Egocentric Representation in Experience and Action

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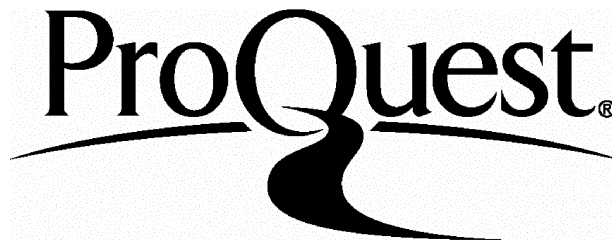
Abstract

Strawson has argued that in order to refer to a particular thing we must be able to locate that thing in space. That requires us to have some conception of space, but what is involved in our possessing such a conception? We can make an intuitive distinction between objective thought about space and subjective thought about space. In what does that distinction consist? All thought about space must employ a frame-of-reference to identify places. We can make a distinction between ways of thinking about space which employ a frame-of-reference which identifies places relative to the subject's body and those which do not. It is not implausible to think that this distinction corresponds to the intuitive distinction between subjective and objective thought about space. But a body-centred frame-of-reference cannot be used to identify places over time, and hence thought which employs a body-centred frame-of-reference cannot constitute subjective thought about space. It might be objected that we do not need to identify places over time in order to think about them, but there are good arguments in support of the claim that we do. Because thought about places requires us to identify them over time, Evans and Peacocke have argued that subjective and objective thought about space are interdependent. If this is right, then subjective thought about space is one aspect, or element, of our conception of objective space; but there are reasons for thinking that subjective thought about space independent of objective thought must be possible. Perhaps it was wrong to think the distinction between subjective and objective spatial thought consists in the frame-of-reference employed in identifying places. Is there some other account that we might give? Campbell distinguishes ways of representing space according to the way that a subject grasps the meaning or significance of the representation. He describes a way of representing space which is subjective; but does it really constitute a way of representing space?

Contents

1. Strawson, Reference, and Space.

In *Individuals* Strawson argues that in order to refer to particular things we must be able to locate them in "the scheme of a unified spatio-temporal system of one temporal and three spatial dimensions" (1959, 62). In what follows I shall, as a way of introducing many of the issues that I want to discuss, outline the argument which leads him to this conclusion.

Strawson begins his argument by asking how we are able to identify the things that we hear people speaking about - when someone says something about a particular thing, how are we able to understand what it is that they are saying? Later he extends this question to include thought - how are we able to think about particular things? An answer to one question will be an answer to the other, Strawson suggests, because the general structure of thinking about particulars is not different when we want to communicate with each other in speech and when we do not (1959, 60). Although in the remainder of this thesis I shall be concerned with spatial *thought* and *representation*, I will discuss Strawson's argument in terms of referring in speech on the assumption that the conclusions will apply, as Strawson claims they will, to thought.

The question we want to answer is how we are able to refer to, and understand references to (I shall shorten this to 'refer to'), particular things, and this is potentially problematic for Strawson because he supposes that in order to refer to a particular thing we must be able to identify the thing referred to. It follows that in order to say how we are able to refer to particular things we need to say how we are able to identify particular things. By "identify" is meant something like "know which"; so the requirement that we be able to identify what it is that we are referring to is the requirement that we, in some sense, know which thing it is that we are referring to. Accepting the requirement leads to a general problem.

It is not clear what exactly is required if we are to identify or know which thing it is that we are referring to, nor why we should accept the requirement as a necessary condition of reference to particulars. It may have some intuitive plausibility, but all that Strawson says in its favour is that we could not significantly claim to be able to talk about members of a class of thing (in this case particulars) if it was in principle impossible for us to know

which member of the class we were talking about at any one time (1959, 16). We could perhaps make this point by saying that there must be some account of what it is about a subject's speech or thought in virtue of which how things are with the particular thing thought about determines whether the expression or thought is true or false; only if this is so could we have any justification for claiming that our talk or thought was about, or referred to, that particular thing. Merely saying (trivially) that someone who says or thinks 'a is F' knows which object they are talking about: it is a that they are talking about, would not provide any such explanation. Some more substantial account is required. (One problem with giving such an account is that if knowing which thing is referred to involves some other thought about a, that it is G perhaps, then we just seem to have the same problem again for 'a is G'. This gives us a reason for supposing that such knowledge must ultimately grounded in some ability or capacity to discriminate the thing.)

Whatever exactly the requirement comes to, Strawson holds that a sufficient condition for identification is that the thinker "can pick out by sight or hearing or touch or otherwise sensibly discriminate, the particular referred to, knowing that it is that particular" (1959, 18). Sensible discriminations of this sort constitute cases of what Strawson calls "demonstrative identification" which allow us to "directly locate" the particular referred to (1959, 19).

But much of the time we refer to, or think about, things that we are not currently perceiving, and in such cases we will not be able to directly locate the particular thing to which we refer. How are we able, in such cases, to identify the particular in question? If we cannot directly locate the particular in the way just described then, Strawson says, that leaves two possible alternatives: that either we identify the particular using a name, or we identify it using some description or set of descriptions. These, Strawson argues, are not genuine alternatives since "a name is worthless without a backing of descriptions which can be produced...to explain its application" (1959, 20). It follows that in cases where we cannot directly locate the particular to which we refer we can only identify it using a description or set of descriptions, and hence all identification of particulars we cannot directly locate must ultimately depend on identification by description, where such descriptions contain only general terms. But if this is so then we face a problem, for no matter how much detail we add to a description we can never guarantee that it is uniquely

satisfied: there remains the possibility of what Strawson calls "massive reduplication"; the possibility that there might be some exact copy of this part of the universe in some other part of the universe. If that were so we could never frame a description that would be uniquely satisfied - whatever description we used would be satisfied by something in our own part of the universe and by a duplicate thing in that distant part of the universe. Because the universe might be reduplicated no description can claim to uniquely identify a particular thing - it will identify all those particular things which satisfy the description. And we can never know that the universe isn't reduplicated in this way, so we can never know that a description is uniquely satisfied, and hence no description can provide us with knowledge of which particular thing it is we are referring to. Descriptive identification cannot therefore constitute the identification of a particular thing. Since reference requires such identification, we cannot refer to a particular thing using a description alone. The possibility of massive reduplication therefore has the consequence that we are only able to refer to those particular things that we can directly locate. And yet of course we can and do refer to things that we cannot directly locate, the problem does not in fact arise for us, but why not?

Strawson suggests the following solution to the problem. Although we cannot uniquely identify a particular using a completely general description, we may identify it using a description which relates it to something that we can directly locate. If we can directly locate a particular by demonstrative identification then we can, by describing some unique relation between it and the particular to be identified, use that directly located particular to identify any other particular, even when the particular in question cannot itself be directly located. In this way the problem of massive reduplication can be overcome; and it follows that "all identifying descriptions may include, ultimately, a demonstrative element" (1959, 22).

In principle we could identify any particular by describing its relation to a directly located particular, but what sort of relations between those particulars we can directly locate and all other particulars are such that we can use them to uniquely identify the particulars to which we refer? Strawson points out that there exists one such system of relations; it is "the system of spatial and temporal relations, in which every particular is uniquely related to every other" (1959, 22). We can, by demonstrative identification, determine, at a time, a

point of reference and we can define axes of spatial direction, and we can then, in principle, individuate every other particular by its unique spatio-temporal relation to that point and time. Even if the universe were repetitive, even if, that is, it were massively reduplicated, we could still uniquely identify particular things by their spatial relations to something we can directly locate, since no two different places can bear the same spatio-temporal relation to the same reference point.

In general, Strawson claims, we can identify a particular, we can know which particular it is (and hence refer to it), if we know it to be identical with some particular about which we know some individuating fact, where an individuating fact is a fact that is true of that particular and no other (although we needn't, Strawson says, be able to articulate such knowledge. It may consist in some ability or capacity.). The location of something in space and time is just such an individuating fact and, Strawson is surely right to claim, we each of us possess a conception of a unified spatio-temporal framework in which we and our surroundings have a place, and each element of which is uniquely related to every other, and hence to ourselves and our surroundings (1959, 24). It is in virtue of our having a conception of this framework that we are able to think about and refer to particular things even when we are unable to directly locate them.

It might be accepted that knowing the location of something in space and time is sufficient to identify it, but is such knowledge necessary for identification - are there not other sorts of individuating fact which would do just as well? Can we not, for example, formulate some descriptions (maybe only a few) beginning with expressions like "the first" or "the only" which "proclaim, as it were, the uniqueness of their application" (1959, 26) and which could uniquely individuate a particular thing and hence allow us to identify it without our knowing its location? Such a description Strawson calls a "pure individuating description" (1959, 26). If such descriptions are to provide a basis for identifying particulars independently of our knowledge of their spatio-temporal location, then they must not include terms which relate to particular places or times (they must not include place names, for instance, nor dates, nor demonstratives). One such description is "the first dog born at sea". It may seem doubtful, particularly given the possibility of massive reduplication, whether we could ever know this description to be uniquely satisfied if we knew nothing else about the particular in question, and if we were unable, even

approximately, to locate it in space and time. But even if it were granted that the description was known to be uniquely satisfied, our identifying knowledge of the particular in question would be a peculiarly useless piece of knowledge since "so long as our knowledge of it retained this completely detached character," detached in that we should be unable to connect it in any way to our general scheme of knowledge of particular spatio-temporal things, we could learn nothing further about it except more general truths (1959, 28).

The claim is that reference to, and thought about, particular things requires that we have, what we do in fact have,

> "a single picture which we build, a unified structure, in which we ourselves have a place, and in which every element is thought of as directly or indirectly related to every other; and the framework of the structure, the common, unifying system of relations is spatio-temporal" (1959, 29).

Nothing in what has been said rules out the possibility that there might be alternative non-spatial systems of relations which could be used to individuate particulars,[1] but nevertheless it is in fact the case that the scheme we use is the spatio-temporal one. It is therefore of interest to examine in more detail what is involved in the possession of such a scheme, irrespective of whether it is necessary that we should possess it.

