensed are uniform in a way which allows our treating them as dispositions. As directly sensed, they result from the causal interaction among material substances, at least one of which is sentient. Normally, for every effects disposition there is a relevant causal disposition. From this are retroduced laws describing what is directly sensed. When an effects disposition is directly sensed although no causal disposition is directly sensed, the usual predictions can still be made. These predictions concern

other effects dispositions which will shortly be directly sensed and hence seem to involve a reference to things with causal dispositions. This is one way of looking at the matter.

But it can also be looked at as involving a reference to the causes-2 of there being any direct sensings at all -- and as involving their behaving causally-3 such as to cause-2 those sensings to be uniform in some manner. The way of describing this uniform manner is retroduced from situation in which both causal dispositions and effects dispositions are directly. However, that way of describing the ongoing uniformity holds even when the causal dispositions are not directly sensed. Indeed, it holds even when no relevant antecedent thing is directly sensible at all. But, given the way people think, the use of any such predictive laws seems to involve a reference to something with a causal disposition. Now those laws hold for what is sensed only because of the causal-3 interaction among material substances. Thus, material substances do exist in these situations. The causal dispositions are therefore ascribed to the only available candidate and material substances, electrons for example, are thought to have such causal dispositions as charge -- which is a sequence of sets of determinates. This is a mistake. Those material substances which are electrons (and protons, etc.) differentially cause-2 there being

the uniform sequences of sets of determinates which are the effects dispositions of material objects. They also cause-2 there being the uniform sequences of sets of determinates which are such causal dispositions as charge of directly sensed material objects. From both of these dispositions certain predictive laws are retroduced. Now the material substances are such that these laws can be used predictively about effects dispositions even when the material substances fail to cause-2 there being the sensing of the relevant causal disposition. And the laws are determined to be relevant for predicting future fragmented effects on the basis of the identity of that fragmented effect which is presently sensed.

And hence it is that nothing prevents causal dispositions from being explicated in the manner presented above -- that is, as inapplicable to the causes-2 and -3 of what is directly sensed. That material substance which, under certain conditions, would cause-2 a material with a relevant causal disposition to be directly sensed continues to cause-3 such changes in another material substance that another material object is directly sensed to have an effects disposition even when the first material substance does not cause-2 its material object to be directly sensed.

6-c. This treatment of a disposition as a sequence of sets of determinates such that, generally, a numerical

identity is asserted between those sets which are material objects at each respective stage of the sequence also indicates the point of view of causal idealism towards the impenetrability of spatial individuals. This is important in that their being impenetrable has historically been treated as one of the strongest indications that spatial individuals are independent of being sensed -- hence, an anti-idealistic indication.

According to causal idealism, impenetrability is the disposition of a spatial individual either to not combine with another spatial individual at a single place or else to combine with another spatial individual at a single place as a composite which is qualitatively different (at least in shape or size) from either of those components. Thus, when impenetrable individuals collide either they will rebound or else form something qualitatively non-identical to either of the original individuals. And thus, the impenetrability of spatial individuals can be accounted for without treating them as independent of being sensed.

It is because most spatial sets of determinates are impenetrable that Meiland's argument, as presented in subsection 3-a above, is so effective. It is somewhat interesting to note, however, that that argument does not apply to such spatial sets of determinates as shadows or waves (because waves are superposable). Thus, if the projectors of two qualitatively identical shadows

which are projected to different places are so manipulated that the shadows are projected onto a single place, the resulting shadow would be qualitatively identical to both of its components. Hence, if, like men in Plato's cave, we were prohibited from sensing the causes of sensed shadows, then we would be prohibited from knowing how many shadows exist at a single place. Insofar as it is advantageous to know how many things exist at some place it is therefore fortuitous that not many spatial things are like shadows.

This feature of shadows indicates a more important point. Suppose a blindfolded man stands in a warm room and a thin stream of warm air is directed onto his stomache and another, qualitatively identical, stream is directed onto his chest. The result will be his feeling two cools of a certain vague shape. Then suppose the second stream is directed onto his stomache. Unless the man is very accute, the felt result will be the same as had the second stream simply been turned off. That is, sets of determinates which contain felt determinates but no seen determinates often are penetrable. Presumably, it is for this reason that they are not treated as individuals. And thus, there is more to be categorized in the spatialworld than has been considered in this chapter's ontology. On the other hand, this type of entity clearly could be categorized by that ontology. (This point shows simply that the world of sensings is

richer than the world of things which traditionally is considered in ontological discussions.)

7. No attempt has been made at treating those spatial entities of whose essence it is to change continually -- fires, rivers, organisms, and processes, for example. It has not been attempted because I feel it to be a slightly different and much more difficult task than treating those spatial entities which can but need not change. However, nothing seems to prevent that's being done within the general approach of this ontology.

As far as I know, there are no other actually practiced ways of ontologically categorizing what is directly sensed and can but need not change than those presented in this part of the chapter. If this is correct, then an ontology which makes reference only to the components of sensings and their positions relative to one another suffices to ground the use of enough actually practiced ontological categories that causal idealism cannot be rejected on the grounds that it is ontologically inadequate.

Additionally, this ontology entails at least coherent positions towards, and perhaps solutions to, three fairly major ontological problems being currently considered. Thus, there is support for the ontology of causal idealism in virtue of its being a philosophical

retroduction. (Philosophical retroductions differ from scientific retroductions in that the statements-solutions which they entail are, since unverifiable, arguable. Except for indicating how the entailed statements-solutions relate to one another via causal idealism, I shall not produce new discussions about them. However, it should be clear from what is presented that these statements-solutions are viable as part of one general world view which has been fairly thoroughly examined.)

PART B

8-a. It is traditional to distinguish those of an individual's properties which are essential to it from those of its properties which are accidental to it on the grounds of whether or not a change in the individual's having or not having a given property suffices for the individual's being changed substantially -- being no longer numerically identical with the individual which existed prior to the change. However, mainly because it is possible adequately to identify what exists at a single place in different ways it has become popular to deny that these are adequate grounds for making the distinction. This issue will now be discussed from the point of view of causal idealism.

As was pointed out in subsection 4-b above, a

single determinate which composes what is sensed at some place can be treated either as composing a material quality or as composing a material object. This holds for each of the determinates which might exist at that place. And in this sense can it be said that a material object has material qualities. A chunk of white phosphorous, for example, is the set of determinates white, mealy, garlic-smelling at some position which has the qualitative dispositions to burst into flames at thirty degrees C. and to dissolve in turpentine. Here, whiteness and garlic-smellingness and mealiness are the material qualities, properties, of the material object, individual, chunk of white phosphorous.

Suppose that after long exposure to air a chunk of white phosphorous will no longer smell like garlic and that when it doesn't it will not dissolve in turpentine. Suppose also that, for some reason, we are interested in white phosphorous only because it smells garlicy or dissolves in turpentine. In such a case, since what exists after the change does not interest us though what existed before the change did, it should be able to be said that they are numerically non-identical -- that the original material object chunk of white phosphorous no longer exists. Hence it would be that garlic smelling would be essential to a set of determinates' being white phosphorous.

On the other hand, suppose that while a chunk of

identity must be necessary for the numerical identity of material objects. It is not required that the qualitative difference of two sets suffices for their numerical difference. It is not required that a change in the membership of a set entails that the original and subsequent sets be numerically different. At least, this is not true for the sets of determinates which compose our sensings. This, on the grounds that the treatment of sets in historical mathematics does not alter the world and need not alter ontological ways of treating the world. If the world can most expediently be treated as composed of sets of determinates and if there is some good reason for rejecting that qualitative identity is necessary for numerical identity then mathematicians simply must invent a set theory according to which some changes in a set's membership do not suffice for the resulting set's being numerically non-identical to the original set. That is, they must allow for the essential-accidental distinction.

Due to the current practice, this proposal seems a little shocking at first. But at second it seems so undeserving of controversy as to be embarrassing.

9. With the exception presented in subsection 8-b, which is here irrelevant, material objects are sets of determinates with specific memberships. Hence, one type of material object can generally be distinguished from

in daily life on treating what is directly sensed as material objects rather than as material qualities. That is, we have a reason for a practice which we are not required to employ. In exactly the same manner, no matter how encompassing the reason for identifying a chunk of white phosphorous such that no numerical identity holds after its long exposure to air, that reason cannot require that that practice be universally followed. That a set of determinates with certain dispositions at a single place can be treated in one way does not preclude its being able to be treated in another way. And just as a bunch of material qualities will evolve differently than does a material object, so also will a material object which results from one way of treating a set of determinates evolve differently than does the material object which results from another way of treating that same set.

We are left with the problem of describing the substantial-accidental change distinction and the essential-accidental property distinction within the context of causal idealism. Now how those distinctions are described depends on whether or not qualitative identity is necessary for numerical identity. Although this is probably the main issue that leads to the distinctions, I have no intuitions in favor of one of its two alternatives. Therefore, I shall simply present the alternative treatments.

b. Let it be first assumed that qualitative identity is necessary for numerical identity. Suppose we are interested in a chunk of white phosphorous as smelling garlicy and hence reject that the result of its long exposure to air is numerically identical with the original material object chunk. Here, the chunk of white phosphorous as a set of determinates is treated as possessing, among other things, the material quality garlic-smelling. And since garlic-smelling no longer exists after a long exposure of white phosphorous to air, what originially existed no longer does.

On the other hand, let it be supposed that we are interested in a chunk of white phosphorous independently of its smelling garlicy and hence accept that the result of its long exposure to air is numerically identical with the original material object chunk. Hence, the original chunk of white phosphorous must wind up being numerically identical with the subsequent chunk of white phosphorous. But assuming that qualitative identity is necessary for numerical identity, this requires that some method be invented for treating a set of determinates which includes garlic-smelling as qualitatively identical to one which doesn't. This can be accomplished simply by saying that, while it exists at the same place as do white and mealy, garlic-smelling does not compose the white phosphorous in the

way that they do.

Now it has already been said (in sub-subsection 3-b above) that a material object is all of the determinates at a single position. This can be squared, however, with not treating garlic-smelling as composing white phosphorous in the way that white and mealy do. Thus, white phosphorous would be treated as being composed of a garlic-smelling or an onion-smelling or a...or no smell at all -- depending on what, if any, smell exists where white and mealy, etc. do. In essence, it would then be required that white phosphorous is composed of the determinable, smell, if it smells at all -- and not composed of that determinable if it doesn't smell at all. This does not mean that there are sensings of determinables in addition to there being sensings of determinates -- it does not mean that we sometimes sense smell and sometimes sense garlic-smell. It means only that under this type of treatment such a thing as white phosphorous can have any smell or no smell and still be the same thing. It is grouping garlic-smell with onion-smell, etc. and then treating white phosphorous as being composed of that group, that determinable, if it has any smell at all -- which it needn't.

Under such a treatment, when a chunk of white phosphorous goes onion-smelling or non-smelling from garlic-smelling the material object then has not changed accidentally because it has not changed. Thus, if onion-

smell replaces garlic-smell, nothing of the white phosphorous set has changed -- the determinable, smell, is still there. Nor would the white phosphorous set have changed if there is no smell where the white phosphorous is so long as white phosphorous is treated as containing smell or not containing it.

In short, under the assumption that qualitative identity is necessary for numerical identity, there is no distinction between the substantial and accidental changes of a material object. If a material object is so treated that it changes at all then it has changed substantially and what would now exist is not numerically identical to what would have existed prior to the change. And, along the line, changes in what is sensed where a material object exists need not be treated as changes of the material object at all if the composition of the material object is properly identified.

Now material qualities have been so identified that they are composed only of determinates. Thus, no determinable is a material quality. And thus, under this treatment there still is good reason for employing the essential-accidental distinction.

This time, however, the distinction does not bifurcate material qualities, properties. Rather, it bifurcates that which composes a material object into determinates qua material qualities as opposed to determinables. If the corruption of something composing

a material object suffices for the resulting material object's being numerically non-identical to the original material object then that component has been treated simply as a determinate. Thus, it can also be treated as a material quality. As sufficient for the material object's changing, it would be said that such things, material qualities, are essential to the material object possessing them. Hence, each of the material qualities possessed by a material object is essential to it. But if the corruption of something composing a material object does not suffice for the resulting material object's being numerically non-identical to the original material object then that component has been treated as a determinable. Thus, it cannot also be treated as a material quality. As irrelevant to the material object's changing, it would be said that such things, determinables, are accidental to the material object possessing them.

And hence it is that according to this treatment under causal idealism, the essential-accidental distinction is a good one -- though it does not bifurcate material qualities, properties. And hence it is that according to this treatment under causal idealism, the substantial-accidental change distinction is not a good one.

c. Let it be second assumed that qualitative identity is not necessary for numerical identity. The

treatment of the distinctions which is then required by causal idealism is traditional and straightforward. Specifically, it does not involve treating material objects as being composed of determinables nor of being alternately composed and not composed of them.

If we are so interested in a material object that a numerical non-identity is asserted between it and the result of its being changed in the way that white phosphorous might be after a long exposure to air, then the material quality, property, which has been corrupted was essential to that material object and it has changed substantially. On the other hand, if we are so interested in a material object that a numerical identity is asserted between it and the result of its being changed in the way that white phosphorous might be after a long exposure to air, then the material quality, property, which has been corrupted was accidental to that material object and it has changed only accidentally.

This treatment can be accomplished under the assumption that qualitative identity is not necessary to numerical identity while it cannot be accomplished with that assumption's negation because it is only under that assumption that nothing prevents a numerical identity's being asserted between qualitatively different material objects.

Contrary to modern discussions of phenomenalism, there is nothing about idealism which requires that, since material objects are sets of determinates, qualitative

identity must be necessary for the numerical identity of material objects. It is not required that the qualitative difference of two sets suffices for their numerical difference. It is not required that a change in the membership of a set entails that the original and subsequent sets be numerically different. At least, this is not true for the sets of determinates which compose our sensings. This, on the grounds that the treatment of sets in historical mathematics does not alter the world and need not alter ontological ways of treating the world. If the world can most expediently be treated as composed of sets of determinates and if there is some good reason for rejecting that qualitative identity is necessary for numerical identity then mathematicians simply must invent a set theory according to which some changes in a set's membership do not suffice for the resulting set's being numerically non-identical to the original set. That is, they must allow for the essential-accidental distinction.

Due to the current practice, this proposal seems a little shocking at first. But at second it seems so undeserving of controversy as to be embarrassing.

9. With the exception presented in subsection 8-b, which is here irrelevant, material objects are sets of determinates with specific memberships. Hence, one type of material object can generally be distinguished from

another type on the basis of their qualitative identity or not -- on the basis of whether or not they have the same material qualities. Suppose, however, that two material objects are qualitatively identical except for the fact that one of them dissolves in turpentine and the other one doesn't. In this case, if we are to be able to identify the first as of a type distinct from the second, there is good reason to hold its disposition to dissolve in turpentine as essential to it. On the other hand, if there are no material objects qualitatively identical to the first which do not dissolve in turpentine then there need be no good reason to treat their disposition to dissolve in turpentine as essential to these material objects. And there is this reason against it.

When a material object, individual, is said to do or to have anything which is essential to it, nothing non-trivial has been said: saying of something that it is what it is is only trivial. One could as well remain silent about it after referring to it and convey as much information about it. This is one way of expressing the paradox of analysis: statements about an individual are, if true, trivial.