What are the necessary conditions for our possession of this scheme: that is, what is required if we are to be able to think of a spatial world in which we ourselves and all the particular things that we can think about are located? This is a question that I will be examining throughout the rest of this thesis, but before turning to that I will sketch Strawson's own outline of an answer.

Our conception of space is the conception of a unique and unified system of relations. To say that it is the conception of a unique space is to say that we conceive of only one such system of relations, and not two or several each bearing no spatial relation to the others. We conceive of the system as unified in the sense that we think of every place within the

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[1] In fact Strawson considers such a possibility (1959, chapter 2) which Evans discusses (1985b).

system as spatially related to every other place in that system. We cannot conceive of the existence of two places which are not spatially related. Conceiving of space as unified in this way is sometimes described as thinking of it as connected.[2] If this is our conception of space then any account of how we are able to think about space must account for how we are able to think of it as a unique and unified system. This places a constraint on what constitutes an adequate account. To possess such a conception, Strawson argues, we must not only be able to identify particular things, but also to re-identify them; we must, that is, be able to identify a particular encountered on one occasion as the same individual as one encountered on a previous occasion (1959, 31 ff.). This is a consequence of the fact that we do not continuously observe our environment. To see why it follows consider the case in which we directly locate something by demonstrative identification. Given such an identification we can think about and refer to that particular, and we can use it to identify other particular things that we cannot directly locate. Now, suppose that there is a gap in our observation of the particular that we directly locate. If we do not identify the particular we directly located before the gap with a directly located particular after the gap, if we do not recognise them as being the same individual, then we will have no reason to think of the particulars we identified relative to what we directly locate before and after the gap as being the same individuals. We will, in effect, be thinking of two different groups of particulars each group being picked out relative to a different, numerically distinct, particular. Each new period of observation would be conceiving of a new system of spatial relations and there will be no spatial or temporal relation that we could use to relate them, we would no longer have a unique system. Thus if we did not re-identify particulars we would not be conceiving of a single, a unique, system of spatial relations.

The point can perhaps be made clearer with the use of an example. Suppose that you are in front of a Church in a small town. On the way to the Church you passed the Rectory, which is now out of sight. You can still think about the Rectory and you can still identify it, even though you cannot see it, as long as you can think of its location relative to the Church. You might think of it as the building back round the bend in the road and on the left. The only places that you can think about, we are supposing, are the places that you can identify in this way relative to what you can directly locate - the Church. Now suppose you were to stop observing the Church for a time because, for example, you fell

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[2] See Sklar for a description of the properties of space (1974, 46 ff., 306-8).

asleep in the churchyard. When you woke up and saw the Church again there seem to be two possibilities open to you. You might re-identify the Church as the same particular Church that you saw before you fell asleep; or you might, in a sceptical frame of mind, doubt the numerical identity of the Church you now see and the Church you saw before you fell asleep. If you took the first option then you could think of the place you now occupy as the same place you were before you slept (it stands in the same relation to the same Church),[3] and you can think of the Rectory as the same Rectory, back down the road on the left (it also stands in the same relation to the same Church).

But if you took the second, sceptical, option then you wouldn't be able to identify the place you are with the place you were before - of course they look very similar (they are qualitatively identical) but you must take them to be distinct. The place you are now is a place that you think of as standing in a spatial relation to a different Church. The question of what spatial relation the place you now are stands to the place you were before you went to sleep cannot be answered. In taking the sceptical option you are not supposing that you are now in front of a similar church which itself stands in some spatial relation (being three miles to the west of, say) to the original Church; you are not, that is, supposing that you might have moved. That would be to suppose that the Church you fell asleep in front of now exists in some place unobserved by you, and in thinking this way you must suppose that were you to go back you would see the same Church again, i.e. that you would re-identify the Church as numerically the same as the one you saw earlier. But the point of the sceptical option is that you refuse to make such a re-identification. You cannot therefore conceive of any spatial relation between your past and present location: you are now identifying places relative to a different object. And you will no longer be able to identify the Rectory that you saw on the way to the Church because you identified it in relation to a Church different to the one you now see. Thinking about the place that is down the road and on the left in relation to this Church is thinking about a different place, and you can have no idea how the two places might be related. Thus refusing to re-identify

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[3] Assuming, you might think, that the Church hasn't moved. In fact if we are identifying places relative to one object then we can't make sense of the idea that it might have moved, a point I will discuss later. In practice our re-identifications don't depend on a single object, but on a group of objects some of which may move relative to others. We select the dominant objects to constitute what Strawson calls our "reference frame" (1959, 37).

the Church after the gap in your observation means that you wake up in a spatial world whose spatial relation to the world you went to sleep in cannot be conceived by you.

In order, therefore, to possess a conception of the world as a unique spatio-temporal system of relations we must be able to re-identify particulars. However it is that we do this, our criteria for re-identification must allow for such facts as the fact that we move, that our attention is limited, that we go to sleep - that there are, in other words, discontinuities and limits in our observation of the world (1959, 32).

Re-identifying particulars over gaps in our observation in this way involves thinking of them as continuing to exist during these gaps, continuing to exist unperceived (1959, 71ff.). Thinking of things as existing unperceived and hence independent of one's perception of them is the central ingredient in our conception of an objective, independently existing, world. One consequence of conceiving of a unique system of spatial relations therefore seems to be that we must conceive of it as existing independently of our experience. I'll come back to this point.[4]

There is a great deal more that needs to be said about what is involved in conceiving of a unified spatio-temporal scheme, some of which will emerge in the course of this thesis. Strawson discusses only one further aspect, which he describes as a "complication" to the account (1959, 36). A condition of our possessing the spatio-temporal scheme is that we should re-identify particular things, but a necessary condition of a particular thing's identity is its spatio-temporal continuity. It counts against saying a particular at one place and at one time is numerically identical to a particular at another place and time if there is not some succession of places between the two places that were occupied by the particular in question at successive times. Thus in order to re-identify particular things - in order to decide whether this particular is the same as some previously encountered particular, I also must be able to re-identify places. But we cannot re-identify places independently of being able to re-identify particular things "there is, rather, a complex and intricate interplay between the two" (1959, 37). Places are only identified by their relation to things,[5] and a condition of the identity of a material thing is that it should be continuous in space.

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[4] See sections 7, 9.

[5] This does not imply any reductive view of the nature of space: to say that we identify places relative to things is not to say that places consist in such relations. The two questions are distinct.

Therefore "the identification and distinction of places turns on the identification and distinction of things; and the identification and distinction of things turns in part on the identification and distinction of places" (1959, 37). "There is," Strawson says, "no mystery about this interdependence. To exhibit its detail is simply to describe the criteria by which we criticise, amend and extend our ascription of identity to things and places" (1959, 37).

If Strawson's argument is right then in order to refer to a particular thing we need to be able to locate it in space, where this might involve directly locating it, or locating it relative to something that we directly locate. This in turn means that we must have a conception of a unique and unified space in which we and particular things are located. He argues that possession of such a conception requires that we re-identify material objects, and that the identity of such objects is interdependent with that of places. I suggested that this sort of re-identification is central to the idea of an independent world. Whether all this is right is something that needs extended discussion. Now I want to consider in more detail what is involved in thought and representation of space; what is required, that is, for a conception of space.

2. Subjective And Objective Space

We can make an intuitive distinction between two different ways of thinking about space or about regions of space. The distinction is that between thinking of space in an objective way and thinking of it in a way that is subjective. This distinction can be drawn in a variety of different ways, each corresponding to a different notion of objectivity.

Sometimes objectivity is associated with an "absolute" conception of the world: the objective world is that way the world is conceived to be when we conceive of it as existing independently of any thought or experience (Williams 1978, 64 ff.). Such a conception can seem puzzling - it requires that we conceive of the world as unconceived, something which appears, by its very nature, impossible to do. According to an alternative and less exulted notion of objectivity, an objective conception of the world is the conception of a world that is independent of any particular individual; independent, that is, of their spatio-temporal position, and of their particular situation and constitution (Nagel 1979, 206 ff.; McGinn 1983, chapter 2). Such an objective conception requires that we conceive of the world in abstraction from any particular point of view. This notion of objectivity is maybe something more like the objectivity possessed by scientific theories, and amounts perhaps to the claim that the truth of propositions about the world, the truth of the content of our beliefs about it, do not depend in any way upon the states of the subject who believes them to be true.[6] Neither of these conceptions of objectivity quite corresponds to the notion I want in order to draw the intuitive distinction between subjective and objective ways of thinking about space; and they fail to do so because they make the idea of an objective world too abstract and general.

The objective way of thinking about space that I am interested in is a way of thinking about the space we inhabit; the space we perceive, and move through, and act in. Thinking about space in this way is not simply thinking about space at the level of a general scientific theory, in the way that a physicist might do; rather we conceive the particular regions of space that we experience to be objective. At its most abstract, we can say that someone engaged in pure geometrical reasoning is thinking, in some sense, about space.

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[6] Notice, by the way, that this last formulation is compatible with some forms of phenomenalism: phenomenalism maintains the truth of our everyday thought about e.g. material objects, without being committed to an ontology of material objects.

But pure geometry has no empirical content, it is not a theory about the world, it is a mathematical description of possible spaces constrained only by the requirement that its geometrical properties be logically consistent. Theoretical thought about empirical space is less abstract than this, it is the applied geometry of physics. Such theorising assigns physical significance to the terms of pure geometry in order to make it an empirical theory about the world. As such it can be true or false as a description of physical space, and in virtue of this we might say that reasoning using physical theories is thought about the spatial world. Nonetheless, such theorising is still completely general. In talking about objective spatial thought or objective spatial representation I am interested in what is involved in representing particular regions of space, rather than physical space in general. There may be no question, given the more general and abstract notion of objective space, of our experiencing the objective spatial world, of our experiencing the reality which is constituted by truths not dependent on the subject (Evans 1985b, 251-2), any more than there is of our experiencing the world as described by quantum physics; whereas the idea of objective spatial representation that I am exploring here is the idea of an objective representation of the world we experience.

Thinking of such particular regions of the space we experience as objective is thinking of it, in Hume's words, as "an external universe, which depends not on our perception, but which would exist, though we and every other sensible creature were absent or annihilated". But it is not simply an abstract theoretical conception, rather the very world "which we see, ... and feel, ... is believed to exist independently of our perception, and to belong to something external to the mind, which perceives it" (Hume 1777, 151-2). Objective thought about space, then, is thought about the particular regions of space we experience, conceived as existing independently of our experience of it; it is the space of the external world which we inhabit, and in which we think of ourselves as located.

This sort of conception is sometimes described as being 'map-like': it is thought about places and objects from no particular point of view, with the subject represented as one object among many, occupying no privileged position in an independent world.

If, intuitively, this is what it is to think objectively about space then what, in contrast, is it to think about space in a subjective way? We can make sense of the idea of a subjective

way of thinking about space that requires very much less of a subject in the way of intellectual and conceptual resources. It might be the way of thinking about space that we share with animals (and young children). If objective thought about space is, to a certain extent, theoretical and map-like, then subjective thought about space is perhaps better characterised as practical, dependent on our perspective and location, and somehow tied to our point of view. It is the way we think about or represent space in our immediate interactions with it; the way we think about it when we perceive and act upon things and places in space, and when we move and navigate through space. Thinking about space in this subjective way, "as someone plunged into its centre" (Campbell 1994, 5) need not require any theoretical grasp of space, nor any grasp of space beyond what is required for our immediate practical purposes - we needn't, at this subjective level, have any idea about what or whether space exists beyond and between our practical engagement with it; nor whether it exists independently of such engagement. We needn't think of ourselves as located in space. Nonetheless, we still want to say that thinking subjectively about regions of space can be genuine thought about these regions, genuine thought concerning places (and the relations between places) in the external spatial world. In calling this sort of spatial thought subjective I don't mean to suggest that it is somehow not thought concerning our immediate environment. It is subjective thought about regions of space and not thought about subjective regions of space; it is, in other words, still the representation of an external world, non-idealistically conceived (Eilan 1995, 353-6). This point will be important when we come to consider what is involved in such thought, and whether there can be a way of thinking about space which is subjective in this way.

I have characterised two different ways of thinking about or representing space, and I have tried to spell out, intuitively, the distinctive features of each. But in what, exactly, does the distinction consist? What is involved in each way of thinking about space? In what follows I will attempt to spell out this distinction, and in particular to give some account of what is involved in subjective thought about space.

Before turning to that, I need to say something about what is involved in representing space. Representing particular regions of space - particular stretches of our spatial environment - requires that we represent particular places and the spatial relations between them. In a large part of what follows my emphasis will be on what is involved in thinking

about or representing particular places, and less about the representation of spatial relations. This is because until some account of the subjective representation of places has been given the question of how we represent the relations between them doesn't arise. To begin, then, I will make some general remarks about what is involved in thought about or the representation of places. All such thought must identify the places thought about using some *frame-of-reference*.

3. Places And Reference Frames.

The idea of a frame-of-reference is used a great deal in psychology, in those areas of psychology which aim to explain the various abilities we have to move around and act in space. The sort of abilities for which we might want to give some psychological account include, for example, the ability to reach out to pick up something we can see, or to maintain an upright posture during walking and running, or the ability to maintain our gaze on a fixed spot whilst turning our head, or simply our ability to move around in a familiar building. One psychologist concerned with these and other questions remarks, of frames-of-reference, that "[i]t is trivial to say that any description of a given state of matter is frame dependent" (Paillard 1991, 471). What is meant, and why is it trivial?

Consider the example of movement. Whether something is moving or not depends on the point relative to which movement is measured or described. When driving on the motorway one car may not be moving relative to another car travelling at the same speed, and yet both cars will be moving relative to the road or to objects by the roadside. Whether we say that the car is moving or not depends on what we take to be our fixed point of reference: relative to another car we may say that a car is not moving, whereas relative to the road or to the environment it is moving. In this sort of case it would be unusual to use another car rather than the environment or the road as that relative to which we measure movement. An aeroplane in flight is an example for which it is more natural to think that we have a choice: we can measure or describe the speed of an aeroplane relative to the air through which it is passing, or we can measure its speed relative to the ground. Which we do depends on what we want to know (how much fuel the plane will need, for example, will depend on its movement relative to the air, its airspeed; on the other hand, how long it will take to reach its destination will depend on its movement relative to

the ground, or its ground speed). It doesn't make sense to ask simply How fast is the aeroplane flying? without saying relative to what its movement is to be measured. The same is true in the case of a car, it is just that usually we take it for granted that the movement of a car should be measured relative to the road; that we do not explicitly say so does not mean that it is not what we are doing.

Movement, then, is always relative to something, and to say that something has moved implies that there is something relative to which it has moved, and a description of the movement must include, either explicitly or implicitly, a point of reference relative to which the movement is measured or described. It makes no sense to ask whether something has moved simpliciter. But the relativity of movement is just a particular instance of a general feature of spatial position. When something moves it changes its position, and if we describe something as having changed its position then we must be using some reference point relative to which its position has changed and which we can use as a criterion for what is to count as being in the same position. When the car moves relative to the road it has moved to a different place relative to the road - we are describing places in terms of their relation to some part of the road. If we say that the car had not moved relative to another car then we are describing places in terms of their relation to that other car. In each case what we count as the same place, and hence what we count as movement, depends on the way we are describing places.

In a similar way, all descriptions or thought about places depend on a frame-of-reference. Consider the question of whether the pen with which I write is in the same place now as it was five minutes ago. To answer this we need to know how places are being identified, what is to count as being the same place. Just as we cannot ask whether something has moved without saying or assuming a point of reference relative to which movement is measured, so we cannot ask whether something is in the same place, nor what place that is, without there being some point of reference relative to which places are identified. The concept of a place and of movement is the concept of something relational. And that is why it is trivial that any spatial description is frame dependent. The question of how places are identified is a matter of which frame of reference is used to identify them. I am holding my pen in my hand just as I was five minutes ago, so we can say that the pen is still in the same place. But five minutes ago I was sitting at a different desk in a different

room, so we can just as well say that the pen is in a different place: it is the same place in relation to my hand, but a different place in relation to the room or to my desk. Thus an answer to the question of whether my pen is in the same place or not depends on how we are thinking about places, what frame of reference we are using to identify them. The different ways of thinking of where my pen is differ in the frames of reference they employ. In each case we are identifying the place where my pen is relative to its spatial relations to certain objects; my hand, the desk, the room, and in each case it is these objects which provide the frame of reference.

It is, as Strawson points out (1959, 38), easy to construct antinomies by varying the frame-of-reference in which we ask: Is it in the same place? "My hat is in the same place as it was; for it is still on the back seat of the car. But it is in a different place; for the car has travelled from London to Manchester." Such antinomies should "perplex no one". They just show how we can shift the frame-of-reference relative to which we identify places.[7]

A frame of reference may just be used to mean a way of thinking about places or, rather, to mean the way in which places are identified. But we can make the notion of a frame of reference more precise if we take it to mean, not simply the way in which places are identified, but that relative to which places are identified.[8] We might, for example, think of a place as the middle of the desk, or as the place in front of the house, or underneath the tree, or to the right. In each case we are identifying a place relative to some object which constitutes the frame of reference. In each case a place will count as being the same place if it is in the same position relative to the object which constitutes the frame-of-reference. We can describe such reference frames as being tree-centred, or house-centred, or more generally, as being environment-centred. We can describe a frame-of-reference that identifies places relative to (some part of) the subject's body as being body-centred.

I said that the idea of a frame-of-reference is used a great deal in psychology. A typical example is the explanation of how we are able to maintain a stable gaze on a fixed place in our spatial environment whilst our head moves relative to that place (Berthoz 1991, 85-90). One explanation describes a "vestibulo-occulo reflex", according to which the

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[7] For more on frames-of-reference, see Eilan, et al. (1993, 25-31).

[8] Following, for example, the psychologists Pick and Lockman (1981, 40), who define a frame-of-reference as "a locus or loci with respect to which spatial position is defined".

semicircular canals in the ear detect acceleration and movement of the head and feed information about such movement to the muscles controlling the eyes' direction of gaze in such a way that the eyes move to compensate for any movement of the head. In this way they are able to maintain a stable gaze or position relative to the environment. The mechanism is said to provide stable frame-of-reference for maintaining eye position. Since the eyes are in fact stable relative to the environment, the mechanism can be said to provide a environment-centred frame-of-reference.

We might think of the more precise notion of a frame-of-reference as being something like that used in physics or mathematics. Suppose we wanted to identify places using co-ordinates so that two places count as the same place just in case they have the same co-ordinates. A frame of reference is then a way of specifying how co-ordinates can be assigned to places in the world. We can use an object, or group of objects, to specify the origin and axes for such a co-ordinate system, to define the frame. For example, we could use the edges of my desk to provide a set of axes which could then be used both to identify points within the desk and to identify places external to it. We could use lines running through one long side, one short side and one leg to define three axes. Then we could use this reference frame to identify, for example, the position of the armchair as being such and such a distance from the origin along the axis of the long side, going in a certain direction (Campbell 1994, 9-10). Using this frame, the position of the armchair will have changed only if it changes in relation to the desk. There can of course be more complicated ways to set up a frame-of-reference. Instead of simply centring a frame of reference on an object we might define a notional point of origin relative to several landmarks, visible mountains say, or prominent buildings, and then locate places by giving their distance from the point and their angle on a line relative to a line from the origin to one of the landmarks.[9] If a representation identifies places using this sort of reference frame then in order to describe how places are being identified we need to both specify the object or objects relative to which places are defined, and the axes that are being used.