Applying this paradox to the having of properties by an individual is innocuous. What is an individual when treated in one manner is, if treated in another manner, a bunch of properties. Hence, it is unavoidable that statements about the properties had by an individual are trivial -- this fact underlies the discussion in

reidentified in terms of these facts about them.

Now there are two kinds of entity which actually are only indirectly sensed -- those which would be directly sensed in other circumstances and hence which compose subjunctive direct sensings; and those which cannot be directly sensed in any circumstances. Neither of these kinds of entity can be either individuated or reidentified in the way in which actually directly sensed objects are. This will be shown in the next two subsections.

a. Consider first those actually indirectly sensed entities which are directly sensible. There is but one means for treating such an entity -- indeed, for thinking it exists, given actual circumstances. This means is an argument from fragmented effects. And that argument yields only that if some set of determinates which actually is directly sensed is to compose a world which is coherent then there must be something else which actually is not directly sensed -- something which, because it composes a subjunctive direct sensing, is a set of determinates with a certain causal disposition. However, this does not suffice for individuating such an entity because it yields nothing unambiguous about its position. And this does not suffice for identifying such an entity because it yields nothing unambiguous about its membership as a set of determinates.

subsection 4-b above.

But applying this paradox to the having of dispositions by an individual is non-trivial so long as we want, if feasible, to treat such true statements as the laws of motion and gravitation, for example, as non-trivial when applied to the spatial entities to which they truly apply. These laws describe certain dispositions. If these dispositions are held to be essential to an individual then it is only trivial to say of it that it has these dispositions and can therefore be described by those laws. Thus, so long as we can avoid holding this without thereby sacrificing our ability to distinguish one type of individual from another with which it is in any way qualitatively different then in order to retain the non-triviality of describing individuals by the motion and gravitation laws (or dissolving laws, etc.) we must avoid holding it. That is, where feasible, to preserve the non-triviality of some true descriptions of an individual we must avoid holding as essential to it anything which is not involved in its being an individual in the first place. And, dissolving and motion laws tell us things about individuals which we did not know when we first saw them as individuals because they tell us about more than sets of determinates -- they tell us about the permanent possibility of sequences involving those sets of determinates.

This point about the paradox of analysis does

not seem to be restricted to causal idealism. However, why it holds and how it can be avoided is probably best seen from the point of view that the determinates which compose our sensings also compose both material objects and material qualities.

10. The theme of the ontology of causal idealism is that the standard ontological categories can be applied to the components of sensings as sets of determinates if proper attention is paid to their various kinds of positions. The proof that this can be done is that it has been done.

I think this means that the ontology of causal idealism is a counter-example to what Quine calls the inscrutability of reference -- a thesis which is linked up to the fact that what is sensed as a rabbit stage is qualitatively identical to what is sensed as unfragmented rabbit parts, etc. I am not sure of this, however, because I am not sure what the inscrutability of reference is. To me it seems a thing which comes and goes. It seems to be presented at one place and then to be hedged or ignored or denied at others. This might result simply from my misunderstanding. And if so, then it is likely that I am about to quote Quine out of context.

At one place, and seemingly in a posture of summarizing, Quine says "What makes sense is to say not what the objects of a theory are, absolutely speaking,

but how one theory of objects is interpretable or reinterpretable in another."[5] Now if the theory Quine mentions is about what is sensed and if the ontology of causal idealism is acceptable then Quine is incorrect. Within the context of causal idealism, a theory, if about what is sensed, would be about sets of determinates which have various kinds of positions. This is unalterred by whatever facts there are about translating that theory's referential terms into those of another theory which is also about what is sensed. That is, assuming that the ontology of causal idealism is acceptable it follows that, absolutely speaking, the objects of a theory which is about what is sensed can be treated simply as being sets of determinates with different kinds of positions.

FOOTNOTES

1 I do not know whether or not sound entities or taste entities or smell entities must, for all sensers, qualify as non-spatial. Presumably, the area of the tongue-mouth complex, for example, by means of which, say, a bitter is sensed is large enough that a taste sensing at one time can be composed of fragmented and extended, hence spatial, entities in just the manner that the hand, for example, by means of which, say, a hot is sensed is large enough that a feel sensing at one time can be composed of fragmented and extended, hence spatial, entities. And the same possibility applies to smelling and hearing except that in the case of hearing it would seem easier actually to distinguish sound entities as spatial because sensed by means of spatially fragmented ears than to distinguish them as spatial because sensed by means of an extended single eardrum

In what follows, I shall be concerned only with what I presume to be factually true now for human sensers -- that neither smell sensings nor taste sensings nor sound sensings are composed of extended or fragmented entities and hence that such entities are non-spatial.

2 I call these material objects and qualities to emphasize that they are spatial but not personal or numerical entities. I call them material objects and qualities to emphasize that they are kinds of individuals and properties, respectively.

3 About here it should be admitted that individuals (tho not properties) are normally considered to have insides which, generally, compose no actual sensing. But this in no way indicates that an individual's inside is in any way different from its outside requiring that its inside be treated differently than is its outside. The inside of an individual, were it to be sensed, would be sets of determinates which could be individuated on the basis of their respective positions. When its various insides are only subjunctively directly sensed, we are required simply to treat an individual's outside as signifying its inside in order to conform to normal considerations.

4 "Do Relations Individuate?", Philosophical Studies, XVII (June, 1966), pp. 325-332.

5 "Ontological Relativity", Ontological Relativity and Other Essays, (New York, 1969), p. 50.

CHAPTER III: COSMOLOGY

INTRODUCTION

This chapter will continue the discussion about indirectly sensed entities which was begun in chapter 1. Its major theme is that such entities as electrons which are only indirectly sensible should be treated as material substances. That is, those entities whose existence is inferred by means of an argument from fragmented effects should be treated as identical with those entities whose existence is inferred by means of an argument from fragmented experience. Alternatively, it is that entities of the sort which cause-3 there being the sensing of fragmented effects should be treated as being of the same type as those entities which cause-2 there being any sensings at all.

Central to justifying this thesis-theme is the fact that nothing can both cause there being a certain effect and also compose that effect. Then, the strategy is twofold: to show that, given the ordinary style of reasoning, entities which are only indirectly sensible cannot be treated as composing directly sensed objects; to show that, given the ordinary style of reasoning, entities which are only indirectly sensible can be treated as causing there being direct sensings composed of objects -- cause there being directly sensed objects. This will be discussed in parts C and D.

To reintroduce the topic of indirectly sensed entities, part A will show that, regardless of whether or not they are also directly sensible, entities which actually are only indirectly sensed can be neither individuated nor identified in the manner in which actually directly sensed entities are. Then, part B will present two reasons why what is known about directly sensed objects cannot be explained by means of what is known from indirectly sensing entities. It will also present the sketch of a reason why this sort of explanation might be sound.

PART A

1. A directly sensed entity is a certain component of an actual sensing from one or more of the five senses. It is individuated in one way or another on the basis of its position. (Here and forthwith I shall be concerned only with those directly sensed entities which are spatial and which are treated as individuals -- that is, with material objects.) A material object which is actually directly sensed is determined to be qualitatively identical to or different from the other components of that or other sensings on the basis of its sharing or not a common membership as a set of determinates with those other directly sensed objects. (Remember, however, subsection 8-b of chapter 2.) Such objects are identified and

perturbations in the orbit of Uranus established the acceptance of Newtonian mechanics beyond doubt. Thus, the inferences licensed by that mechanics can be used to make indirect sensings which are, beyond doubt, of something or another. Specifically, it would then be beyond doubt that the motion of an orbiting planet which is described by Kepler's laws must be caused by a force imparted from something such that it varies with the inverse square of the distance between that thing and the planet if the planet's motion is caused by forces imparted by that thing at all. Thus, disregarding its explanation by relativity theory, it appears that the precession of the perihelion of Mercury must be assumed to be caused by something, Vulcan, which is indirectly sensed by means of, among other things, the inverse square law as an inference license.

But this appearance is ambiguous. The Newtonian inferences indicate only that whatever forces affect the orbit of Mercury must be such that their vector addition must equal the vector of a force riding in a certain solar orbit which is interior to that of Mercury. That is, those forces could be exerted by a cluster of fragmented monoliths: Vulcan could be a cluster of monoliths rather than a single planet. And, which is more relevant to our present concerns, it is not the case that the forces exerted by each of those monoliths would have to obey the inverse square law because it is required only

1. If the magnitude of the effect of a force is proportional to the magnitude of the force itself and if two such forces are vectorially addible then the effects of such forces are vectorially addible. This is the superposition principle. For our purposes, it means that any behavior of an object which results from the action of superposable forces on that individual is qualitatively identical to the behavior which would result from the action of other forces on that individual so long as the vector addition of the forces in the first case equals the vector addition of those in the second. For any vector magnitude there is an infinite number of combinations of forces whose vector addition equal that magnitude. Thus, for example, the pointer of of weight measuring device will touch '10' if it is depressed by a single 10 gram weight, two 5 gram weights, or five 2 gram weights; and so on.

Forces which result from the charge or mass of a moving object are superposable. (It will be assumed that any other forces in virtue of which things someday might be indirectly sensed are also superposable.) Thus, for example, if a moving object which has both charge and mass is in an electrical field and is in a gravitational field, then its resultant motion will depend on both the electrical and gravitational forces. Concerning the simplest case in which the electrical and gravitational forces are equal in magnitude and in the same direction,

the object will move in that same direction at a velocity directly proportional to the magnitudes of those forces. And had the electrical force been twice as strong and the gravitational force absent, it would have behaved identically.

Consider a case which is at once more complex and more relevant. According to Coulomb's law, electrical forces of attraction and repulsion are assumed to vary directly with the magnitudes of the charges had by those objects which influence one another electrically and inversely with the square of the distance between them. Thus, let us assume the motion of an object with a certain charge to be unaffected by anything except other charges acting on that object according to Coulomb's law. Since forces imparted by charged entities are superposable, if, for some reason or another, we can sense only the motion of that object it is impossible to determine whether it is being affected by forces imparted by one or by many charged entities. So long as their resultant vectors are equal the relevant object could be affected by a single entity with a medium sized charge in front of its direction of motion, or it could be affected by the combination of an entity in front of it with a large charge and by an entity behind it with a small charge, or it could be affected by several entities in front of it with very small charges. And in the last case, the charged entities could be very

far apart or very close together, though the magnitudes of their charges would have to vary accordingly. Applying the argument from fragmented effects to any of these cases, it would thus be impossible to determine whether the force causing the phenomenon of interest (the motion of a charged object) is imparted by one or by many entities as sources of force.

It can be said generally that so long as only the effect of superposable forces is sensed it is impossible to determine from how many positions directly sensible entities as sources of force are acting. Hence it is that no phenomenon qua fragmented effect with which to make an indirect sensing of that which is directly sensible can be assumed to be about that which is one as opposed to many if it is additionally assumed that the imparted forces which cause that phenomenon, the forces in virtue of which the existence of the indirectly sensed entity is to be inferred, are superposable. Another way of saying this is that, under those conditions, it is impossible to determine if that phenomenon qua effect is about an entity which is unfragmented as opposed to its being about an entity which is fragmented.

According to the ontological system presented in chapter 2, the standard ontological categories get applied to what is sensed in virtue of the various kinds of positions had by what is sensed. Thus, a directly sensed

entity has been treated as an individual if it has been treated as having a single and unshared position. And it has been treated as a property if it has been treated as having a multiple and shared position. Hence, if what is known about a directly sensible entity comes only from its being the source of a force causing a fragmented effect by means of which it is indirectly sensed, then it cannot be treated as an individual or as a property (or as a material group, or as a masss, for that matter) according to the ontological system of chapter 2. This, because nothing unambiguous can be known about its position.

11. The difficulties do not stop here. Assuming that a numerical identity holds between entities only if they are at least (more or less) qualitatively identical and that reidentifying an entity involves treating it at one time as numerically identical to an entity from some other time, then an entity which is only indirectly sensed cannot be identified such that it is reidentifiable.

Unlike the case for directly sensing them, the qualitative identity of directly sensible entities which actually are only indirectly sensed cannot be determined from indirectly sensing them. Directly sensible objects are sets of determinates. Thus, two of them are qualitatively identical if and only if their memberships are (more or less) the same. But the only thing we have

to go on in determining the identity of objects from indirectly sensing them is the argument from fragmented effects. And such an argument yields nothing about the membership of the causal object as a set of determinates which its conclusion makes reference to. Additionally, such an argument is ambiguous even with respect to the causal laws which are obeyed by the components of such an object if it is fragmented -- and, as we have just seen, whether or not it is fragmented cannot be determined by means of such an argument.

Consider the first point. It is possible for, say, a scarlet object to be involved in the antecedent relatum of a causal relation leading to some phenomenon as its consequence. And it would be similarly possible for, say, a black object to be involved in the antecedent relatum of a qualitatively identical causal relation leading to a qualitatively identical phenomenon as its consequence. But in sensing those objects only indirectly only the consequent phenomenon would compose an actual sensing and only the relevant causal disposition of those objects involved in the antecedent relatum of that causal relation could be inferred. In short, a black such entity could not be distinguished from a scarlet such entity.

Consider the second point. Suppose that the prediction and subsequent discovery of Neptune by Leverrier on the basis of Newtonian inferences concerning

perturbations in the orbit of Uranus established the acceptance of Newtonian mechanics beyond doubt. Thus, the inferences licensed by that mechanics can be used to make indirect sensings which are, beyond doubt, of something or another. Specifically, it would then be beyond doubt that the motion of an orbiting planet which is described by Kepler's laws must be caused by a force imparted from something such that it varies with the inverse square of the distance between that thing and the planet if the planet's motion is caused by forces imparted by that thing at all. Thus, disregarding its explanation by relativity theory, it appears that the precession of the perihelion of Mercury must be assumed to be caused by something, Vulcan, which is indirectly sensed by means of, among other things, the inverse square law as an inference license.

But this appearance is ambiguous. The Newtonian inferences indicate only that whatever forces affect the orbit of Mercury must be such that their vector addition must equal the vector of a force riding in a certain solar orbit which is interior to that of Mercury. That is, those forces could be exerted by a cluster of fragmented monoliths: Vulcan could be a cluster of monoliths rather than a single planet. And, which is more relevant to our present concerns, it is not the case that the forces exerted by each of those monoliths would have to obey the inverse square law because it is required only

that their vector addition must equal the vector of a certain other force which does obey this law. We don't know even how many such forces are superposed. Thus, one of them, a black monolith say, might exert a force obeying an inverse square root law while anotherone of them, a scarlet monolith say, might exert a force obeying an inverse cube law. Alternatively, the gravitational constant of proportionality for causal relations involving black monoliths might be $\frac{1}{2}G$ while that for scarlet ones is $2G$.

Hence, it cannot be assumed that the phenomena by means of which a certain directly sensible object is indirectly sensed result from a causal relation whose antecedent relatum involves an object which is fragmented or not. And it cannot be assumed that, were it to be fragmented, each of the components taken singly would participate in the same kind of causal relation. Thus, it cannot be assumed that objects which are only indirectly sensed resemble one another even by participating in qualitatively identical causal relations.