The object used to define a frame of reference need not be immobile and it need not be inanimate. I suggested that the position of my pen could be specified relative to a frame of

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[9] See (Eilan et al., 1993, 26), and see O'Keefe's description of the frame-of-reference used by rats (1993, 41 ff.). I describe it in section 9.

reference centred on my hand, where we might use various parts of the hand to define axes. We could just as easily define a frame of reference centred on the head, or on the centre of the body, using the trunk and limbs to define axes (for an example from psychology, see Berthoz (1991, 95-8)). Nor need the axes be defined relative to some object; we could just as well use the direction of gravity to define an up-down axis; or we might use the directions indicated by a compass to define axes of direction.

4. Reference Frames And Representation

A frame-of-reference is a way of identifying places at a time, and by providing criteria for the identity of places it will provide a way of identifying places over time; a way, that is, of re-identifying places. Any individual thinking about or representing places must employ some frame-of-reference to identify and re-identify those places. If all thought about places must employ some frame-of-reference, then we can ask of any particular thought about or representation of space, What frame-of-reference is being used?

It might be objected that not all thought about places requires the use of a frame-of-reference since we can identify a place, and hence think about it, other than in terms of its spatial relations to other places and objects, by reference to its non-spatial properties. We might, for example, use a description such as "the coldest place", or "the place which is most frequently visited" to identify a particular place.

Whilst it is true that we can think about places in this way, it does not constitute thinking of them *as* places. It might be objected that we are thinking about a place when we think of "the coldest place": we are thinking of *that place*, wherever it is, which is coldest. Perhaps that is right; but if so, it doesn't constitute an objection to my claim. Our concept of a particular place is the concept of one amongst a network of spatially related places: what we mean by a spatial representation of a place is a representation of one place amongst many. In order to think in this way of a place - in order to think of *that place* - as a particular location in space, we must think of it as being spatially related to other places. Unless that were so, our thought wouldn't count as thought about places *as* places, and unless our representation of places represents them as spatially related to other places it wouldn't be a spatial representation, a representation of *space*. Our concept of a place is

the concept of a part of space, of something whose identity depends upon its position or location, its spatial relations to other places and things. And this identification requires a frame-of-reference. It follows that of any spatial representation we can ask what frame-of-reference is being used to identify places. And in using a description we must already have some conception of places, where such a conception involves the use of some frame of reference.

Given the notion of a frame-of-reference and the requirement that a spatial representation employ a frame-of-reference we can taxonomise ways of thinking about space according to the frame-of-reference that they employ. We might use one of a number of different criteria to distinguish different kinds of reference frame. We might, for example, distinguish them according to the kind of thing that an individual uses to define the frame, whether it is landmarks, or objects, or some other visible cues, the stars maybe; or we might distinguish frames according to, for instance, the role they play in guiding the subject's actions or behaviour, or we might distinguish them according to the particular axes they use. One very general distinction we can draw is simply that between ways of identifying places in which the identity of a place is a matter of its relation to the subject or the subject's location, and those in which it is not. Given this distinction we can say that any way of thinking of places in which a place will count as being the same place only if it stands in the same spatial relation to the subject's body uses a *body-centred* frame-of-reference, and we can say that if a place counts as being the same place just in case it stands in the same spatial relations to things in the environment (where they might be objects, or landmarks, or parts of a room, or whatever) uses an *environment-centred* frame-of-reference.

This is a very general distinction between representations according to the criteria they employ in identifying places, but it is natural to think that the distinction corresponds to that between subjective and objective ways of thinking about space.

I described the intuitive notion of subjective thought about space as thinking about space in a way which is dependent on the subject's perspective and location, and as tied to the subject's point of view: it is a way of thinking of places which is subject relative, and one way in which we might capture what is distinctive about this way of thinking of space is by

saying that it employs a body-centred frame-of-reference. In contrast I described objective thought about space as thinking about places in a map-like way, or as involving a map-like representation of places. Objective thought is thought about places from no particular point of view in the same way that a map is a representation of places from no point of view. A map is a representation of places in which places are identified relative to the environment. So it is plausible to think that what is distinctive about objective spatial thought is that it is a way of thinking about places that uses an environment-centred frame-of-reference.

Does the distinction between subjective and objective thought about space consist in the distinction between the frame-of-reference employed by the representation in identifying places? In particular does the difference between representations which employ a body-centred frame-of-reference, and those which do not, really capture a substantial distinction?

Merely specifying that relative to which a representation of space identifies places leaves a lot unspecified. We can make further distinctions, for example, between representations all of which employ a body-centred frame-of-reference; and there might be important differences between such ways of representing places. Thus we may think of places, identifying them in relation to ourselves (using the first-person, for example), and we might think about places relative to the object which is in fact oneself without realising that it is oneself. Both these ways of thinking employ a body-centred frame of reference and yet are very different: they will have different consequences for thought and action.

A complete account of any particular way of representing space would have to say more that just which frame-of-reference is being used, and it may be that in giving some account of the distinction between subjective and objective thinking about space we must say something more about how the subject grasps the frame-of-reference used in identifying places. It might be, for example, that subjective thought is thought which employs a certain kind of body-centred frame, that the subject must grasp that frame in a particular way, or that it must be a way of thinking about places which has some special or direct connection with the subject's actions. For now that does not matter since, I shall argue, no representation which employs a body-centred frame-of-reference could constitute subjective thought about space.

5. Two Problems For Egocentric Thought.

The question that I want to consider is whether we can give some account of a subjective representation of space which captures the more or less intuitive conception of a subjective way of thinking about space that I described earlier. In particular, is a way of representing space which employs a body-centred frame-of-reference a subjective way of thinking about space in this sense?

There may be ways of representing places which employ body-centred frames-of-reference and which require very little in the way of intellectual or conceptual abilities. In order to represent places using a non-body-centred, or an environment-centred, frame-of-reference an individual must, at the very least, have some grasp of the stable features or objects in her environment relative to which places can be identified, and arguably she must have a conception of herself as one such object among others. This is not the case with some ways of thinking using a body-centred frame-of-reference. The subject may have some primitive grasp or apprehension of her own body (which may consist in nothing more than the fact that she uses it in action) relative to which she identifies places, which does not require her to think of her body as an object (for the idea that egocentric frames are primitive see Campbell's discussion (1994, section 1.2)).

A body-centred way of thinking might therefore be a way of thinking that could justifiably be attributed to animals, and it seems plausible to suggest that a subjective representation of space might simply consist in representation which identifies places relative to a body-centred frame-of-reference. For the remainder of this section I shall call any representation of space which identifies places in this way an 'egocentric' representation of space. Note that this use of the term 'egocentric' is more inclusive than many definitions found in the literature. Usually egocentric is used as a term for a subset of those ways of thinking which identify places relative to a body-centred frame-of-reference. I am going on to discuss problems which affect *any* way of thinking in this way, and so will not restrict my use of the term.

It may be that not all body-centred frames-of-reference will count as subjective (we would need to say more about how the subject thinks about the frame, more about the frame's

psychological significance, before deciding) but it is plausible to suggest that a subjective representation of space will be egocentric, if only because any representation of space which employs non-egocentric frame-of-reference will be 'objective'.

The aim of this section will be to argue that thinking of places egocentrically cannot meet the conditions necessary for thought about places in the external world, and consequently that subjective thought about space cannot consist in any way of thinking of places which employs a body-centred frame-of-reference.

There are, I will argue, general reasons for doubting that we can explain subjective representation of space in terms of an egocentric representation. Bear in mind that a subjective representation of space is still supposed to be genuinely of space, a representation of the space of the external world. This is part of the intuitive idea of a subjective way of thinking about space, and we are committed to it if we want, for example, to claim that the spatial content of perceptual experience is both subjective and also that perception informs us of the spatial layout of our environment. The reason for doubting that we can give an account of the subjective representation of space in terms of an egocentric representation is that any spatial representation which employs a body-centred frame-of-reference is incapable of representing places in the external spatial world. And it is for this reason, together with the idea that thinking of places using a non-body-centred frame-of-reference involves conceiving of space as objective, that many have rejected the possibility of a self-standing subjective representation of the external spatial world (Evans 1982, chapters 6, 7; Peacocke 1992, section 3.4).

Why then, can't an egocentric representation represent places in the external world? There are two related problems, the first of which is, superficially at least, a result of the contingent fact that we move around in the world, that our position changes: if creatures like us, who move through an objective spatial world, are to be able to think about places in that world then we must be able to identify places in a non-egocentric way.[10] The difficulty that movement creates is insoluble as a result of the second problem: that we

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[10] I will argue later that the problem is not simply that we move, but goes deeper. For now, though, that doesn't matter.

cannot represent our own location using an egocentric representation. I will describe each problem, the movement problem and the self-location problem, in turn.

If we identify places relative to a body-centred frame-of-reference, then sameness of place is a matter of sameness of spatial relation to the body: we will think of two places as being the same just in case they stand in the same spatial relations to our body. This means that if our body moves, then the places which are defined relative to our body move with it; what counts as the same place is always a matter of its spatial relations to our body, so if it moves then the place which bears the same spatial relations to our body will move too. This is a rather misleading way to make the point since, in order to describe what is happening, I am using a different, a non-body-centred, frame-of-reference. Remember that we are thinking of the places simply and solely in terms of their relations to our body, so the identity of a place is for us, thinking in this way, determined by these relations. The point is simply that, on this way of thinking of places, they essentially stand in the relations that they do to our body. It follows that places cannot change their relation to our body, they cannot move; we think of a place which bears a different spatial relation to our body as being a different place, not as the same place in a different relative position. So when our body moves the places identified relative to it move as well.

We, of course, do move. Or rather our bodies move relative to places in the external world. When we move around in the world our location in the external world, the place where we are, changes. But if our body moves relative to places in the external world, then it follows that places defined in relation to our body move relative to places in the external world. Sameness of place is always a matter of sameness of relation to the body. This means that if our body moves relative to the external world what counts as the same place, relative to our body, will be a different place in the external world.

This has the consequence that we cannot think about or represent places in the external world egocentrically. In order to think about or represent a place we must identify it, but we cannot identify places in the external world egocentrically. This is because the particular places we identify relative to our body will be different places in the external world as we move around in the world. What we think of as the same place relative to our body will be potentially many different places in the external world. The identity of places

in the external world is simply not a matter of their spatial relation to our body, so if we identify places relative to our body we will not be identifying places in the external world. And if we are not identifying places in the external world then we cannot be representing or thinking about those places.

Suppose we were to think of some egocentrically identified place. I might, for example, think of a particular place as the place that is in front and to the right of me. Is this thinking about a particular place in the external world? I have argued that it cannot be since the place in the world which is in front and to the right of me after I move will be a different place in the world to that which is in front and to the right of me before I move. But if I think of a place egocentrically then I will not be able to grasp that difference - as far as I am concerned I will be thinking about the same place: it is the same egocentric place, the same place relative to me.

It is difficult to grasp quite how limited egocentric spatial thought is, but consider the following example. You are standing before your desk and you think: There, in front of me, is my desk. If you then walk over to the window you may think: There, in front of me, is the window. The normal way to describe this would be as a case of your moving around the room and thinking about different things occupying different places. But if you are thinking about places egocentrically then you will not be thinking of different things occupying different places, but of different things occupying the same place at different times. In this case the place in question is the place in front of you, and it will be as if the objects which occupy that place change: before you "move" the place will be occupied by your desk, and after you "move" the place will be occupied by the window. You cannot, of course, be thinking of this as objects changing their location as you move, since you will not be able to grasp the fact of your own movement (a point I'll come back to). Instead you will simply be thinking of places in such a way that it is as though all the objects around you change their positions. (The way we think about what we perceive is nothing like this, of course, but that is simply because we do not just think of places egocentrically).

This problem of movement is really quite a simple one, but difficult to state clearly. It has the consequence that we cannot represent places in the world egocentrically because the identity of places in the world depends on their spatial relations to the environment, to other

places, and as such places in the world do not move relative to one another. If we want to identify them we cannot do so using a frame-of-reference which can move relative to the environment. Having moved what counts as the same place relative to one - body-centred - frame-of-reference will be a different place relative to another - environment-centred - frame-of-reference.

The movement problem is not peculiar to body-centred or egocentric frames-of-reference, it is not restricted to those ways of thinking of places in which places are identified relative to the subject, but would occur for any representation that uses a frame-of-reference that can move relative to the places we want to identify. Thus, we could, for example, define a frame-of-reference and identify places relative to a car, but we could not identify places in the external world in this way since, as the car moves, the places we have identified relative to it will move as well. To represent places in the external world we will typically (but perhaps not always) need to be able to use an environment-centred frame-of-reference.[11]

Any representation that identifies places using a body-centred frame-of-reference cannot represent places in the external world. Hence, since such a subjective way of thinking is supposed to be a subjective way of thinking about the external world, an egocentric representation cannot constitute a subjective way of thinking about space of the sort we want.

There are two ways in which we might overcome the movement problem so that we are able to identify places relative to which we move. The first way would be to map places identified egocentrically onto places identified relative to some other frame-of-reference which remains stable relative to the environment during our movement. If we did this then we could keep track of places relative to which we move, and the fact that we move would not then prevent us identifying places in the world. Alternatively, we could keep track of places by compensating for our own movement and "updating" the location of places relative to us as we move. This requires that we keep track of our own movement over time. If I were to think of a place egocentrically identified as 'on the left' and I grasped the

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[11] This is rather misleading: an environment-centred frame-of-reference will often be defined relative to objects which can move. But when using such a frame we usually define it relative to many objects, some of which may move relative to the others, but the majority of which are stable (Strawson 1959, 37). We shall see in the next section that simply staying still won't solve the problem.

fact that I had turned through 180° in relation to the environment, then I could think of the same place by thinking of it egocentrically as 'to the right'. Similarly, if I knew that I had moved forward I could think of the place as 'to the left and behind'. In this way it would be possible to identify places egocentrically and yet still identify places in the world relative to which we move.

Both these solutions are, in effect, variants of the same solution, and both require us to give up the suggestion that an egocentric thought can be thought about places in the external world. They do so because both solutions require the use of an alternative, non-body-centred, frame-of-reference. The first solution obviously does so - it requires the us to map places onto an alternative frame; the second solution does so as a result of the self-location problem.

Any appeal to the self-location problem might seem redundant; it might just seem obvious that the second solution involves a non-egocentric frame-of-reference. Given the way that I have defined frames-of-reference any way of thinking about places in which sameness of place is not a matter of sameness of relation to the body will count as non-egocentric. Hence tracking movement in a way that allows identification of places relative to the environment will constitute non-egocentric identification of places. The point I want to make, however, is that the very possibility of tracking places requires the use of a non-egocentric frame, and not that tracking itself constitutes the use of such a frame.[12]

An alternative frame-of-reference is needed if we are to keep track of our own movement, and hence to update places as we move, because we cannot represent our own location, the location of our body, using an egocentric representation. This is a consequence of the fact that, in general, the location of an object that constitutes or defines a frame-of-reference cannot itself be identified, and hence cannot be represented using, that frame-of-reference; the location of the object which constitutes one frame-of-reference can only be identified from within a different frame-of-reference.

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[12] There is a sense in which an individual using an egocentric frame-of-reference could track movement without any extra conceptual sophistication, using inputs from efferent nerves in her muscles, say, and not by using some non-egocentric frame-of-reference. This might be thought to constitute the most primitive way of thinking about places non-egocentrically. The issues here need more discussion than I have space to give them, but the argument of the next section shows that this would not constitute thought about places (see Peacocke 1983, 74-5) and compare O'Keefe and Nadel's discussion of routes (1978, chapter 2).

If we identify places only relative to some object (say) then it simply makes no sense to ask where that object is, and whether it is in the same place now as it was at some previous time. In the case of the object relative to which places are identified we could say that it is just trivially true that it is always in the same place; but it would be more accurate to say that it simply makes no sense to ask whether the object has moved. We can only make sense of the idea of something having moved in relation to something else, and it makes no sense to ask whether something has moved in relation to itself. It is simply not possible for the object which constitutes the frame-of-reference to be in any place other than the place it is, where by place is meant 'place within the framework'.

The situation is somewhat analogous to the use of the length of some standard length to define a system of measurement. If a unit of length is defined in relation, for example, to some standard bar of metal (as we might define a metre as the length of the standard metre bar) then it makes no sense to ask whether the bar itself has changed its length (in metres) over time. A metre is just whatever length the bar is, and for as long as this is how a metre is defined we cannot ask whether the bar is still a metre long.[13]

It might be objected, as Kripke does, that we *can* make sense of a change in length of the bar we use to define length since in using the bar in the way we do we are merely using it to fix the reference of the term "metre", rather than giving the meaning of "metre", and that once we have fixed the reference we can make sense of the possibility of the standard we used to fix the reference changing its length in relation to the length whose reference we have fixed (Kripke 1980, 54-6). Kripke may well be right about this, but in order to use the example in a way that is analogous to place identification I will assume that in defining length using a standard bar we are not fixing a reference, but *giving the meaning* of the term "metre".

I described the definition of length as only somewhat analogous to identifying places using a frame-of-reference because we may be only fixing the reference of length term using a

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[13] Wittgenstein (1959, paragraph 50) writes: "There is *one* thing of which we can say neither that it is one metre long, nor that it is not one metre long, and that is the standard metre bar in Paris. - But this is, of course, not to ascribe any extraordinary property to it, but only to mark its peculiar role in the language game of measuring with a metre rule."

standard. However, when we use a frame-of-reference to identify a place we are not merely fixing a reference, we are doing something more like defining places: a particular place is defined by its relation to our frame-of-reference, and when we are thinking of places relative to a single frame-of-reference the only sense we can give to the idea of a place is in terms of such a definition. If we were thinking of places using two or more different reference frames then we could identify a place in one frame using another in a way analogous to reference fixing. We might think of 'the place on my right' as referring to the place in front of my desk, and in that way we might think of the egocentric description as fixing the reference of my thought about the place. But to do this I must be using two frames-of-reference - I must be able to think of places relative to my desk or to the environment, and then take my egocentric thought to be referring to places identified in that environment-centred frame-of-reference. But I am asking whether egocentric thought alone allows self-location. (This is a disanalogy with the case of length - in that case we have some grasp on what length is independently of any definition of a system for measuring it.)

We can of course set up different systems of measurement by defining length in relation to two different standards. We might define a metre as the length of one bar, and a yard as the length of a different bar. Given two such definitions it may make no sense to ask whether the yard bar is always a yard long, nor whether the metre bar is always a metre long (I am assuming, remember, that we are defining the *meaning* of the length terms), but we can ask about the length of the bars in relation to one another. We can ask whether the metre bar is always so many yards long, and so on. We can only make sense of changes in the length of the standard relative to which length is defined if we adopt some other standard. The same is true of the location of the object we use to define or identify places.

As an account of measurement and the definition of length the idea that the standard is used to give the meaning of terms may be, as Kripke suggests, implausible - we have some grasp of the concept of length independently of the standard - but when we are thinking of places egocentrically we are only thinking of them in terms of their spatial relations to some frame-of-reference; and a consequence of this is that the place relative to which other places are defined, or the location of the object which constitutes the frame-of-reference cannot itself be identified using that frame-of-reference. In order to identify the location of the object which constitutes the frame-of-reference we must use some other frame-of-

reference in just the same way that we have to adopt (on the 'Wittgensteinian' view) a different standard in order to say whether the metre bar has changed in length. The second suggested solution to the problem of movement therefore requires that we use a frame-of-reference other than a body-centred frame, hence a body-centred frame-of-reference is not sufficient for the representation of places in the external world.

If we are identifying places relative to a body-centred frame-of-reference then we cannot identify the location of the body; nor can we, given that thought about a place requires that we identify it, represent the location of the body using a body-centred frame-of-reference. This means that any way of thinking, or any form of representation, which requires the representation of the location of the subject's body, must represent places relative to a frame-of-reference other than a body-centred frame.[14] Nor can a representation which identifies places relative to a body-centred frame-of-reference (an egocentric representation) be used to represent the movement of the subject's body. In order to represent such movement we must represent a change in the location of the body. But if a body-centred frame-of-reference cannot represent the location of the body, then neither can it represent change in location of the body, and hence cannot be used to represent the subject's movement.