On the other hand, nothing is known from indirectly sensing entities except what is inferable by means of an argument from fragmented effects. It follows that nothing which can be known about them suffices for any two of them being treated as qualitatively identical. And hence it is that nothing which can be known from indirectly sensing entities suffices for their being

reidentifiable. For example, for all that is known from indirectly sensing it, that which causes the precession of Mercury's perihelion at one time might be a cluster of monoliths all of which obey the inverse square law whereas that which causes it at another time might be a cluster of monoliths some of which obey the inverse cube law and some of which obey the inverse square root law.

b. Consider second those actually indirectly sensed entities which are not directly sensible -- those entities which are only indirectly sensible. Again, there is but one means for treating such an entity -- an argument from fragmented effects. This time, however, that argument lead to a reference to an entity which, since not directly sensible, is not a set of determinates.

It is appropriate here to review the discussion in subsection 6-b of chapter 2. There, it was pointed out that, since entities which are not directly sensible are not sets of determinates and since causal dispositions are sequences of sets of determinates, causal dispositions cannot be ascribed to entities which are not directly sensible. However, this does not render unsound an argument from fragmented effects which concludes with a reference to an entity which is not only not directly sensed but also is not directly sensible. Nor does it render impossible the prediction of future fragmented

effects by means of a law originally retroduced from the effects disposition of a directly sensed object as being joined to the causal disposition of another directly sensed object. Rather, it calls attention to the fact/hypothesis that all of our direct sensings, whether uniform in some predictable manner or not, are caused-2 by things which are not directly sensible and which interact causally-3 among one another. And that the uniformity of an evolution of directly sensed effects is not changed just because the directly sensed causes-1 from which was retroduced a law accounting for that kind of uniformity are, in certain circumstances, absent.

According to causal idealism, clouds are directly sensed because of the causal interaction between a differential material substance cause-2 and a sentient material substance. Let the differential cause-2 be called a quasi-object. Thus, a directly sensed cloud results from the causal-2 action of a quasi-cloud. (Notice that directly sensing a cloud does not suffice for indirectly sensing a material substance, a quasi-cloud. Directly sensing a cloud suffices for making reference to its quasi-cloud cause-2 only when it is joined to an appropriate argument from fragmented experience.) Any change in the sensed cloud results from a change in the quasi-cloud. The quasi-cloud can be changed only by its causal-3 interaction with other material substances.

Generally, those other material substances, when interacting with a sentient material substance, themselves differentially cause-2 some other object to be sensed, and hence are themselves quasi-objects. And, generally, they interact causally-3 with the quasi-cloud only if the objects they cause-2 to be directly sensed interact causally-1 with the directly sensed cloud. The causal-1 objects are treated as having causal dispositions; the cloud is treated as having effects dispositions. It is from the uniform evolutions of these dispositions that laws are retroduced by means of which predictions can be made about future effects of that or other clouds. Coulomb's law, for example, is retroduced from the behavior of such directly sensed objects as charged spheres.

However, sometimes the cloud is directly sensed to be changed in the usual kind of manner even when no causal-1 interaction is directly sensed. In such a case, the cloud change is a fragmented effect and if its cause is assumed to be not directly sensible then a material substance has been indirectly sensed. As not directly sensible the material substance which causes-3 the quasi-cloud to be relevantly changed does not have causal dispositions. But this does not prevent its acting uniformly as causing-3 the changes in the quasi-cloud such that directly sensed tracks appear in the directly sensed cloud and such that certain predictions

can continue to be made about that effects disposition by reference to laws about charged objects. And in this sense can that antecedently acting material substance be said to have such quasi-causal dispositions as quasi-charge.

As not directly sensible, it is not clear that or how an indirectly sensed material substance has a distance and direction either from other material substances or from material objects. But there are reasons for, in some sense, ascribing positions to them. For example, predictions about future cloud tracks can be based on positional information about present cloud tracks. (Also, see sub-subsection 11-a-iii below.) Now either position can, in some sense, be ascribed to indirectly sensed material substances or not. If not, then it follows immediately that the ontological system of chapter 2 will not apply to them for that system applies ontological categories in virtue of the various kinds of positions had by things. However, even if indirectly sensed material substance quasi-have positions, they cannot be adequately individuated or identified.

Assuming that indirectly sensed material substance quasi-have positions, I think it unavoidable to assume further that a material substance quasi-has the same position as could plausibly be assigned to a relevant subjunctively directly sensed material object. That is, it quasi-has that position which would be had by a sub-

junctively directly sensed material object which could plausibly be held to cause-1 the phenomenon of interest, the phenomenon by means of which something is indirectly sensed. (Otherwise, no specific position could be quasi-ascribed to it at all.) But it has been shown in sub-subsection 1-a-1 that no specific position or set of them can be ascribed even to a subjunctively directly sensed material object which actually is only indirectly sensed. Thus, the material substance could not be determined to be quasi-fragmented or not. It follows that no extension of the ontology of chapter 2 will serve to individuate indirectly sensed material substances.

Following this line of reasoning one step further, it could not then be determined if the components of a quasi-fragmented indirectly sensed material substance operate causally-3 in the same manner -- because it could not be determined if the components of an indirectly sensed material object operate causally-1 in the same manner. Since nothing unambiguous can be determined about what is known of it, its acting causally, it follows that an indirectly sensed material substance cannot be identified so as to be reidentifiable. (For expediency, in what follows it will be convenient to think of the concepts of object and causal disposition as nonetheless having fairly ambiguous analogues in the unsensible world. Hence, the introduction of the "quasi-concepts" here.)

2. There is this point of interest from the discussion in section 1. It has been noted that arguments from fragmented effects indicate that reference must be made to not directly sensed entities in order that some, though not all, components of actual sensings, as fragmented effects, compose a world which is coherent. But in the previous section it was shown that such entities cannot be adequately identified or individuated.

Now I think that these two conclusions are in no way incompatible. Assuming that a certain sensed phenomenon would not have occurred unless some not directly sensed entity acted causally in no way entails that that not directly sensed entity must be adequately identifiable. In short, there is more to a coherent sensible world than can be adequately identified.

If this is correct then Strawson seems to have begun Individuals with an assumption which is too strong: "That it should be possible to identify particulars of a given type seems a necessary condition of the inclusion of that type in our ontology."[1] If this is taken to refer to entities in general (particulars have been so treated that it is necessary that they be identifiable) then Strawson's assumption seems to be incorrect. Thus, we refer to electrons, for example, without being able to identify them adequately -- because they are only indirectly sensible.

I feel it relevant to make this remark in order

to indicate that my previous arguments are intended to show only that the ontological concepts by means of which the ordinary world is organized will not apply to any extraordinary world in which the components are only indirectly sensible because the concepts of qualitative and numerical identity do not apply there in any very ordinary (nor obvious) manner.

PART B

3. In this section it will be shown that, while the argument from fragmented effects is a sound and significant one, there are two good reasons why it does not ground our explaining the identity of a directly sensed object in terms of what can be known from indirect sensings.

a. It has been indicated that a major need for recognizing the existence of entities which are not directly sensed is the argument from fragmented effects: reference must be made to not directly sensed entities in order that some, though not all, components of actual sensings, as fragmented effects, compose a world which is coherent. More accurately, something along these lines would have to be assumed if it has been previously assumed that those actual sensings involve components qua material objects whose behaviors are truly described

causal dispositions of a directly sensed object can be used to explain anything about the identity of a directly sensed object as a set of determinates with a specific membership. But, every kind of causal disposition known about indirectly sensed entities is known about directly sensed objects -- and more besides. Thus, assuming that what is known about one thing can be adequate to account for a second thing's identity (as a set of determinates) only if more is known about it than is known about a third thing which is not so adequate, it follows that nothing known from indirectly sensing entities can be adequate to account for the identity of a directly sensed object. This holds no matter how many correlations are discovered between the quasi-causal dispositions of electrons and the material qualities of material objects. And it holds regardless of such facts as that if objects which are chemical elements are arranged according to atomic weight, a causal disposition, then their material qualities will vary periodically. (See subsection 11-d, however.)

4-a. Now there are reasons other than those that have so far been considered for ascribing existence to things which are not directly sensed. The only reason which has so far been considered is from physics. It is the argument from fragmented effects

This line of reasoning, as a matter of fact, holds good for all those laws used as inference licenses in indirect sensing.

Since forces imparted in virtue of the product of anything's mass and acceleration are superposable it is impossible to determine from just the mass and acceleration of a directly sensed individual affected by nothing but a force imparted in virtue of the product of the mass and acceleration of something else whether that force is imparted in virtue of the product of the mass and acceleration of one or many things else obeying one or many laws about mass -- so long as the vector addition of those imparted forces is equal. But, and this is important, we do not need to determine this in order that we be instructed by the argument from fragmented effects. For that argument is only that, e.g., from the motion laws and the fact that a directly sensed massive individual is accelerated by nothing else directly sensed, in order that that individual compose a world which is coherent it must be inferred that some responsible thing(s) which is not directly sensed exists and causes it to accelerate. If the responsible thing is directly sensible, it has mass. If it is not, it has quasi-mass.

Thus, when we deduce from a cloud track and some laws of electricity "An electron did it", 'electron' serves only to refer to some thing or things which

quasi-has a certain trajectory, the vector addition of whose quasi-charges equals some magnitude and which is otherwise unidentified. The world which is composed of, among other things, that cloud track does not loose its coherence just because its cause, an electron, as only indirectly sensible is identifiable only as having certain quasi-causal dispositions.

b. On the other hand, there are two very straightforward senses in which nothing of what is known from indirectly sensing entities, nothing which is inferable by means of an argument from fragmented effects, can be used to explain what is known about directly sensed objects. This can be shown via the following two arguments.

1. The first argument is to the conclusion that what is known from indirectly sensing entities cannot be used to account for what is correlatively known about directly sensed objects. The argument concerns the facts that it is only causal dispositions(or quasi-causal dispositions) which are known from indirectly sensing entities and that such dispositions must be inferred in virtue of what is already known about objects which are directly sensed.

Consider mass. The mass of an indirectly sensed entity is inferred by reference to the mass of some

directly sensed entity with which it is appropriately related. If the mass of some directly sensed object were not known then neither could the mass of an indirectly sensed entity be inferred because in that case there would be no premise by means of which to begin an argument from fragmented effects. For example, it is only because, given its mass, the perihelion of Mercury precesses in a way incompatible with Newtonian mechanics unless, as one alternative, there is a disturbing force imparted by some source which is not directly sensed that there is reason to suspect that Vulcan exists as having a certain mass describable by Newtonian mechanics. That is, it is only because Mercury is directly sensed to have mass that Vulcan is indirectly sensed to have mass -- the mass of an indirectly sensed entity is inferred from that of a directly sensed object.

But, assuming that nothing inferred from something else can be used to explain that something else, it follows that nothing of what is known from indirectly sensing entities, their causal dispositions, can be used to explain a correlative causal disposition of a directly sensed object.

There is this complication. Suppose that the (macro) laws about the mass of directly sensed objects must be modified in this manner in order that the quasi-mass of indirectly sensible only entities be accurately

described. A variable must be introduced as related to quantity of (quasi-) mass such that the macro law which is relevant to directly sensed objects is a "limiting case" of the more general law in the sense that the value of that variable is unity for the macro law. But this does not show that the (micro) law which is relevant to the quasi-mass of indirectly sensible only entities and for which the value of the variable is not unity explains the macro law. At most, it shows that the macro law is explained by the more general law in the built-in sense that for it the value of the introduced variable is unity. More importantly, this complication does nothing to alter the fact that values for the quasi-masses of indirectly sensible only entities are inferred from values for the masses of directly sensed objects. And it is from these values for the quasi-masses of indirectly sensible only entities that the more general law is retroduced in the first place. Hence, it remains the case that nothing of what is known from indirectly sensing entities can be used to explain a correlative causal disposition of a directly sensed object.

ii. The second argument is to the conclusion that what is known from indirectly sensing entities cannot be used to account for what is known about a directly sensed object as a set of determinates with a specific membership. The argument concerns the fact that no

causal dispositions of a directly sensed object can be used to explain anything about the identity of a directly sensed object as a set of determinates with a specific membership. But, every kind of causal disposition known about indirectly sensed entities is known about directly sensed objects -- and more besides. Thus, assuming that what is known about one thing can be adequate to account for a second thing's identity (as a set of determinates) only if more is known about it than is known about a third thing which is not so adequate, it follows that nothing known from indirectly sensing entities can be adequate to account for the identity of a directly sensed object. This holds no matter how many correlations are discovered between the quasi-causal dispositions of electrons and the material qualities of material objects. And it holds regardless of such facts as that if objects which are chemical elements are arranged according to atomic weight, a causal disposition, then their material qualities will vary periodically. (See subsection 11-d, however.)

4-a. Now there are reasons other than those that have so far been considered for ascribing existence to things which are not directly sensed. The only reason which has so far been considered is from physics. It is the argument from fragmented effects

But there is also a reason from chemistry for ascribing existence to things which are not directly sensed. A representative example of this comes from those empirical generalizations which are called the laws of multiple and definite proportions. If two directly sensed objects which are chemical elements combine in more than one proportion then the weights of the different amounts of one of the elements which will combine with a fixed amount of the second are in the ratio of small integral numbers; if two elements combine at all then the proportions by weight of the component elements is constant. It is then inferred that these combining proportions of what is directly sensed would not hold uniformly were it not for certain features of what is not directly sensed.

From this line of reasoning, two questions arise: What could be said about these entities which are not directly sensed which would provide a reason for the uniformity which concerns us? Do these entities compose what is directly sensed or do they cause our sensing it? (I assume that this disjunction is exhaustive of what is plausible -- I assume there are no relations except composing and causing which can plausibly be said to hold between what is directly sensed and the inferred entities which are not directly sensed.) In the remainder of this section we shall be concerned with the first question. In the remainder of the chapter we shall be concerned with the second question.

The first question is of a kind which has been considered by cosmologists from the Pre-Socratics onward. But it was Dalton who first ascribed features to what is not directly sensed which entailed that specific and testable results obtain for what is directly sensed. He did it with respect to the proportion laws by ascribing these features to what is not directly sensed: (1) all of the (not directly sensed) atoms of one element have identical weights; (2) atoms of different elements have different weights; (3) when elements combine there is a definite integral number of the atoms of each present; (4) when elements combine no atoms are created or destroyed. Given that statements (1)-(4) are assumed, it follows, for example, that if two elements combine at all then the proportion by weight of the component elements is constant. It follows because the weight of a directly sensed element or compound is considered to result from the weights of its atoms which are not directly sensed.

4-b. The senses in which what is known about directly sensed objects can or cannot be explained by reference to entities that are not directly sensed can now be treated more completely than it was in the arguments of subsection 3-b. On the one hand, the specific weights which are ascribed to the atoms of an element must be inferred in some manner similar to this: the weight of a

mole of hydrogen gas is divided by Avogardro's number (the number of molecules in a mole of gas); the result is the weight of a single atom of hydrogen (for an element, the molecule-atom distinction is conflated). That is, the weight of a hydrogen atom which is not directly sensed is inferred from the weight of a volume of hydrogen gas which is directly sensed. And there are no other features of atoms which are not inferred in this dependent manner. But, as has been said, nothing inferred from something else can be used to explain that something else. Hence, reference to the known features of hydrogen atoms, even together with Dalton's assumptions, cannot be used to explain the weight of directly sensed volumes of hydrogen.