We can put all this in a different way. Thinking of places egocentrically, relative to the body, is thinking about places in such a way that no sense can be made by the subject of the idea that she might herself move or be capable of movement (Campbell 1994, 18). This means that it is not possible to identify places in the world egocentrically. We cannot grasp the fact that we might have moved relative to places in the world, and we cannot keep track of places as we move relative to them because we cannot make sense of the possibility of our having moved.

If my argument is right, then an egocentric representation, a representation which employs a body-centred frame-of-reference, cannot be a representation of places in the external world, and it cannot therefore constitute a subjective representation of space of the sort I have described. Something more or different is needed.

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[14] I have in particularly mind the claim that self-consciousness requires a representation of the subject as one object amongst others (Evans 1982, chapter 7; Peacocke 1992; Campbell 1993, section 5).

6. No Representation Without Re-Identification

I have argued that a representation that identifies places relative to a body-centred frame-of-reference cannot represent places in the external world because a body-centred frame-of-reference cannot be used to identify places through movement, or re-identify places in the external world, but why does an individual need to re-identify a place if she is to represent it? We can ask, of a representation, How does it identify places? where this is understood to mean What frame-of-reference is it using, but why do we need to suppose that in order to represent them an individual must employ a frame-of-reference capable of re-identifying places rather than merely identifying them? There are, it might seem, perfectly good alternative accounts we could give of how a subject's thinking could be about one particular place rather than another, but which don't require that the subject be able to re-identify the places thought about.

Thus it might seem plausible to claim that it is sufficient for a thought to be about a particular place that an individual can identify the place in some way, so that the place thought about simply is whatever place it is that is identified. Even if we think about places egocentrically we can still, it might be claimed, think about places in the external world, the places we think about are just whatever places are in fact coincident with the places we identify egocentrically. When we think of a place as 'to the right' the place we are thinking about is whatever place in the environment is to the right. The content of such thoughts about places might be thought to be analogous to that suggested by two-factor theories of content, according to which the content of a representational state is determined by the subject's mental states together with the her environmental context. In this way the content of the subject's representational states are partially determined by her environment - the relation in which she in fact stands to particular places (I have in mind the sort of account proposed by McGinn (1982), or Fodor (1987, ch.2)). The content of someone's thought 'to the right' would, on this sort of view, concern whichever place was in fact to the right, and hence an egocentric representation could be a representation of places in the world

A variation of such a view might claim that it is both necessary and sufficient for a representation to represent a particular place that there be some causal or informational

link between the place and the content (or some aspect of the content) of the representation. Something more would need to be said about what sort of causal link confers content on a mental state (McGinn 1989, 71 ff.) but, on this sort of view, the content of a representational state will be of a particular place for as long as the state stands in the correct causal relation with that place, and irrespective both of the way that place is identified by the subject and of whether the subject is able to re-identify it.

These are the sorts of objection that one might have against the claim that an individual must re-identify a place in order to represent that place, and there may well be other sorts of account that one might give in an attempt to defend the idea that an egocentric or body-centred frame-of-reference is sufficient for a representation of places in the world. But, given a plausible assumption about the connection between the content of a representational state and behaviour, all such accounts must be wrong. I will argue that in order to represent a place an individual *must* be able to re-identify that place, and hence that an egocentric representation cannot represent places in the world.

Why does the representation of a place require the re-identification of that place, and hence require the use of a frame-of-reference which allows such re-identification? There may be more than one way to argue for this, but I shall argue that the requirement is defensible on the grounds that nothing an individual could do would justify the attribution to her of a representation of places other than those that she is able to re-identify. Unless an individual could re-identify a place and manifest a grasp of that re-identification, then there would be no grounds that would justify our attributing to her a representation of that place.

My argument depends upon the claim that there is a necessary connection between the content of a representation state and behaviour; that there could not be a representational state whose content could not, at least potentially, be manifested in behaviour. The truth of this claim is, I will argue, entailed by a functionalist or interpretationist view of mental content, and by any view which takes the content of representational states to have an essential role in the psychological explanation of behaviour.

What is the connection between the content of a representational state and behaviour, and why is it necessary? A psychological explanation is an explanation of behaviour which

aims to make the behaviour intelligible in a certain way, by showing why it makes sense for the subject to act in the way she does. In giving such an explanation we generally appeal to the content of representational states: in explaining why someone goes to the fridge, for example, we might appeal to her desire for a glass of milk, and to her belief that there is milk in the fridge, and so on. These kinds of explanation are often called folk-psychological, and they explain behaviour in terms of those beliefs and desires of the subject which generate the behaviour.[15] A similar point holds for those other kinds of psychological explanation which do not appeal in this way to beliefs and desires. Some animals, for example, might exhibit such complexity and structure in their behaviour that it becomes overwhelmingly plausible to attribute representational states to them in order to explain that behaviour. In doing so, we appeal to the content of such states in explaining the animal's behaviour in a way analogous to folk-psychological explanation. Psychological explanation, then, is rational explanation - it adverts to the contents of representational states, and the contents of the states rationalise the action to be explained.[16]

It is characteristic of representational states with *spatial* content that they are implicated in the explanation of *spatial* behaviour and action. If we want to explain, for example, why someone intentionally moves towards a certain place we might appeal to the fact that there is something which they want and which they believe to be at that place. Similarly, we might appeal to the fact that someone sees a cup to be in a certain location in explaining why, in the circumstances, she reached to the place she did. These sorts of actions have intentional descriptions which relate them to the spatial environment: an action may be described as a turning in a certain direction, or as a reaching to a particular place. Of course, only certain descriptions will be appropriate if we want to describe the intentional properties of such actions - someone's pointing in a certain direction may be correctly described as pointing at a tree, but not as pointing towards the North or towards Alpha Centauri. The correct description will be the one that specifies the content of the intention

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[15] For a discussion of folk psychology see, for example, Fodor (1987, chapter 1), and for the idea that explaining behaviour makes it intelligible see, for example, Davidson (1980).

[16] In saying that the explanation of animal behaviour is rational explanation I don't intend to claim that animals have reasons for what they do in the same way that we do, merely that we appeal to the content of their representational states in making sense of what they do. There are those (eliminativists) who claim that these sort of content invoking folk-psychological explanations are false, but to consider them would take this argument too far afield. For an example, see Churchland (1981).

which generated the action. A psychological explanation of spatial behaviour therefore appeals essentially to the spatial content of representational states, and it must be possible for representational states with spatial content to explain such intentional spatial behaviour.

On some views of the mental these sorts of explanatory relations between the content of representational states and behaviour are constitutive of representational states. Thus, according to a functionalist theory of the mind, mental states are identified with certain functional states or properties of an individual. The mental properties of a state are possessed by that state in virtue of its functional role - how it is related to other states of the individual and to perceptual inputs and behavioural outputs. Mental states are, therefore, individuated by their functional role; but some mental states have content and are individuated by, or in virtue of, their content; so functionalism about content claims that mental contents are individuated functionally. A representational state has the content it does, according to such a view, in virtue of its functional role, where the functional role of a representational state is a matter of its role in the sorts of psychological explanations that I described. A consequence of such a view is that mental states have contents if and only if they stand in the relations described by psychological explanations.[17]

An interpretationist view of the mental entails a similar conclusion. On such a view the representational states an individual has are just those that she might, at least in principle, be interpreted as having; where someone is interpretable as possessing a representational state just in case the best scheme for interpreting them on the basis of what they do and say would attribute that state to them. Interpreting someone is explaining and predicting their behaviour in terms of their reasons (Child 1994, ch.1; examples of interpretationist accounts include Davidson 1984, Dennett 1987). The sort of explanations of spatial behaviour that I have described are typical examples: we explain why someone reaches to a particular place in terms of their beliefs about that place together with their other attitudes, and our interpretation of their behaviour attributes to them a representational state (in this case a belief) with spatial content. In interpreting someone we appeal to the contents of their representational states, so the contents of the representational states of an individual are just those required in order to predict and explain their behaviour.

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[17] For this sort of account of content, see Block (1987), Cummins (1982, ch.9), Field (1981).

Even if we doubt the existence of a constitutive connection between the content of a representational state and behaviour, we still have good grounds for thinking that there must be some connection between them. To deny that representational states can be exhaustively known on the basis of behaviour would mean that we have to rely for our knowledge of some such states, or of some aspects of such states, on the deliverances of introspection alone, and that the contents of our beliefs, desires, and so on, are known on the basis some first-personal introspective awareness of the contents of those states. Of course, an account of the mental has to accord some role to first-person awareness, but that the content of representational states might be exclusively first-personal is problematic (Child 1994, 32-9, esp. 36).

The contents of the representational states of an individual will therefore be manifestable in their behaviour, and when we attribute such states to a individual we must do so on the basis of that individual's behaviour: we attribute to it those states necessary to explain and rationalise such behaviour. And we attribute representations of space and of places to an individual on the basis of their spatial behaviour. It follows from this that we would have no grounds for attributing a representation of places to an individual who did not manifest (intentional) spatial behaviour But it does not follow from what I have said that we can only attribute states with content representing places to an individual who is able to re-identify them. I have not yet established my conclusion.

An individual might manifest egocentric spatial behaviour on the basis of which we attributed to her a representation of particular places. Suppose that someone reached out to a place that they can see in order to grasp something that they believe to be there. Would this sort of spatial behaviour justify the attribution of a representation of the place? In order to explain their movement we might appeal to their desire for some thing together with the belief that it was located at the particular place they reached to; and in explaining their behaviour in this way we would attribute to them a representation of that particular place. But how must they be thinking of the place, in particular, what is the frame-of-reference employed in their representation of it? We will not be able to answer this question on the basis of a single action since we can describe that action in any number of

different ways in relation to different frames-of-reference, and we cannot tell, on the basis of a single movement, under which of these descriptions the action was intentional.