On the other hand, the thrust of Dalton's assumptions (and variations on this them) is that everything possessed by directly sensed objects results from the features of atoms which are not directly sensed. If there were nothing known about the combinings of directly sensed elements those not directly sensed atoms would still exist and would still determine the identities of things which are directly sensed. Indeed, that there are any directly sensed objects to be combined depends on there being combinations of atoms which are not directly sensed. This is unaffected by its being the case that everything actually known about atoms is inferred from what is known about directly sensed elements.

Whether this line of reason indicates that reference to atoms really can explain some or all of what is known about directly sensed objects is a question I shall pursue only sketchily and much later in the chapter (subsection 11-d). For the moment, it is important to note simply that there are chemistry reasons for introducing not directly sensed entities which are different from the physics reasons for introducing them.

PART C

5. So far, atoms have not been treated as indirectly sensed. When something is indirectly sensed, it is inferred via an argument from fragmented effects: some directly sensed object would not compose a world which is coherent unless reference were made to things which are not directly sensed but which are assumed to have certain causal or quasi-causal dispositions. Thus, the physics reason for making reference to entities which are not directly sensed involves their being indirectly sensed. And, clearly, to a large or complete extent this reason involves their being related to directly sensed objects causally.

But the chemistry reason for making reference to entities which are not directly sensed is that without that reference there is no reason why certain directly sensed uniformities obtain. It is not that a sequence of actual

sensings would be incoherent unless reference were made to something not directly sensed. Rather, it is that there would be no reason why a sequence of (coherent) actual sensings is as it is (uniform) unless such reference were made. In this sense then, let us say that the chemistry argument from undiscovered reasons used to introduce not directly sensed entities involves those entities as being hypostatized rather than as being indirectly sensed.

Notice that even if there really are atoms, the chemistry reason for saying so is nonetheless inventive of things that do not compose actual sensings. Of course, for that matter, so is the physics reason for saying that Vulcan or electrons exist -- though, it does seem more imperative to stop the world from being incoherent than it does to make it reasonable. I hope my use of 'indirect sensing' and 'hypostatize' more rather than less squares with traditional use. I need names for either slade of the distinction being considered.[2]

Now, on the face of it the chemistry reason does not in any sense involve not directly sensed entities as being related causally to directly sensed objects. Rather, it seems to involve them as the components of directly sensed objects -- to things which, except for reasons irrelevant to their being components, would result from a protracted enough spatial division of any directly sensible object.

On the other hand, it is the normal practice to

assert a numerical identity between those not directly sensed entities which are hypostatized and those which are indirectly sensed -- to identify an atom as a composite of component electrons (and protons, etc.). What seems to happen is this. From tracks in cloud chambers, a retroduction is made: there are entities which are not directly sensible which have relation R-1 to directly sensed objects; the tracks in the directly sensed clouds result from the quasi-causal disposition, quasi-charge, of those not directly sensible entities in R-1 to directly sensed clouds. From the directly sensed combinings which lead to the proportion laws, a retroduction is made: there are entities which are not directly sensed and which have relation R-2 to directly sensed objects; all of the not directly sensed entities which are related by R-2 to a single directly sensed element have identical weights and those related by R-2 to different elements have different weights; only the relations among these not directly sensed entities are affected by combinings of directly sensed objects; the weights of directly sensed objects are determined by the weights of the not directly sensed entities in R-2 to them. For one reason and another, it is then concluded that those not directly sensed entities in R-1 to directly sensed objects are of the same kind as are those not directly sensed entities in R-2 to directly sensed objects such that sometimes a single not

directly sensed entity is in R-2 to one directly sensed object and shortly thereafter is in R-1 to another directly sensed object. And insofar as this numerical identity holds, then atoms also must be treated as not just not directly sensed but also as not directly sensible. In this case, they have quasi-weights instead of weights.

In the following discussion, it will be shown that, contrary to traditional opinion, both R-1 and R-2 should be treated as the same kind of relation, a causal relation -- though they are not identical causal relations. This will be accomplished by first showing that R-1 need not be treated as to any extent involving not directly sensible entities as the components of directly sensed objects. Then it will be shown that none of the traditional reasonings by analogy to the conclusion that no directly sensible entities compose directly sensed objects are sound. However, sound reasonsings by analogy about the same phenomena will be presented to the conclusion that not directly sensible entities cause there being directly sensed objects. Finally, an interpretation of R-2 will be presented according to which the weight of a directly sensed object results from the quasi-weights of several not directly sensible entities without involving those not directly sensible entities as composing that directly sensed object. In short, the only adequate treatment of not directly sensible entities involves them as material substances -- whether

hypostatized or indirectly sensed, these entities cause our directly sensing objects.

6. As an introduction to this project we should begin by noticing a fact about the causes as opposed to the components of a directly sensed object. To do this, we must distinguish three types of components.

An antetemporal component is one which does not retain its precombining identity once that which it composes has its identity -- that is, after the combining is completed. Iron and carbon, for example, are antetemporal components of steel. So are steel slivers fused into a steel chunk is they loose the characteristic shapes and sizes by which they were distinguished one from another before combining. A cotemporal component is one which does retain its precombining identity even after the combining is completed. A nail and a wood beam, for example, are cotemporal components of a shelter. A cotemporal* component is one which has its identity while that which it composes has its identity but which did not exist until the formation of what it composes.[3] A sliver which would be produced by chipping a steel chunk which itself was formed by the fusing of some steel sliver antetemporal components, for example, is a cotemporal* component of that steel chunk. (In this case, the cotemporal* sliver components of the steel chunk are not identical to the antetemporal sliver components of

that chunk.) It is to be noticed that this tripartite distinction is exhaustive of the temporal ways in which a composite may be composed of components.

Now the fact about the causes as opposed to the components of a directly sensed object which is of interest to us is this. On all sides it will be granted that entities which are not directly sensible are not antetemporal components of directly sensed objects. After all, a major chemistry reason for introducing them is that something must endure during those combinings -- say, as of iron and carbon -- in which no directly sensed components endure. But a cotemporal component of a directly sensed object, together with its other cotemporal components, is identical to that object. On the other hand, no cause is in any way identical to its effect. It follows that an entity which is not directly sensible cannot both cause there being and also compose a directly sensed object: an electron cannot both cause there being a directly sensed object and also compose that directly sensed object.

The following example might help illustrate this point. When a projector throws the image of a film slide onto a screen, the slide can be said to differentially cause the projected image. But it does not cotemporally compose that projected image. On the other hand, the upper left hand quarter of the image is a cotemporal

component, and hence, together with the other quarters, is identical to the image. But it does not cause the image.

At least to those of us who grew up in the mainstream tradition of philosophy and science in the 1960's, this simple point leaves us with a fairly fundamental problem. That tradition taught that such not directly sensible entities as electrons both cause there being directly sensed objects (cause there being sensings whose components can be treated as spatial individuals) and also compose those objects. It is the goal of the following discussion to clarify the tradition.

7. The first step in this direction is to expose a mistake in what I take to be the major reason for thinking that to some extent even the physics reason for introducing not directly sensible entities involves their composing such directly sensed objects as copper wire coils. The reasoning goes like this:

> Tracks in cloud chambers are caused by not directly sensible entities which are related to directly sensed things like copper wire coils. For, it is the heating of those wire coils which produces the tracks. Furthermore, if the coils were heated long enough they would disappear. Now this is just what would happen to a pile of boards surrounded by fog in a strong wind. But there is no question that the boards would be related to the pile by being its cotemporal components. Therefore, it must be that the not directly sensible entities are cotemporal components of the wire coils. Except for reasons irrelevant to their being such components, these not directly sensible entities would result from a protracted enough spatial division of the wire coils.

(The last statement is not false. But it is tricky. It will be further discussed in section 9 below.)

To show that this reasoning is mistake, it is sufficient simply to show one other analogy according to which the same phenomenon would obtain. This is not a very difficult task. But it is very important. It introduces a way of treating not directly sensed entities which completes the story about material substances begun in sub-subsection 3-d-iii of chapter 1.

The strategy here is to take seriously the other side of the exhaustive distinction between ways in which not directly sensible entities can plausibly be related to directly sensed objects. Namely, to treat the former as causing the latter. This will be seen as a promising approach if it is granted that chapter 1 showed that it is not the case that what is sensed is independent of sensing and hence that sensing is not a relation between what is sensed and what senses. Rather, sensing is the result of a causal relation between things which are independent of sensing.

In the following discussion I am trying to complete the story of how sensings might be caused by what is independent of sensings. In essence, I am trying to complete Locke's story. But my effort has the advantage of its now being commonplace that such things as electrons exist and that they are not directly sensible. Thus, here I am trying to take the shortest safe route to their

being independent of sensing in a way which allows our treating them as material substances -- as the causes of sensings.

The first step is showing that it is as plausible so to treat them as it is plausible to treat them as composing what is sensed. The reasoning goes like this:

> Tracks in cloud chambers are caused by not directly sensible entities which are related to directly sensed things like copper wire coils. For, it is the heating of those wire coils which produces the tracks. Furthermore, if the coils were heated long enough they would disappear. Now this is just what would happen if the image of a coil were projected from a film slide onto a screen. Ordinarily, just the coil image would apear on the screen. However, if the slide is surrounded by a fog which is also projected onto the screen and if small bits of the slide were ejected when the coil image is heated then tracks would appear in the projected fog image. And if enough bits of the slide were ejected then the projected coil image would disappear. But there is no question that the slide would be related to the coil image by being its cause and the bits of the slide to the fog tracks by being their differential cause. And if the slide (and the projector) were somehow not directly sensible then it would be impossible to determine unambiguously that this is what is going on -- especially so if it could not be determined that the slide and projector were at some distance and direction away from the coil and fog images. (See sub-subsection 11-a-iii.) Therefore, it is possible that not directly sensible entities are causes of there being directly sensed copper coils as well as being causes of there being directly sensed fog tracks.

8. This is a key section to this chapter.

So far it has been shown only that there is a plausible alternative to treating not directly sensible entities as composing directly sensed objects when only the physics reason for introducing not directly sensible

entities is considered. In this section it will be additionally shown that there is no sound reasoning by analogy to the conclusion that not directly sensible entities compose those directly sensed objects to which they are related. These reasonings will be contrasted with reasonings about the same phenomena which are sound. These latter reasonings are causal idealistic and are to the conclusion that not directly sensible entities are related only causally to directly sensed objects. It will be seen that where the two lines of reasoning diverge, one of two mistakes is committed by the non-idealistic line. Either it treats what composes a directly sensed object as also causing our sensing it or else it treats a composite as numerically different from its cotemporal components. A summary way of saying all of this is that only things which are directly sensible can compose things which are directly sensible -- only determinates and sets of them can compose determinates and sets of them.

a. Non-idealists usually begin to argue that not directly sensible entities can compose directly sensed objects by pointing to the fact that the combining of some directly sensed objects changes them -- the fact that the membership of combined sets of determinates is changed simply by the combining.

For example, a cube of sugar is white and opaque. But it is cotemporally composed of crystals which are clear and transparent. These crystals are prisms -- if uncolored light enters one side of such a crystal it will depart another side as a spectrum of colored light. It is only because they are prisms that a sugar cube formed by cotemporally combining many such crystals appears white. The spectrum of colored light departing one crystal enters another and so on such that the light which finally departs and strikes a senser gives a white appearance to their composite.

The mistake in this persuasive argument is to treat what is sensed as being the cause of what is sensed and hence as independent of sensing. It is to ignore the argument which was presented in section 1 of chapter 1. It is to reject the idealistic motto "Whenever you reach for a thing-in-itself which is independent of your sensing it, you will always trip over your sensings."

The idea behind the argument can best be uncovered by means of some diagrams. On the one hand, the non-idealistic notion of a man's sensing a single crystal prism is this:

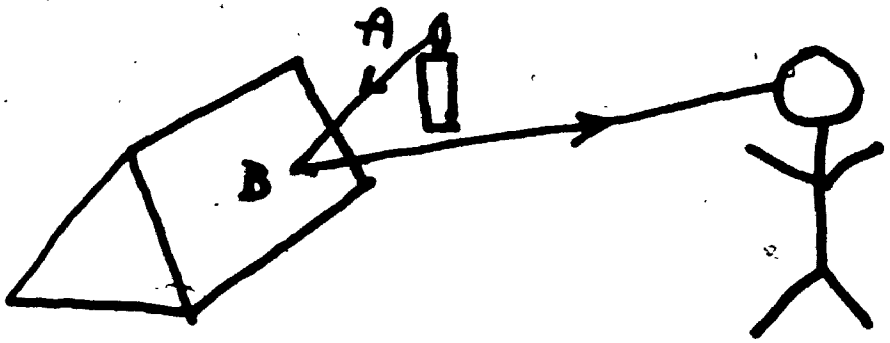

Diagram 1

Light from point A is reflected from the crystal prism at all points B on its facing surfaces to the senser causing his seeing that small, clear, transparent, pentahedronal object. Perhaps later, its spectrum yielding disposition is discovered. The prism is independent of the senser's sensing it because it remains existing and able to cause sensing even when no sensers are relevantly situated.

On the other hand, the non-idealistic notion of a man's sensing a composite of several crystal prisms is this:

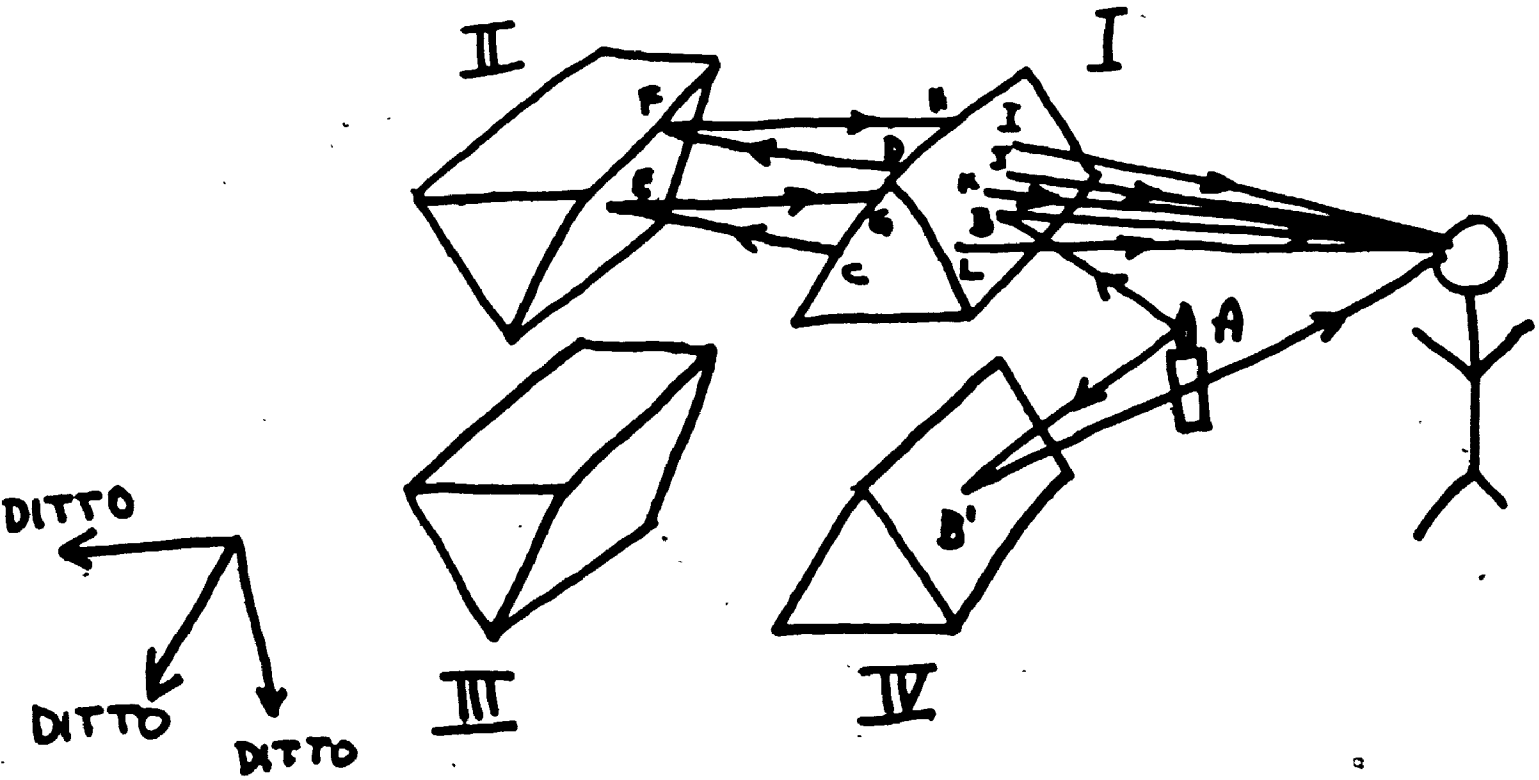

Diagram 2

Some light from point A is reflected from prism I at all points B on its facing surfaces to the senser. But some of this light is refracted to points

C and D where it departs that prism to points E and F of prism II. There it is reflected back to points G and H of prism I where it is again refracted to points I, J, K, L. There, it departs to the senser. This occurs not only between prisms I and II but also between prisms III and IV. It also occurs between prisms I, II, and III and between prisms I, II, III, and IV, etc. Each refraction changes the nature of the light. The end result is that there is caused in the senser his seeing a more or less large, continuous and homogeneous cubical object which is white and opaque. Thus, when combined the otherwise clear prisms become white. And hence it is that there are alleged to be prisms which are independent of and external to the senser and his sensing which, depending on the circumstances of their being combined or not, causes him to sense their being clear or white.

Now everyone must grant that something is wrong in this argument: No cause is identical to its effect; no component of a thing which is sensed is independent of that thing or of that sensing. (A composite is identical with its cotemporal components; that which is sensed cannot be independent of being sensed.) Perhaps the easiest way to identify where the non-idealistic account goes wrong is to give the causal idealistic account of this situation and then to discover where it diverges from the non-idealistic account. This point of divergence

should indicate a mistake in the non-idealistic account.

The causal idealistic notion of a man's sensing a single crystal prism is twofold: one concerns what is sensed; the other concerns what causes what is sensed. When a single prism is sensed an actual sensing is composed of a set of determinates which is clear, transparent, and pentahedronal. This set of determinates has the disposition to produce a spectrum of colored light. This means tha, for example, when a certain piece of paper is exposed to light on one side of the prism it is white; when it is exposed to light on the other side of the prism some parts of it are blue, some green, and some red. In order to solve the argument from fragmented experience, it is assumed that something causes our sensing the prism when we do. Presumably this same thing is responsible for producing a light spectrum on a piece of paper relevantly located with respect to the seen prism. This more or less diagrams the causal idealistic account:

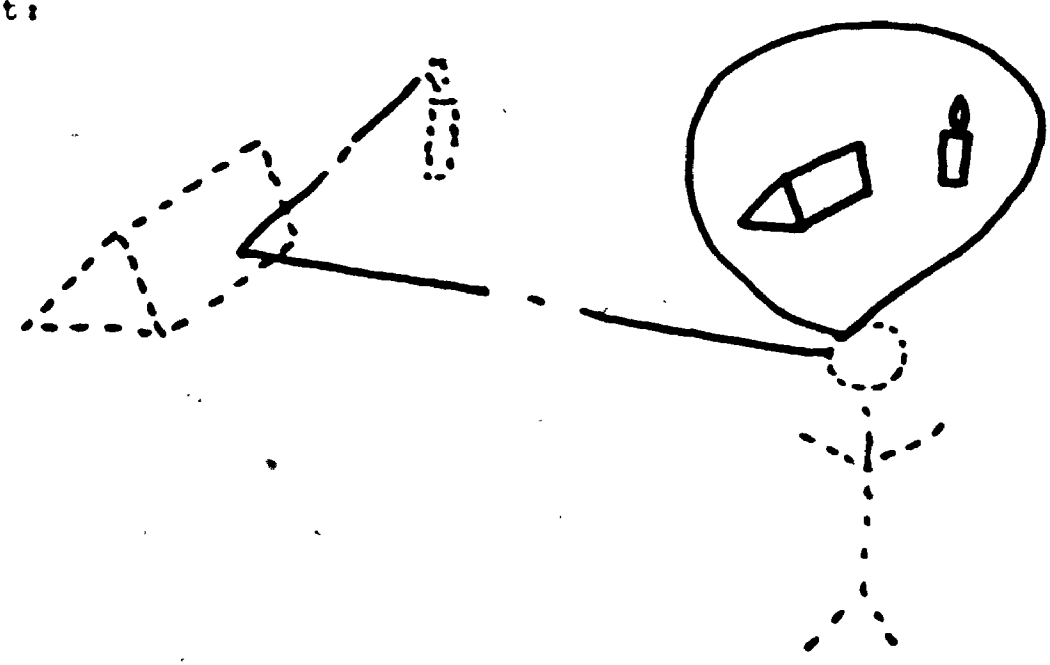

Diagram 3

(There are two inadequacies in this diagram: there is a set of determinates representing the material substance senser and the differential cause-2 of a sensing; it is indicated that this cause-2 is at some sensible distance and direction from the sensing.)

The important difference between this diagram and diagram 1 is that here it is not claimed that what is sensed is qualitatively or numerically identical to what causes what is sensed. There is another way of saying this. If the name of the man in the diagram is Jones then diagram 1 accurately represents someone's (say, Smith's) seeing Jones' looking at what Smith sees to be a prism. But it does not represent Jones' seeing a prism. Diagram 3, on the other hand, accurately represents Jones' seeing a prism together with the causal idealistic solution to the argument from fragmented experience. The only thing that Jones sees is what is in the balloon and that is not independent of his sensing it. The mistake contained in the non-idealistic account is to treat what represents what Smith sees as also representing what Jones sees. Alternatively, it is to treat a diagram which accurately represents Smith's seeing Jones' looking at what Smith sees to be a prism as also representing in any important sense the cause of Smith's seeing what he does. (However, see the third paragraph following.) This treatment requires that a numerical identity be asserted between what is sensed

and what causes there being the sensing of what is sensed. And this is impossible.

Entrenched non-idealists will not sacrifice that there is a difference between what Smith sees and what Jones sees. They will try to overreach their sensings to obtain things-in-themselves which are independent of sensings and will therefore reject the point that the differential cause of what is sensed must be numerically distinct from what is sensed -- they will reject that a cause cannot be identical to its effect. But there can be no argument about this once it is pointed out to reasonable men. Eventually, it must follow that there can be no argument as to the inaccuracy of diagram 1 as representing anything other than what is contained in Smith's sense balloon when he sees Jones looking at what Smith sees to be a prism.

The causal idealistic account of a man's sensing several crystal prisms which are combined by being jammed together should begin with presenting this detail about the phenomenon of prisms producing light spectra. Sensed prisms are sets of determinates. As such, the only causal relation in which they participate is causality-1 or signification. Light, on the other hand, is a standing cause-3 of visual sensing. And light can change, thereby changing what is visually sensed even tho the differential cause of what is seen does not change. Thus, light is a standing cause of one's seeing either

a prism or a piece of paper. But the causal relation in which light participates when a spectrum is produced and a prism and piece of paper are seen is not the same as the causal relation in which the seen prism and the seen piece of paper participate when that same spectrum is produced. It isn't, because light is causally responsible in the first place for there being the seen prism and piece of paper as capable of being in any causal qua signifying relation. In short, light does one thing when a seen spectrum is produced; seen prisms do another.

A seen prism's being involved in a spectrum's being produced can be diagrammed in this fashion:

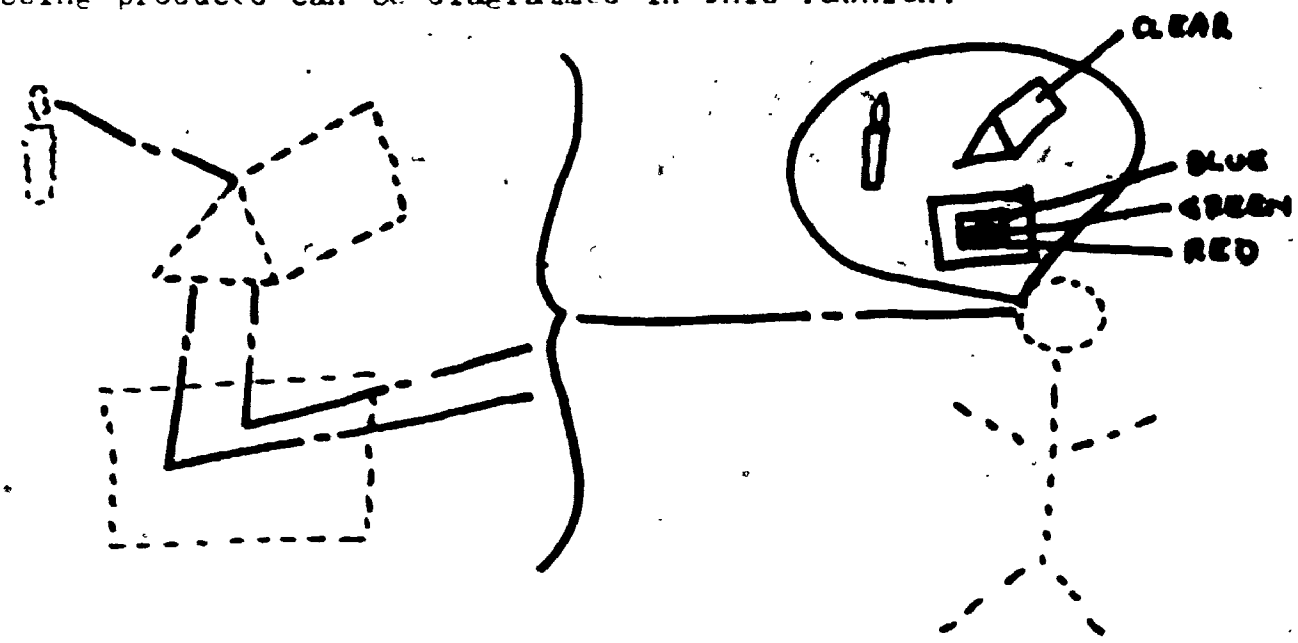

Diagram 4

It should be noticed that the seen prism is involved only in the sense that the seen spectrum is not seen until after a prism is seen (or seeable) to be relevantly situated relative to the seen paper receiving

the seen spectrum. But it is the causal-3 interaction between the quasi-prism and the light which changes the light such that its interaction with the quasi-paper and then the quasi-person senser produces a sight different from the sight produced by the interaction of the quasi-paper and ordinary light with that senser. And the seen prism is involved simply because the light can be relevantly affected by the quasi-prism only if that quasi-prism is so situated that it causes the seen prism to appear as relevantly situated. And in this sense can it be accurately said that diagram 1, which represents Smith's seeing Jones' looking at what Smith sees to be a prism, also represents the seen prism in a relevant causal relation. (See subsection 11-a)

The causal idealistic account of a man's sensing several crystal prisms which are jammed together complicates this situation only slightly. The only important modification that needs mentioning is that the light which is modified by one quasi-prism also gets modified by other quasi-prisms and eventually strikes (not a quasi-paper which reflects it to a senser, but uninteruptedly strikes) a quasi-person who does the sensing. And it is because the light has been thusly modified that a sensing produced by only one quasi-prism is qualitatively different from a sensing produced by that and other quasi-prisms. That is, sometimes the membership of a set of determinates (say, a piece of paper) changes when only the standing

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cause-3 of our sensing it changes -- i.e., when the differential cause-2 does not change. (It is from experimenting with such situations that we adduce declarations about such standing conditions of sensing as light.) When light is simply reflected off of one quasi-prism, the prism it causes-2 to be seen is clear; when it is reflected and refracted off of many quasi-prisms, the composite they cause-2 to be seen is white.