To see why, suppose that the subject had an egocentric representation of the place. She would form a belief about the egocentric location of something and, in the right circumstances, form an intention to reach to that egocentrically specified place. For as long as the thing that she wants is at that place then she will succeed in reaching it. Suppose however she had a non-egocentric representation of the place. She would form a belief about the non-egocentric location of the thing she wanted, and intend to reach to that place. The extensional descriptions of the resultant actions would be the same in both cases, but their intentional descriptions differ. In the first case the subject intends to reach to a place egocentrically thought about, and the place is represented egocentrically in the content of the intention. We might say that she intends to reach to the right. In the second case the subject's intention is to reach to a non-egocentric place, and the place is represented non-egocentrically in the content of the intention; the subject might be intending to reach to the middle of the table. In order to decide how the subject is representing the places we need to see either how she behaves over time or consider the counterfactual properties of her action. A single action will not enable us to decide how the subject is thinking about places. If we hold the content of the intention fixed in each of the two cases described then the subject's behaviour as she moves will provide a basis for deciding how she is representing places. If, as she moves, the description of the subject's actions remains constant only when the action is described as directed at a place egocentrically identified, then we have grounds for attributing a representation of a place egocentrically identified - we can explain the action by appeal to an egocentric representation. If, on the other hand, a description of the action remains constant only when it is described as directed at a non-egocentrically identified place, then we have grounds for attributing a representation of a non-egocentrically identified place - we can only explain the action by appeal to such a representation. (This is similar to Peacocke's constancy criterion for fixing the frame-of-reference and axes appropriate for specifying the spatial content of intentional states (1992, 96)).

Whilst this shows that we need to attend to how places are re-identified in order to decide which frame-of-reference is used by the subject in thinking about places, it doesn't yet

show that we must re-identify places in order to represent them - it shows that non-egocentric thought is necessary in order to think about places as the subject moves, but not that egocentric thought isn't sufficient when the subject stays still: why isn't the subject who re-identifies places egocentrically representing the places in the external world which are identical (at a time) with those egocentric places? Why isn't it right to attribute a representation of a particular place, thought about egocentrically, to a subject who we judge to be using an egocentric frame-of-reference? I want to argue for the conclusion that an individual thinking in this way would not be thinking about particular places in the external world, but nothing I have said so far has established this. The conclusion that I have reached is that we would have no grounds for an attribution of spatial content to an individual who didn't manifest spatial behaviour, but for as long as we have attributed representational states sufficient to explain the subject's behaviour then we have satisfied the requirements of psychological explanation or of interpretation. This does not yet give us a reason for supposing that an individual is not representing a particular physical place when she is thinking about the place egocentrically - it does not show that the subject must re-identify a place in order to represent it. When explaining why someone reaches to a place we appeal to the fact that she has a belief about that place, and this would seem to be true whether she is thinking egocentrically or non-egocentrically about places, and whether or not she is able to re-identify those places. In explaining behaviour we should therefore attribute representations of places in the world to an individual who re-identifies places egocentrically, and if their behaviour justifies the attribution of such representations then we have reason to think that it is not necessary to re-identify places in order to represent them and that an egocentric representation is sufficient for thought about places in the world, contra my argument.

But there is a further constraint on the attribution of representational contents to an individual. We attribute to an individual those representational states needed to explain and rationalise her behaviour, but in doing so we should attribute no more than is strictly necessary: we should not attribute representational states to an individual that go beyond those needed to explain her possible actual and counterfactual intentional actions.[18] As C Lloyd Morgan writes: "In no case may we interpret an action as the outcome of the

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[18]   Peacocke appeals to a constraint of this form, which he calls (and I shall follow him) a 'Tightness Constraint' (1983, ch.3) Dennett appeals to something similar (1979) as does Davidson (1982, 477) Child discusses them (1994, 43).

exercise of a higher psychical faculty, if it can be interpreted as the outcome of the exercise of one which stands a lower in the psychological scale" (quoted in Peacocke 1983, 86 fn. 27). The same thing can be said about the attribution of states with representational content to an individual.

What justification is there for such a constraint? It is not simply a consequence of an interpretationist or functionalist theory of the mental which holds that the nature of mental states is exhaustively given by their role in the true theory which ascribes them, since there might be two adequate interpretative or functionalist explanations of an individual's behaviour one of which attributes more content to the individual than the other.[19] We might, for example, be able to explain some particular piece of spatial behaviour in terms of a representation of particular places, or in terms of egocentric spatial thought which does not involve the representation of particular places. The constraint would require us to attribute the egocentric thought.

We might think that we can justify such a constraint on the grounds of parsimony - a sort of Occam's Razor applied to content - but this makes my argument unduly weak since there might be reasons for overriding any parsimony in the attribution of content on the basis of behaviour alone. A causal account of content, for example, might argue in response that there are good reasons, having to do with causal relations or whatever, for attributing more content than is strictly required for the explanation of behaviour.[20]

Although an individual's behaviour could be explained by attributing content which violates the constraint, I suggest that attributing a representation with a certain content to an individual will generate expectations about what she will do in certain different circumstances. And if we attribute content which violates the constraint then we would implicitly credit her with abilities she lacks: we would expect her to do things, given the

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[19] What is meant by 'more content'? We might elucidate this is terms of the expressive power of a set of concepts or propositional attitudes, but that won't work if the content is not conceptual (nor if the subject lacks speech). It can perhaps best be explained in terms of behavioural abilities: a representational state A has more content that another, B, only if A is sufficient to explain any behaviour explained by B, but not vice versa; so that there are some sorts of behaviour which we could explain by appeal to A, but for which appeal to B would be inadequate. This is a loose definition, but will do for what follows.

[20] An externalist account of content might argue for the same conclusion, see Burge (1986). Explanations of spatial behaviour are typically externalist - they appeal to the relational properties of the behaviour to be explained, and this limits such an externalist objection (see Peacocke (1993)).

representational content which we attribute, which she does not do. In such a situation we would have two options. We could say that the subject fails to manifest any such abilities because our attribution of the representational states which implied their possession was mistaken. Or we could maintain the correctness of the attribution, and give some explanation of why the implicitly attributed abilities are not manifested. In giving such an explanation we might, for example, appeal to some breakdown in the connections between a representation of space and the motor control systems of an individual, or because perhaps of some physical constraint. Thus we would not deny that someone paralysed after an accident, and hence unable to manifest behaviour sufficient to justify an attribution of spatial content, could think about their spatial environment simply because they could not move, we would give a different explanation of the absence of spatial behaviour. Given this, it might seem that we could never know that the constraint really applied, and that we could never justify ruling out the possession of more content than is required to explain manifested behaviour.[21]

In response, it might be said that we usually can tell when a failure to manifest behaviour is due to a breakdown and when it is simply due to a lack of ability. We can ask, for example, what behaviour would be manifested in counterfactual circumstances, or by other creatures of the same species. But the point does not matter for my argument. All I need to establish is the claim that it is necessary for a creature to be attributed representation of particular physical places that it manifest an ability to re-identify those places. An argument which shows that such abilities are not always sufficient doesn't show that they are not necessary for the attribution of spatial content. We know that an individual representing egocentric places using an egocentric frame-of-reference couldn't manifest such an ability because it could not re-identify places through movement. The fact that there might be cases where an individual could re-identify places, but fails to do so, doesn't show that re-identification isn't necessary.

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[21] This constraint on the attribution of content is analogous to Evans's Generality Constraint which applies to the possession of concepts (the constraint claims that a condition upon a subject's being credited with a thought that a is F, and hence possessing the concept a, is that that she be able to think that a is G for any property G of which she has a conception). Just as he supposes the possession of a concept to consist in the possession of an ability which can be manifested in certain general ways, so in ascribing representational states we are ascribing states which explain abilities. This gives us reason to distinguish representational states, which are involved in psychological explanations of behaviour, from mere informational states, which are not. For one way of motivating the Generality Constraint, and a discussion of structural constraints applied to representational states see Campbell (1986).

Given this constraint we will have no justification for attributing representations of places to an individual other than those she is able to re-identify. If we were to attribute to an individual a representation of a particular place then we would expect that to be manifested, at least potentially, in her behaviour; there are certain sorts of things that we would expect her to be able to do. Most importantly, we would expect her to have some grasp of the fact that she can move relative to that place; and that if she wants something at the place then she must always return there in order to get it, and so on. We would expect her to manifest what Peacocke calls "perspectival sensitivity" (1983, 66 ff.), which is the sustaining of one's aims with respect to places in the environment over changes in position relative to them. (If we attributed a representation of a particular place to an individual thinking egocentrically then we would have to say that she could think about the place at one moment, but then, simply in virtue of having moved, couldn't). We know that an individual who is thinking of places egocentrically cannot track places through movement and therefore could not manifest such a grasp. For that reason egocentric spatial representation is not the representation of particular places.

Is it right to describe egocentric representation as a representation of space at all? There is behaviour which is more primitive than the ability to represent places and yet which is still spatial, the ability to reach to the left or right, for example, may properly be described as spatial, since it may be impossible to describe the movement in other than spatial terms (Evans 1982,157; Campbell 1993, 66).[22] Psychologists often appeal to such egocentric representations of space in explaining the control of movement, where such explanations make essential appeal to *spatial* representations; but the explanatory work is often done by the geometrical properties represented, and not by representations of the environment. We might even allow that egocentric thinking is, in some sense, thinking about places. If the subject is able to re-identify places relative to her body then she might be said to be thinking of places, it's just that she can make no sense of the possibility of movement relative to such places, such a subject "has an array of places, such as 'just within reach and to the right', which it carries with it through the world" (Campbell 1993, 66). We can, then, suppose that there is some sense in which an individual could be regarded as

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[22] Peacocke seems to doubt the propriety: such behaviour may display no more, he says, than "a sensitivity to second order stimulation patterns" and therefore lacks correctness conditions (1992, 90).

representing places, and that any representation which exhibits the right sort of structure will count as a representation of places, but such places are not places in the external world.