The situation can be diagrammed thusly:

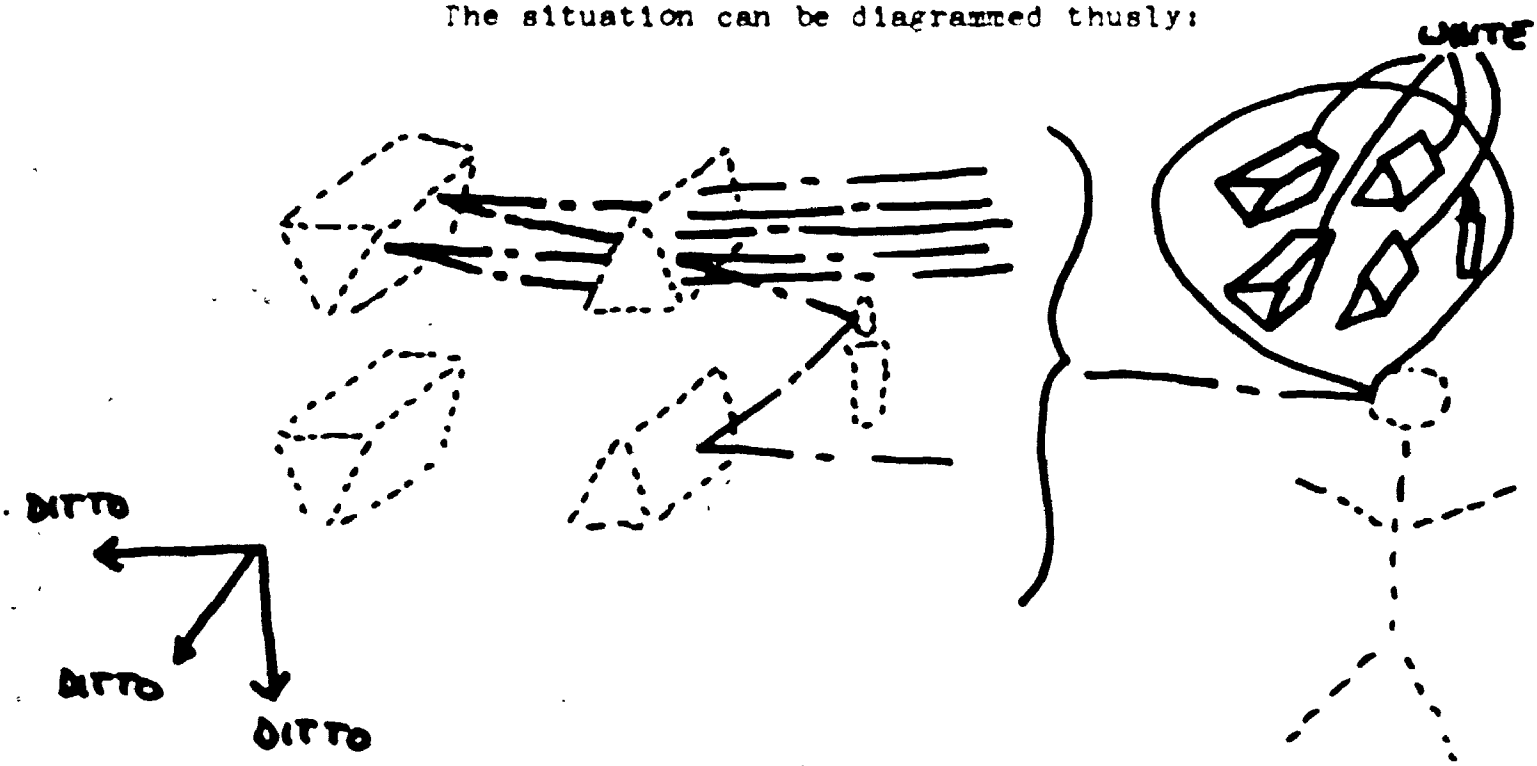

Diagram 5

The important difference between this diagram and diagram 2 is the same as the important difference between diagrams 1 and 3. Here, it is not claimed that what is sensed is qualitatively or numerically identical to what causes what is sensed. Similarly, diagram 2 represents Smith's seeing Jones'looking at something which Smith sees -- it does not represent

Jones' seeing that something. Diagram 5 represents Jones' seeing something, together with the causal idealistic solution to the argument from fragmented experience -- the only thing that Jones sees is what is in the balloon. The mistake contained in the non-idealistic interpretation of diagram 2 is to treat the representation of what Smith sees as also representing what Jones sees. Alternatively, it is to treat a diagram which accurately represents Smith's seeing Jones' looking at what Smith sees to be something as also representing in any important sense the cause of Smith's seeing what he does or of Jones' seeing what he does.

Two things have so far been done in this section: a mistake has been shown in a non-idealistic account of certain phenomena; the causal idealistic account of the same phenomena has been presented. However, the argument showing the non-idealistic account to be mistaken does <u>not</u> consist in showing it to be different from the idealistic account. The argument showing the mistake of the non-idealistic treatment consists in revealing the mistaken assumption that that which is sensed is numerically identical with the cause of that which is sensed. It also shows that this treatment comes from treating a representation of what Smith sees as also representing what Jones sees and as also representing the cause of their seeing what they do. To show exactly where this occurs, the

non-idealistic treatment has been contrasted with the causal idealistic treatment because the concept of causal idealism begins with the assumption that nothing which is sensed is independent of being sensed although, given that certain sensings are fragmented, something is independent of being sensed and causes there being sensings. I hope that some support has been incidentally generated for causal idealism by showing that and how it treats a phenomenon which is sometimes alleged to be incapable of idealistic treatment -- namely, the sugar crystal-sugar cube relation.

b. When any one of, say, four sugar crystals is seen while isolated from the others it is clear and transparent. But when all four are seen very close to one another or touching one another, each of them is white and opaque. In this case, simply combining things yields a fragmented or unfragmented composite whose relevant components are not qualitatively identical to the original components. Additionally, the process is reversible: if the sugar crystals are separated and isolated again, they will once more be clear and transparent.

Contrary to traditional opinion, this is not analogous to the situation which non-idealists allege to concern electrons. In the prism situation the components are directly sensible whether combined or not. More importantly, when combined it is a bunch of components, each of which is a set of determinates which is directly

sensible. But in the electron situation it is supposed to be only the composite qua set of determinates which is directly sensible -- not the component electrons. For, even if we look at a table top (i.e., what is, according to non-idealists, a bunch of combined electrons) theory says that nothing will enable us to sense one of those electrons as a set of determinates. Thus, the component electrons are supposed to remain not directly sensible while their composite becomes directly sensible. (This option has been closed off: "The electron components of what is directly sensed remain unsensible; they cause our sensing the composite object.") And hence it is that the combining of some not directly sensible things is supposed to yield something which is directly sensible but not numerically identical to those things which cotemporally compose it.

Non-idealists sometimes use this other example in support of their claim that a composite need not be numerically identical with its cotemporal components. A forested mountainside seen from afar is continuous and homogeneous green, tho its component trees seen from anear are green, yellow, and brown. It is inferred that therefore the surface is not numerically identical to its cotemporal components because it is not necessary for each of the cotemporal components of a homogeneous surface to be qualitatively identical to that surface. That is, there is a sense in which some composites are additional

to their combined cotemporal components.

Now, there is no sense in which a composite is even qualitatively different from its cotemporal components, much less numerically different. Interpreting the forest example as indicating the contrary results from first assuming that an afar forest is composed of the same trees that an anear forest is composed of and then doing some slippery reasoning.

In the first place, what is seen from anear is both a bunch of component trees and a composite forest. But what is seen from afar is not a bunch of trees -- it is a solid green expanse. Spatially dividing a small chunk of the seen afar forest from the rest of what is seen would not yield a tree -- it would yield a small chunk of gree. This is the phenomenon-- it is what does and would compose our sensings. And, on the face of it, no small chunk of green is a tree because a tree has a brown trunk, branches, and separate green leaves.

Under the face of it, of course, a small chunk of green can be and is treated as a tree. For one reason and another, we wind up assuming and saying that a single tree which has a brown trunk and separate green leaves if seen from anear is a chunk of green if seen from afar regardless of whether or not it is surrounded by other trees. (The causal idealistic reason is this: a quasi-tree causes-2 our sensing something which has a brown trunk and separate green leaves when it causes our sensing

something from anear; it causes-2 our sensing something which is continuous green when it causes our sensing something from afar.) That is, we wind up assuming that the afar green chunk is numerically identical with the anear brown trunk with separate green leaves. But once this is assumed, it would be an outright contradiction to use some reasoning which winds up saying that the combined anear trees which are numerically identical with the anear forest are not numerically identical with the afar forest.

In the second place, the reasoning must be specious which leads to one's saying that a bunch of anear trees is numerically different from an afar forest. There is no question that the anear trees are numerically identical with the anear forest. And, eventually, there is no question that the anear forest is numerically identical to the afar forest. Immediately, it follows that the anear trees must be numerically identical to the afar forest. (Indeed, were they not numerically identical to it, in what sense could it be said that they compose it?) When this is rejected, it is because anear trees are not qualitatively identical to an afar forest. But then, neither is an anear forest qualitatively identical to an afar forest. Yet all will grant that it is unacceptable to treat an anear forest as numerically different from an afar forest just because one is anear and one afar. But this would be required if it is accepted

that a composite afar forest is numerically different from a bunch of component anear trees since, presumably no matter what, the bunch of anear trees is going to remain accepted as numerically identical to the anear forest.

It follows that the forest case does not exemplify even that a composite is qualitatively different from its cotemporal components. After all, just as an anear forest is qualitatively different from an afar forest, so is an anear tree qualitatively different from an afar tree. Remarking that a bunch of anear trees is qualitatively different from an afar forest is irrelevant to concluding that a bunch of afar trees is qualitatively identical to or different from an afar forest. And it is only this latter issue which concerns us.

And hence it is that the forest case exemplifies neither that a composite is numerically different from its cotemporal components nor that it is qualitatively different from them. It follows that if an electron is treated as a cotemporal component of a directly sensed object then there is no reason at all, much less a sufficient reason, for treating it (together with the other electrons and protons, etc.) as being numerically or qualitatively different from that object. In this case, there is no reason for not treating it as being directly sensible. But this is not theoretically possible. Thus, treating an electron as cotemporally composing a directly sensed object involves our having

no sufficient reason for not also treating it as being what it cannot be.

And hence the fact that combining some sets of determinates changes their memberships (even if the combining process is reversible) is irrelevant to supporting the claim that electrons compose directly sensed objects. Since a composite is numerically and qualitatively identical to its cotemporal components, if that composite is directly sensible then so also must its cotemporal components be directly sensible. But under no circumstances are electrons directly sensible. Therefore, under no circumstance do we have reason to treat them as cotemporally composing directly sensed objects.

"But electrons <u>are</u> cotemporal components of directly sensed objects so it <u>must be</u> that a composite need not be numerically and qualitatively identical to its cotemporal components" simply introduces mystery where none need be. For this phenomenon can be handled by causal idealism without involving mystery:

> Single quasi-prisms so interact with light that clear, transparent, pentahedronal things which have spectrum yielding dispositions are seen. Multiple quasi-prisms so interact with light that a white, opaque thing which doesn't have spectrum yielding dispositions is seen. Quasi-prisms (and all material substance differential causes-2 of sensed objects) are such that what they cause to be sensed cannot be alterred without thereby altering the quasi-prism itself <u>except</u> in those cases where the standing causes-2 of what is sensed are alterred. Jamming together multiple seen prisms does not alter quasi-prisms except as they are related to other

causes-2 of what is sensed. (See subsection 11-a.) But in the case of so altering quasi-prisms, the standing cause-2 of what is sensed also gets alterred. It gets alterred such that what is then sensed is not qualitatively identical to what was previously sensed -- color and opacity replace clear and transparency in the sensed set of determinates.

In short, jamming together several seen crystal prisms yields a seen cube of sugar. But not because those combined prisms cause our seeing them differently than when uncombined. And not because their composite is numerically different from them.

9-a. This is another key section in the chapter.

To this point fairly considerable results have been produced. Concerning the physics reason for introducing not directly sensible entities, there has been seen to be a viable alternative to treating those entities as to any extent composing directly sensed objects. Also, it has been seen that the reasoning by analogy traditionally presented in support of treating not directly sensed entities as composing directly sensed objects involves one of two mistakes. Along the way, alternative reasoning by analogy has been presented -- reasoning which, it seems to me, involves no mistakes. This reasoning leads to the causal idealistic conclusion that not directly sensible entities be treated as material substances -- as being related to directly sensed objects only causally. But there is more to be done.

The discussion began in the first place in reaction to its seeming that the chemistry reasons for introducing

not directly sensed entities involve their being in a relation, R-2, to directly sensed objects which cannot be interpreted as being causal. Rather, it seems to require a component-composite interpretation. The major part of the task will have been accomplished if it can now be shown that the hypostatizing chemistry reason for making reference to not directly sensed entities can be interpreted as involving their being simply in one or another causal relation to directly sensed objects.

The chemistry reasons were produced in order to make reasonable certain directly sensed uniformities. They involve a reference to not directly sensible entities mainly as having certain quasi-weights which are such that the weights of those directly sensed objects to which they are related by R-2 could be treated as resulting from the quasi-weights of the not directly sensible entities. Now this relation between the two types of entity can be treated as being only causal. This can be accomplished by using the same line of reasoning as was presented in section 7 above:

> The weight of a directly sensed object with which we are concerned is a causal disposition. As a causal disposition it is the permanent possibility for that object to be involved in a sequence of determinates which also involves another directly sensed object, a scale, in which the only relevant change is the moving of a pointer on that scale. Suppose the object is a chunk of iron.
>
> The quasi-weight of the not directly sensible entity which causes-2 that chunk to be directly sensed is its permanent ability to cause-3 such

> changes in that (and other) quasi-scale which causes-2 the scale concerning us to be directly sensed that the pointer of the directly sensed scale is directly sensed to move. That is, the direct sensing of a sequence which is the causal disposition, weight, results from the causal-3 interaction between quasi-objects, one of which causes-2 there to be the sensing of a chunk of iron and one of which causes-2 there to be the sensing of a scale.

b. It is appropriate now to complete the story which began in sub-subsection 3-d-iii of chapter 1 and has appeared intermittently since about how arguments from fragmented effects are related to causally-2 and -3 acting material substances.

The chunk of iron which is directly sensed to cause-1 a scale's pointer to move has cotemporal components -- its upper half as opposed to its lower half, for example. They can be separated. If so, the sum of their respective weights will equal that of the original chunk. But if so, then the quasi-iron chunk which originally caused the chunk of iron to be directly sensed has itself been so alterred that it interacts with sentient material substances differently now -- such that what is now caused-2 are two smaller and fragmented iron chunks. And just as the weight of the original chunk resulted from the quasi-weight of the original quasi-object, so also do the weights of the subsequent chunks result from the quasi-weights of the subsequent quasi-chunks.

But there is a smallest directly sensible component of any object -- the use of microscopes included -- because

there is a smallest directly sensible object. If such an object is itself spatially divided, nothing relevant will be directly sensed. There is a reason for this. The reason is that a material substance so interacts with a sentient material substance as to cause-2 something to be directly sensed only if it is quasi-large enough. Alternatively, only if enough material substances which are too quasi-small to be quasi-objects (too quasi-small to cause-2 an object to be directly sensed) are quasi-jammed together.

But, and here's the whole point of this story, material substances which are too quasi-small to cause-2 an object to be directly sensed are nonetheless capable of so interacting causally-3 with other material substances which are quasi-large enough to cause-2 such directly sensed objects as scales to exist that the sensed scales appear or behave differently than they do if their causes-2 did not interact with those quasi-small material substances. Hence, fragmented effects appear. Furthermore, the measurement number which is read off the scale when any complete bunch of quasi-object components of the original quasi-object are measured is equal to the measurement number read off that scale when it measures a complete bunch of components of the original quasi-object which are too quasi-small to be quasi-objects. And it is in this sense that the directly sensed weight of a directly sensed element results from the indirectly sensed quasi-

weights of those atoms which, as quasi-jammed together, cause-2 that element to be directly sensed.

And hence it is that the proportion laws can be made reasonable by means of Dalton's assumptions about not directly sensible entities without requiring their being treated as composing directly sensed objects. The chemistry reason for introducing not directly sensed entities does not require their being treated as composing directly sensed objects. Rather, they can be interpreted as involving not directly sensed entities in certain fairly complex causal relations with directly sensed objects.

On the other hand, this does not mean that the physics relation R-1 is identical to the chemistry relation R-2. It means only that with respect to quasi-objects and directly sensed objects, R-1 and R-2 both are causal relations. And, with respect to just quasi-objects, R-1 and R-2 both involve a component-composite relation. (See sub-subsection 11-a-ii.) But R-1 does and R-2 does not involve a material substance as causing-3 a change in some other non-sentient material substance.

In short, Locke's story about entities which are related to but independent of sensings can be completed now because in the intervening 300 years a theory of fragmented effects has been developed according to which some entities are not directly sensible and yet are in relations R-1 and R-2 to directly sensed objects.

All fragmented effects show that something operates causally even though it is not directly sensed. Some fragmented effects show also that something operates causally even though it is not directly sensible. Causal idealism fixes on the idea that effects like cloud tracks are directly sensed in qualitatively and predictively the same manner regardless of whether or not a projectile is also directly sensed to fly through the cloud. Then, it retroduces a reason for this. The reason is that the directly sensed cloud changes only if its not directly sensible quasi-object cause-2 changes. And that quasi-object changes only if it interacts with another material substance. Generally, those other material substances themselves cause-2 the direct sensing of some projectile object. And it is from the uniform evolution of the causal dispositions and the effects dispositions of such objects that good predictive laws are retroduced. But those laws hold even when no projectile object with a causal disposition is directly sensed. The causal idealistic idea retroduced from this feature of fragmented effects is that the law holds in the first place only because of the causal-2 and -3 action of material substances. Thus, the law is "about" the material substance world in the sense that it is about what that world causes-2 to be sensed regardless of what else it does or does not cause-2 to be sensed.

PART D

10. It is time to wrap up this discussion. In the second subsection following, an explicit argument will be presented to the conclusion that such indirectly sensible only entities as electrons should be treated as material substances. In the first subsection following, the epistemological premise which has been presupposed in the previous arguments will be explicitly described.

a. The reasoning in this essay depends heavily on what is understandable about directly sensed objects even though it talks about not directly sensible entities. The justification is this. We learn to reason about things which are directly sensed. Now there are more things in the world than things which are directly sensible. Thus, it might be that we ought to learn how to reason about them in a manner which is different from that which we have already learned. But if everything known about things which are not directly sensible can be adequately reasoned about in the old manner then, probably, there is no point in trying to find new manners and being stuck with mystery in the meantime. For example, there seems no point in trying to treat a composite as

numerically different from its cotemporal components just so that we can follow up our hunch that electrons compose wooden tables and wire coils if everything we know about electrons can be adequately reasoned about by treating them as causing-? our sensing wooden tables and [redacted]re coils.

I believe that this is one way of describing the empiricistic approach to philosophy. It is the approach I have employed in telling these stories.

b. Here is an explicit argument to the conclusion that such not directly sensible entities as electrons should be treated as material substances:

i. Such not directly sensible entities as electrons must be treated either as composing directly sensed objects or as causing our sensing those objects.

ii. If electrons are treated as composing directly sensed objects then we must modify our reasoning such that either what composes a sensed object also causes our sensing it or else that a composite need not be identical to its cotemporal components.

iii. If electrons are treated only as causing our directly sensing objects then everything known about them can be adequately reasoned about by our present method of reasoning.

iv. The empiricistic approach to philosophy should be followed.

Therefore, v. Electrons should be treated only as causing our directly sensing objects.

vi. That which causes our directly sensing objects (and qualities, etc.) is called material substance.

Therefore, vii. Electrons should be treated as material substances.

Notice that it has not been argued that since those entities whose existence is inferred by means of the argument from fragmented effects and by means of the argument from undiscovered reasons are not directly sensible and since those entities whose existence is inferred by means of the argument from fragmented experience are not directly sensible that therefore they must be the same entities.

The argument is that those not directly sensible entities which are inferred by means of the science arguments cannot be treated as composing directly sensed objects but they can be treated as causing the sensing of those objects. When they are so treated, they qualify as being the same entities which were inferred by means of the argument from fragmented experience.

Two weaknesses in the argument should be noted. First, premise-i is weak because the only disjunction it exhausts is the plausible alternatives which I could think of for interpreting R-1 and R-2.

Second, premise-iv is weak because it inhibits theorizing which requires styles of reasoning alternative to our native one. Examples of such theories which I think are adequate are relativity theory, the psychological-philosophy of Casteneda's Don Juan and Zen. On the other hand, those examples stand on their own ground -- they are not dependent on any old style of reasoning. And the stories which I have read about sub-atomic entities, no matter how incompatible with the style of reasoning

native to the western world, actively employ the old style of reasoning.

But hence it is that I can't claim as much strength for this argument as can in general be claimed for arguments. The best I can say is that I tried to find one single coherent interpretation of what is known about electrons in the tradition of western philosophy and science and I couldn't find one that seemed so to me. The interpretation according to causal idealism does seem to me to be coherent.

11. Here are some points of interest that are generated by causal idealism.

a-i. According to causal idealism, there is a sense in which the quasi-object cause-2 of a directly sensed object is changed by changing that directly sensed object. For example, when one spatially divides a sphere, he has quasi-divided a quasi-sphere.

But this indicates simply that directly sensed objects can be changed only by first changing their causes-2, their quasi-objects. If one reaches his arm to move a billiard ball, a thing-in-itself has been reached to move another thing-in-itself. But if he tries to sense either of those things-in-themselves he will always trip over what they cause-2 him to sense. In short, we live in the world we sense; we activate in another.

11. There is an important variation to this theme which is more controversial. The relational theory of space is that everything which needs saying about space is reducible to what can be said about the relations of distance and direction among things. I believe that this theory is adequate for things which are directly sensible. Whether or not it is also adequate for things which are not directly sensible is arguable because for them it is not so clear what the distance and direction relations are. If the answer comes out "No" then causal idealism gets committed to some non-relational theory of space for its material substance world.

I shall not pursue this topic further. But, relatedly, I would like to suggest that causal idealism might not be committed to holding that quasi-objects are at some place different from the objects they cause-2 to be sensed. However, the opposite of this is indicated by diagrams 3-5 in section 7 below. And it is indicated generally by those theories which hold that sensing results from a causal interaction between a senser and something else which is independent of sensing. The reasoning behind the indication is this: no cause is identical with its effect; only one material object can be at a single place at one time; anything not identical to a material object therefore must be at some other place. Another way of saying this is that sensings are in our heads; causes of sensings aren't.

Now the world of sensing is populated by sets of determinates. But the world of the causes-2 of sensings

isn't. So, unless there is something which prevents a thing from one of the worlds from, in some sense, sharing a place with a thing from the other world, it is irrelevant that only one material object can be at a single place at one time (because no two determinates of a single determinable can share a place).

"Sensings are in our heads; causes of them aren't" might or might not be a preventative. It is possible that quasi-objects and sensers so interact that the result of that interaction is, in some sense which it would take a logician to figure out, mapped right back onto the quasi-objects in such a way that it is reasonable to treat them as sharing places. At any rate, since we trip over our sensings whenever we reach for quasi-objects, there will never be any sensory evidence that this sort of mapping doesn't happen. (Which is different from the case in which a set of determinates, a film slide, projects a set of determinates, an image, onto a screen.) Additionally, the world seems to be some place besides in our heads. After all, when one turns his head, the world doesn't turn -- he sees another part of the world.

This topic will be left dangling.

b. I have been treating only electrons (and protons, etc.) and what they compose as the quasi-objects which cause-2 our directly sensing objects. But it is possible that electrons themselves have components. In this case,

electrons are not the quasi-smallest material substances.

What is not possible is that there are quasi-electrons (quasi-quasi-objects) which in any way cause there being electrons. For there is nothing which could be the intermediary cause between what causes what is sensed and what is sensed. That is, the cause of there being directly sensed things does not also cause there being things which are only indirectly sensible. Rather, things which are only indirectly sensible cause there being things which are directly sensed.

c. One way of presenting the primary-secondary quality distinction is that only those sensed qualities which resemble what exists independently of being sensed are primary. I do not think this is a very important distinction. And I was at pains in chapter 1 to show that causal idealism does not entail that anything which is independent of being sensed itself must resemble what is sensed.

But in subsection 9.b of this chapter, it was shown how the causal disposition, weight, of a directly sensed object can be treated as resulting from the quasi-weight of a not directly sensible entity in such a way that the numbers assigned to these two things are equal even though the dispositions themselves are not identical.

With a little more reasoning this might show that something (though not a quality) of what is directly sensed enough resembles something of what exists indepen-

dently of sensing that a relevant primary-secondary distinction can be applied. I have not thought about it further. I mention the point only for its historical interest.

d. Much sub-atomic science is now directed towards relating the structure of those entities to the identity of directly sensed sets of determinates. This project is subject to the challenges I have previously presented.

However, it is possible that some striking uniformities will eventually be discovered relating the quasi-causal dispositions of quasi-objects to the brain or to the quasi-brain. And from this someone might retroduce a theory which does account for the membership of directly sensed sets of determinates in terms of, among other things, such quasi-causal dispositions of electrons as quasi-mass and quasi-charge. It would not surprise me if this is eventually pulled off.

But even in this case, the argument in sub-subsection 3-b-ii would not be incorrect. For in that case the quasi-causal dispositions of indirectly sensible only entities would be related to another indirectly sensible only entity and both of them then related to directly sensed sets of determinates. And this would be different from simply relating the quasi-causal disposition of electrons to directly sensed sets of determinates.

However, a variation of the argument in sub-subsection 3-b-ii might still serve to challenge that kind of account. We must wait and see.

e. It is customary for scientists to bewilder their students by declaring "Your desks really are more empty space than solid matter (because they are composed of atoms)." This is a mistake. Desks are directly sensed sets of determinates which are solid. They remain so under any theoretically possible magnified scrutiny: if there are enough atoms to cause-2 a visual sensing then that sensing is composed of non-gappy components. This holds even though the cause-2 of that sensing is itself quasi-gappy.

On the other hand, those scientists were correct who declared, in the face of incredulity, "Such indirectly sensible only entities as electrons are of a different kind than directly sensed objects." They are correct in the sense that no graphic diagram can accurately represent indirectly sensible only entities and in the sense that indirectly sensible only entities cannot be treated as particles (individuals).[4] (See appendix 2.)

FOOTNOTES

1 Individuals, (London, 1959), p. 3.

2 Strictly, the division between physics and chemistry reasons for introducing entities which are not directly sensed has still been drawn too sharply. The existence of atoms as introduced in Dalton's way involves no indirect sensing. But ascribing to them such features as weight by reference to Avogadro's number does. For the methods by which Avogadro's number is discovered are straightforward cases of indirect sensing. (The normal method is by X-ray diffraction.)

3 It is interesting to note that sets of determinates compose sensings by being cotemporal* with them.

4 This essay has benefitted from my discussion with Bill Harper and Cliff Hooker.

There is a second thing which should be said in the essay's last footnote. In constructing these causal idealistic stories, I have considered the world at moments. I have considered it with time stopped. Thus, I have considered issues about change only when dispositions were discussed -- and then not very deeply. I hope that nothing has been presented which contradicts what should be said about change.

APPENDIX 1

The only sensings whose every component is at some distance and direction from every other component are those of feel and sight. However, the components of the other three types of sensings can be in some sense treated as occupying spatial positions in virtue of their being associated with feel and sight entities. And there are material objects which are generally thought of as being composed of at least smell and taste entities in addition to feel and sight entities.

The components of sound sensings are different from the components of the other types of sensings, however. They do not endure in anything like the same fashion as do sight, feel, taste, or smell entities and so it is not the normal practice to say that a material object has a certain sound or other. This holds even for such material objects as tuning forks -- their characteristic sounds do not endure in the way that their colors do.

There would be little more of importance to say about nonfeel-nonsight entities except for Strawson's treatment of sound entities. However, because his treatment is so penetrating and so well known I think it relevant to show that it squares with the ontology of causal idealism.

Strawson first notes that, in purely auditory terms, we can distinguish sounds as individuals via the criteria of continuity and discontinuity: if, during a certain time, a sound begins, continues without interuption, and ends, then the number of sounds as individuals during that time is one; but if, during that time a sound begins, ends, begins again, and ends, then the number of sounds as individuals during that time is two. But these criteria, he notes, suffice only for identifying a sound as an individual qua distinguishable thing: they do not suffice for identifying a sound as an individual qua reidentifiable thing. It is in order to accomplish the identifying of a sound as an individual qua reidentifiable thing that Strawson introduces what he calls the master sound.

He directs us to consider a "unitary sound sequence" which begins, ends, begins again, and ends again. We can distinguish this situation as involving a single sound particular (the digtinguishable sound between the first beginning and ending is the same as, and hence reidentifiable as, the distinguishable sound between the second beginning and ending) from its involving two qualitatively identical sound particulars (the distinguishable sound between the first beginning and ending is not the same as, and hence not reidentifiable as, the distinguishable sound between the second beginning and ending) by reference to the master sound. If, during the time between the first

ending and second beginning, the master sound changes pitch and/or loudness and does not return to its original pitch and loudness then we say that the situation involves two sound particulars which are qualitatively identical. But if, during that time, the master sound changes pitch and/or loudness but returns to its original pitch and loudness then we say that the situation involves only one sound particular which exists at two times between which experience is fragmented.[1]

And hence it is that Strawson distinguishes numerical identity from qualitative identity concerning individuals in a no-space world.

The implication in Strawson's presentation is that, without the master device, in a no-space world neither individuals nor properties can be reidentified such that qualitative identity entails numerical identity only for the latter. This is not true. And demonstrating it provides an opportunity for showing that the numerical non-identity of qualitatively identical entities which is based on their non-cotemporality is no different from that as based on their non-cospatiality.

First, it should be remarked that any qualitatively identical sound entities with which we might be concerned need not be discontinuous in order to be distinguishable -- for this they need only be non-cotemporal. Any temporally extended sound entity has such components. Along this line, the master sound's varying in pitch or loudness during a continuous, invariant sound would give us reason

to distinguish some qualitatively identical components of a temporally extended sound as different individuals. On the other hand, even without the master sound we can distinguish some components of a temporally extended sound as preceeding or succeeding each other. For ease of presentation, however, let us consider a situation in which a sound begins, ends, begins again, and ends again and call the sound between the first beginning and ending a and that between the second b.

Without reference to a master sound, consider a temporally fragmented auditory entity P which is composed of all and only the auditory entities which exactly resemble a and b. Hence, P has multiple temporal positions and there is no entity which exactly resembles any component of P which has a temporal position different from some temporal position had by P. It should be obvious that if a is treated as representing P then, given what has been said about numerical identity, a is numerically identical with b also treated as representing P. It can be said that P is a sound quality. Similarly, if we treat a and b only as entities which have different single temporal positions then, since they fail to share a relational thing, they fail to be numerically identical. We can say that a and b so treated are sound objects. In short, sound qualities are sound entities which can be at multiple temporal locations; sound objects are sound entities which can be

at only a single temporal location. Thus, for sound qualities qualitative identity entails numerical identity while for sound objects it doesn't.

There is thus good reason for holding sound qualities to be properties and sound objects to be individuals. It need only be further remarked that by using two different descriptions which uniquely refer to a qua sound quality('C#' and 'the sound which is most pleasing to Jones', for example) and two different descriptions which uniquely refer to a qua sound object ('C# at time t-1' and 'the sound at t-1 which is most pleasing to Jones', for example) we are able to reidentify individuals and properties in a no-space world such that qualitative identity entails numerical identity only for the latter.

What cannot be done in a no-space world without the master sound is to identify individuals and properties as re-experiencable such that qualitative identity entails numerical identity only for the latter. If an entity is re-experiencable then it can be sensed at different times. Thus, since entities which share all non-relational features can be numerically different only if they fail to share temporal or spatial positions, in a no-space world entities sharing all non-relational features which can be sensed at different times can be numerically different only if they fail to share temporal positions.

Thus, unless we can determine when entities sharing all non-relational features (qualitatively identical entities) which are sensed at different times are cotemporal and when not, then either they must always be held to be entities for which qualitative identity entails numerical identity, properties, or else never so held, individuals -- and in the second case, no individual is re-experiencable. Thus, in a no-space world without a means for determining this we cannot identify <u>both</u> properties and individuals as re-experiencable such that qualitative identity entails numerical identity only for the former because we cannot identify individuals qua re-experiencable as opposed to properties qua re-experiencable at all. (In a no-space world, if we let temporal fragmentation always suffice for the numerical non-identity of qualitatively identical entities then not only are no entities re-experiencable but also none of them are properties because qualitative identity never suffices for numerical identity. In such a world, if we let temporal fragmentation never suffice for the numerical non-identity of qualitatively identical entities then all entities are re-experiencable but none of them are individuals because qualitative identity always suffices for numerical identity.)

Now re-experiencable individuals are those entities which, if qualitatively identical, can but need not be numerically identical -- as opposed to properties which, if qualitatively identical, must be numerically identical. It must be possible but not necessary for

qualitatively identical and re-experiencable sound individuals between which experience is fragmented to be numerically identical. Thus, if we want to introduce the individual-property distinction in a no-space sound world as applied to re-experiencable entities we must first identify those entities such that they can but need not be both qualitatively identical and numerically identical and we must also identify them such that they must be numerically identical if qualitatively identical. Requiring that they have only a single temporal position is necessary for the first. But it is not sufficient. We must go on to require that qualitatively identical entities with single temporal positions and between which experience is fragmented sometimes are but sometimes are not numerically non-identical. Without this, we cannot identify some non-spatial entities as re-experiencable individuals -- as sensory entities which can but need not be numerically single, though experience is fragmented between the respective sensings they compose, and yet for which qualitative identity does not entail numerical identity.

This can, however, be accomplished by reference to the master device in approximately the way presented in section 1 of chapter 2 because the master device gives us reason for ascribing cotemporality to qualitatively identical sounds which have single temporal positions but between which experience is fragmented.

of phase space having equal non-infinitesimal volumes $\Delta x \Delta y \Delta z \Delta p_x \Delta p_y \Delta p_z$, this problem can be obviated. In such a case, that region of phase space which concerns us contains only a finite number of representators, the phase cells.

Still, however, so long as there are fewer entities to be represented than there are cells to represent, our problem recurs if there is no single macro state of maximum probability because it is possible that there are different sets of cells such that each cell represents at most one entity composing the gas and which sets are thus equally and maximally probable. And this is true even when we require that those sets be compatible with the total energy of the gas we are considering. Thus, to avoid the problem we must go on to assume some such principle as that the maximally probable macro state which concerns us, the state of <u>statistical equilibrium</u>, is the unique one in which the total energy of the gas is distributed such that the component with the highest energy relative to the other components in that state has less energy than does the component with the highest energy relative to the other components in any other maximally probable macro state. (This particular assumption requires that, for some reason or another, if entities are independent of all forces except those of collision with other entities then their

Such reference gives us a reason to hold that fragmented experience is sometimes but not always of cotemporal entities even when those entities are treated as having single temporal locations. That is, even when they are not treated as entities for which qualitative identity entails numerical identity.

Notice, and this is the point, that reference to the master sound does not provide a criterion in addition to their sharing relational and non-relational features by means of which to assert a numerical identity between entities. Hence, it does not provide a grounds for applying the individual-property distinction to sensory entities which is different from C-1. Rather, it provides a criterion for determining whether or not qualitatively identical non-spatial entities share all relational features -- namely, whether or not they share a single temporal position.

FOOTNOTES

1 <u>Individuals</u>, (London, 1959), pp. 61-71.

APPENDIX 2

I began to write these stories because I could not understand the philosophical implications of the assumptions made by the two quantum statistics. For a long while, my thoughts about those assumptions were an integral part of the stories which were developing. It was with respect to them that my ontology was constructed. And from the ontology that causal idealism was suggested. But those original thoughts eventually were not integral to the stories that had been constructed.

However, my friend Cliff Hooker tells me that those thoughts might, on their own grounds, interest physicists and that they should be included with these stories. So I am presenting them in this appendix.

a. Let us consider a (perfect) gas to be some number of spatial entities which have specific momenta and which are independent of all forces except those of collision. Unfortunately, such entities cannot be directly sensed and therefore what can be known about them must be drawn by inference from an argument from presented effects.

Phase space is a convenient calculating device actually used by physicists to represent the momenta as well as the positions of the component entities of a gas. Thus, the position (x,y,z) and momentum (px, py, pz)

of one of the entities composing a gas at some time are represented by a single point having coordinates (x,y,z,px,py,pz) in a phase space having six dimensions. There is a phase point representing each of the N entities composing a gas and taken collectively they represent the state of a gas at an instant. (I am not using the quasi-concepts of causal idealism here, altho strictly, they are applicable in order to make the discussion flow more naturally for scientists accustomed to the traditional cause-component way of looking at not directly sensible entities.)

A micro state of a gas at some instant is the entities composing it as each having a specific position and momentum. A macro state of a gas is a group of equivalent micro states -- where a micro state a of a gas is equivalent to but numerically different from a micro state b of that gas if and only if every position in phase space occupied by a component of the gas in state a is occupied by a component of the gas in state b. Thus, for example, if the only difference between micro state a and micro state b is that two component entities with the same amount of momentum interchange positions then a and b are equivalent but numerically different micro states while they are the same macro state. A more convenient way of saying this would be that two micro states are equivalent if their only difference is that the referents of two phase points

are interchanged.

Clearly, assuming that each micro state is equally probable, that macro state of a gas is most probable which is composed of the largest number of different but equivalent micro states of that gas. This number is obtained from the expression

$$W = \frac{N!}{a_1!, \ldots, a_m!}$$

where a_i is the number of entities represented by a single phase point. Unfortunately, however, this does not determine a single state as most probable: no macro state is composed of more micro states than one in which at most one entity composing the gas is represented by any one phase point; but since there are an infinite number of representative phase points in any region of phase space it follows that, given any finite number of entities composing a gas to be represented by phase points in a region of phase space, there are an infinite number of arrangements of those entities with respect to position and momentum which are such that no two of those entities are represented by the same phase point but which are yet compatible with the total energy had by the gas in that state.

However, if we represent the component entities of a gas by a large number of finitely small cubical cells

of phase space having equal non-infinitesimal volumes $\Delta x \Delta y \Delta z \Delta p_x \Delta p_y \Delta p_z$, this problem can be obviated. In such a case, that region of phase space which concerns us contains only a finite number of representators, the phase cells.

Still, however, so long as there are fewer entities to be represented than there are cells to represent, our problem recurs if there is no single macro state of maximum probability because it is possible that there are different sets of cells such that each cell represents at most one entity composing the gas and which sets are thus equally and maximally probable. And this is true even when we require that those sets be compatible with the total energy of the gas we are considering. Thus, to avoid the problem we must go on to assume some such principle as that the maximally probable macro state which concerns us, the state of statistical equilibrium, is the unique one in which the total energy of the gas is distributed such that the component with the highest energy relative to the other components in that state has less energy than does the component with the highest energy relative to the other components in any other maximally probable macro state. (This particular assumption requires that, for some reason or another, if entities are independent of all forces except those of collision with other entities then their

respective energies tend to be equal.)

A third type of state relevant to gases, the energy state must now be considered. Since the coordinates of the center of some arbitrary phase cell are x,y,z,px,py,pz, any entity represented by that cell has a total momentum

$$p = \sqrt{p_x^2 + p_y^2 + p_z^2}$$

and therefore a total energy

$$\varepsilon = \frac{p^2}{2m}$$

where m, the mass of a represented entity, is assumed to be equal for all components of the gas. Clearly, there are a large number of cells representing entities having the same total energy because there are a large number of cells for which $\sqrt{p_x^2 + p_y^2 + p_z^2}$ is the same and because the energy of an entity which is independent of all but the forces of collision is derivable from its momentum. Instead of grouping together those cells representing entities having exactly the same energy, let us group together those which represent entities having energies which lie between very small ranges of values ε_i and $\varepsilon_i + d\varepsilon$ -- this compensates for the fact that between the centers of two contiguous phase cells which represent entities having energies there is a finite distance h, Planck's constant. Each one of these ranges is an energy layer of phase cells in which there are Zi cells. An energy state of a gas is then identified as

a group of equivalent* macro states -- where a macro state A of a gas is equivalent* to a macro state B of that gas if and only if the number of component entities represented in each energy layer of A is the same as the number of component entities represented in each energy layer of B.

The number of different but equivalent micro states composing an energy state is given by the expression

$$P = \frac{N!}{n_1!, \ldots, n_m!} Z_1^{n_1} \ldots Z_m^{n_m}$$

where $n_i (i = 1, \ldots, m)$ is the number of entities distributed in any way among the Z_i cells of the ith energy layer and N is the number of component entities of the gas. Similarly, the number of different but equivalent* macro states which compose an energy state is given by the expression

$$P' = \frac{(Z_1 + n_1 - 1)!}{n_1!(Z_1 - 1)!} \times \ldots \times \frac{(Z_m + n_m - 1)!}{n_m!(Z_m - 1)!}$$

where it is additionally assumed that more than one entity can be represented by a single phase cell. And the number of different but equivalent* macro states which compose an energy state is given by the expression

$$P'' = \frac{Z_1!}{n_1!(Z_1 - n_1)!} \times \ldots \times \frac{Z_m!}{n_m!(Z_m - n_m)!}$$

where it is additionally assumed that at most one entity can be represented by a single phase cell.

Hence it is that if 'I' and 'II' are treated as referring to records of outcomes by means of which things are indirectly sensed then interpreting them as analogous to records of coin tossings is mistaken. We know more about the a priori probability of the outcomes of coin tossings than we do about the a priori probability of the outcomes of the action of entities which are only indirectly sensible because we know something of relevance from sensing coins that we do not know from indirectly sensing entities which are not directly sensible. We know how to identify coins independent of coin tossings but we don't know how to identify indirectly sensible only entities independent of the outcomes of their causal action. Hence, we can enumerate and identify all of the logically possible outcomes of coin tossings but we can't do this for the outcomes of causal action by indirectly sensible only entities.

at most one of them can be represented by a single phase cell -- as numerically different only if qualitatively different?

Except for raising the objection presented in the first footnote, the first problem will be ignored completely. The second problem, in nutshell form, appears to present the task of explicating the concept of numerical identity for entities which are only indirectly sensible.

b-1. According to both Bose's treatment and Fermi's treatment of the not directly sensible molecules of a gas, given any total energy of a gas it is possible for the individual molecules composing it to be all in the single spatial region represented by the position coordinates of a single phase cell so long as they would then also have a distribution of momentum which is compatible with the total energy of the gas. Under Fermi's assumption, it would be additionally required that no two of those individual molecules be represented by the momentum coordinates of a single phase cell. But then, given the respective sizes attributed to spatial regions represented by a phase cell and the respective sizes and number per unit volume of gas attributed to gas molecules, it follows that more than one, impenetrable, gas molecule can simultaneously occupy the same spatial location -- which is impossible.

Perhaps an adequate definition of 'macro state' (see footnote 1) would also obviate or solve the problem raised here. Clearly, however, it would be unacceptable simply to refuse to admit as physically significant all those phase space representations which, while compatible with a gas's total energy, require that certain represented individuals composing that gas simultaneously occupy the same spatial location. This requirement would be incompatible with the assumption of equal probability for the various possible macro states of a gas on which the calculated probability of a gas's various energy states is based.

11. A second point of interest concerning the treatments of indirectly sensed entities made by Boltzmann, Bose, and Fermi begins with a claim which D-Abro makes about just the first two: Suppose we toss two fair coins simultaneously. The logically possible outcomes may be represented

	I	II
(a)	H	H
(b)	T	T
(c)	H	T
(d)	T	H

where 'I' and 'II' denote the different coins and 'H' and

'T' denote head and tail outcomes respectively. If we treat each of the outcomes (a)-(d) as defining a single micro state it follows that (a) also defines a macro state, (b) defines a second macro state, and (c) and (d) define the same third macro state. On the assumption of equiprobability for each micro state the a priori probability for each one then is 1/4 and the a priori probability for each macro state except the third is 1/4 -- its a priori probability is 1/2. This, according to D'Abro is the assumption which Boltzmann makes.

On the other hand, under the assumption of equiprobability for each macro state, the a priori probability for (a), (b), and (c)-(d) each is 1/3. This, according to D'Abro is the assumption which Bose makes. And, according to D'Abro, this indicates the paradoxical consequences of Bose's assumption: either we must suppose the a priori probability of a double coin tossing to be not as we intuitively suppose it to be or else we must suppose that when one coin shows heads, it acts so as to decrease the probability of the other coin's showing tails.[3] (Presumably, discussion along these lines would indicate that under Fermi's treatment in such a case the a priori probability both for (c) and for (d) is 1/2 -- since it would be excluded that both outcomes would be tails or both of them heads.)

This interpretation of the components of direct sensings as related to entities which are only indirectly

sensible is mistaken. It is not the case that we first identify and manipulate indirectly sensible only entities as specific individuals in definite manners and then record the actually sensed results of those manipulations. If what causes results is only indirectly sensible then we can identify it neither as an individual nor as reidentifiable. Specifically, we cannot describe the referents of 'I' and 'II' as individuals much less as numerically different individuals if 'I' and 'II' are intended to refer to what is only indirectly sensible.

On the other hand, if 'I' and 'II' are intended to refer to coins as the components of direct sensings which can be treated as individuals then they refer to outcomes involving manipulated things -- not outcomes of those things' acting on other things. That is, in such a case neither the coins nor their faces are indirectly sensed.

Thus, D'Abro's claiming 'I' and 'II' to refer to the outcomes of our manipulating identifiable things, coins, which are directly sensible is mistaken if intended as analogous to reports of outcomes by means of which things are indirectly sensed: there cannot be the direct sensing of a tossed head or a tossed tail of a coin without there being the direct sensing of that coin; there cannot be the direct sensing of anything which is only indirectly sensible. For example, directly sensing cloud tracks as fragmented effects does not involve directly sensing electrons.

Hence it is that if 'I' and 'II' are treated as refering to records of outcomes by means of which things are indirectly sensed then interpreting them as analogous to records of coin tossings is mistaken. We know more about the a priori probability of the outcomes of coin tossings than we do about the a priori probability of the outcomes of the action of entities which are only indirectly sensible because we know something of relevance from sensing coins that we do not know from indirectly sensing entities which are not directly sensible. We know how to identify coins independent of coin tossings but we don't know how to identify indirectly sensible only entities independent of the outcomes of their causal action. Hence, we can enumerate and identify all of the logically possible outcomes of coin tossings but we can't do this for the outcomes of causal action by indirectly sensible only entities.

FOOTNOTES

1 This leaves us with the problem of redefining 'macro' state in such a way that it makes reference to arrangements of entities which are intuitively acceptable as being equally probable. Under the above definition this doesn't occur -- as we saw, the probability of a macro state as defined above equals $\frac{N!}{n_1! \ldots n_m!}$ where n_i is the number of entities represented by a single phase cell. So far as I can tell, this problem has not been solved.

2 The exposition in this Appendix was abstracted, with some amendments, from chapters XXXI and XL of The Rise of the New Physics, (New York: 1953).

3 Ibid., pp. 922-923.

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