In discussing the possibility of a body-centred representation of places I argued that because an individual could not keep track of places through movement, hence could not re-identify places, she would not be able to represent places in the external world. But we can now see that the problem with egocentric representations is not simply that the subject moves, if that is thought to imply that, for as long as she didn't move, an individual using an egocentric frame-of-reference would succeed in representing places. We can also see why it would be wrong to describe an individual who didn't move and yet thought egocentrically about places as re-identifying physical places. Even if the subject never moves we can ask what she would do in certain counterfactual situations, and we know that if she is using an egocentric frame-of-reference then she could not make sense of the possibility of movement. The point can be made in another way: if someone never moved then they would never be able to manifest the behaviour necessary to justify the attribution of a representation of places (but putting it this way raises the difficulties I mentioned earlier). Hence mere stasis would not be sufficient to enable an individual representing places egocentrically to represent places in the world.

What sort of behaviour would justify the attribution of a representation of places to a subject? The least that is required is that the subject be able to re-identify places over time, to display "perspectival sensitivity". Re-identifying places requires the employment of a non-body-centred frame-of-reference, but I have not said anything further about what is involved in re-identifying places using such a frame-of-reference, and there may be more than one such way of thinking. (It may not require that the subject be able to initiate movement for example, nor that the subject need employ concepts of objects, and so on.)

I have, then, argued that we can only represent places that we can re-identify. And that re-identification of places requires a frame-of-reference. In order to represent physical places a creature must use a frame-of-reference that individuates places with respect to the environment: a body-centred frame-of-reference will not do. My argument is, perhaps, not unobjectionable; but I hope to have given some indication of the sort of relation that exists

between frames-of-reference as I have described them in the previous two sections, and the ways we explain behaviour and attribute representational states.

7. The Interdependence of Subjective and Objective Thought About Space

I have argued that a body-centred frame-of-reference cannot be used to re-identify places in the external world and consequently that a representation which uses a body-centred frame-of-reference doesn't meet the conditions necessary for a representation of places in the world. The difficulties generated by the movement and self-location problems have led some writers (in particular Evans 1982; and Peacocke 1992, chapter 3) to claim that subjective and objective ways of thinking about space are interdependent and that subjective thought about space counts as thought about places in the world only in virtue of its relation to an objective conception of space. It is this argument that I will now consider.

Evans's discussion specifically concerns what is required for singular thought about, or reference to, particular places. This is a different question from the more general question about what is involved in spatial representation that I have been considering until now, but I want to examine Evans's arguments, both for their intrinsic interest and for the light they might shed on my own discussion.

Evans argues that all thought about particular things must satisfy two principles, and his aim in one of the central chapters of *The Varieties of Reference* is to show how our demonstrative thought about particular places can satisfy these principles. The first principle he calls Russell's Principle, and it is a claim to the effect that in order to think about a particular thing one must know which particular thing it is, and one knows this if one is able to distinguish it from all other particular things of the same kind (1982, chapter 4). Evans calls the second principle the Generality Constraint; it says that a condition upon a subject's being credited with a thought that a is F, and hence possessing the concepts a and F, is that that she be able to think that a is G for any property G of which she has a conception, and to be able to think that b is F for any object b of which she has a conception (1982, 100-105).

Thought about a particular thing will satisfy Russell's Principle if it "fundamentally identifies" its object, or distinguishes it from all others of the same kind (1982, 107). Since places are individuated or distinguished from one another by their spatial relations to

objects, a fundamental identification of a place would identify that place by reference to its spatial relations to the objects which constitute our frame-of-reference.[23] We would, that is, have identified a place (in the world) if we identified it in relation to other things in the world. Identifying a place in this way involves locating it on what Evans calls a 'cognitive map', and such location has "a holistic character" - we identify places by their simultaneous spatial relations to many other things. A cognitive map is a representation of objects and places in the world "in which the spatial relations of several distinct things are simultaneously represented" (1982, 151).

I will say more about this idea of a cognitive map later, the important point to note here is that a cognitive map is a way of thinking about places which identifies them relative to an environment-centred and not a body-centred frame-of-reference. It is therefore, Evans claims, an 'objective' way of thinking about space in the sense that we are not forced, in expressing the content of such thinking, to mention the subject's point of view or location (1982, 152). In contrast to this 'objective' way of thinking about places we can think egocentrically about places. Such thought does not identify places relative to objects in the world, but relative to the subject, or to the subject's body. Our conception of egocentric space is a conception of a space which is centred on our body and which has axes that can be given by the concepts 'up', 'down', 'left' and 'right', and 'in front' and 'behind' (1982, 153-4).

The spatial content of our perceptual experience is egocentric, according to Evans.[24] In perception we gain information about the world,[25] including information about the location of objects and places in egocentric space. If, however, an individual is to be able to perceive the spatial location of things it is not enough that she be able to discriminate

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[23] Evans accepts Strawson's claim (that I mentioned earlier) that there is an interdependence of the identity of places and the identity of things (1982, 151; cf. Strawson 1959, 37). Whether this assumption is true just is, in effect, the question of whether we can have a subjective representation of space; why this is so I hope will become clear.

[24] What Evans calls 'egocentric' is not the same as what I previously called egocentric. I used egocentric to mean, simply, a representation which employs a body-centred frame-of-reference. I describe what Evans means below.

[25] For Evans's notion of information see (1982, sec. 5.2). There are many different uses of the term 'information', and they are not all appealing to the same notion. We should be wary of equating Evans's informational content with any conception of non-conceptual content to be found in the literature. (Evans's notion may owe something to Gibson's - he mentions Gibson (1966) in a footnote).

between things which have different locations on the basis of such information. If perceptual information is to have spatial significance for an individual then it must have some connection with spatial behaviour: an ability to discriminate spatial properties is not sufficient to show awareness of spatial position since it would be quite possible for an individual to discriminate on the basis of what were in fact spatial properties without being aware of them *as* spatial, (1982, 154-5; and cf. Peacocke 1983, 57 ff.) (This makes a point similar to that made in my earlier argument, that an ascription of spatial content can only be justified on the basis of spatial behaviour). Evans thinks, furthermore, that the spatial content of perceptual experience must have some intrinsic connection with behaviour because in suitable circumstances we are able, when we perceive the location of something, to act immediately with respect to that location: we do not have to work out or calculate where, for example, to reach in order to pick up an object we can see, or in which direction to point in order to point in the direction of a sound that we can hear. Evans suggests that the connection is a dispositional one: if there wasn't some necessary connection between perception and action then it would be possible for two people to hear a sound as coming from the same direction but, because of errors in their calculations, to do different things when trying to point in the direction from which the sound was heard; and since this, Evans says, "does not appear to make sense," perceiving the spatial location of some thing must consist, at least partly, in the possession of certain kinds of behavioural dispositions (1982, 155).[26]

Egocentric perceptual content consists in a complex structure of dispositions: dispositions, for example, to reach to a particular place, or to point in a particular direction. These dispositions may be complex in that there may be no simple, or single set of movements

[26] In fact we *can* make sense of this sort of mistake. There are pathologies which destroy an individual's ability to act with respect to the perceived location of things; and there are everyday situations in which we can make such mistakes as, for example, when our hands are twisted behind our backs. This suggests that although in most cases we can act immediately with respect to perceived places, this is not always the case, and when it is not we can explain why not in terms of, for example, the inaccessibility of the representational contents of perceptual experience to the motor systems which control our limbs (Peacocke 1992, 95). If this is right then it is a mistake to think that such content *consists* in dispositions to act, but not to think that there must be some intimate connection between perceptual content and action (Peacocke, for example, gives an account of such a connection in terms of shared content (1992, 94).) Thinking of the content of perceptual experience as dispositional anyway fails to do justice to the rational relations that we think hold between such experience and our actions. Martin makes the same point against a dispositional account of the spatial content of our sensations (1993, 208), and Peacocke makes different objections to a dispositional account of egocentric content in (1994, 424-4). We can, I think, acknowledge these points without generating difficulties for Evans's argument, or at least for the use to which I want to put it.

involved in a manifestation of a disposition. We may, for example, only be able to describe what the disposition is a disposition to do in spatial terms, as a disposition to reach to a certain egocentrically specified place, for instance. Perceptual information has spatial content only in so far as it has a place in such a complex network (1982, 154). Our conception of places in egocentric space does not depend on our receiving information from those places for as long as we can maintain a stable dispositional connection with them, and in the case of egocentric places we can maintain such dispositional connections, we are able, for example, to reach out repeatedly to a place in front and to the right, even when we can't perceive anything there. An individual has this conception of egocentric space for as long as there exists a complex network of dispositional connections between perception and action. Our knowledge of the location of a particular egocentric place simply consists in such a dispositional connection with that place.

The spatial content of perceptual experience is egocentric because it informs us of the locations of things in egocentric space, and consists (partly) in being disposed to behave in certain ways. Egocentric content, for Evans, is not simply any representation of places identified relative to a body-centred frame-of-reference; it is a representational state with content which is constituted by complex behavioural dispositions.[27] It is, nonetheless, a way of thinking about, or a representation of, places which identifies them relative to the subject's body. A subject thinking egocentrically about places will be thinking about them relative to a body-centred frame-of-reference. The point is that not any body-centred frame-of-reference will do, since not all will guarantee the existence of the dispositional connections. Thus, for example, identifying places relative to an object seen reflected in a mirror, which is in fact one's body, whilst being a way of identifying places relative to one's body, will not constitute an egocentric way of thinking about places. Because egocentric spatial content identifies places relative to the subject's body it does not allow a subject to keep track of places relative to which she moves. This is not to say that egocentric thought will not allow the subject to keep track of objects as they move in egocentric space, but keeping track of an object is not the same thing as keeping track of a place.

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[27] It is therefore a different, less inclusive, notion to what I earlier called egocentric thought about places.

How are we able to think demonstrative thoughts about the places that we can perceive? Demonstrative thoughts about places belong to a system of thoughts about places in egocentric space, thoughts like "here", "there", "over on the left", and so on (1982, 153). Such thoughts about places, like all thoughts about particular things, must satisfy Evans's two general principles, Russell's Principle and the Generality Constraint, but egocentric thought about places can satisfy neither.

In order, Evans says, for thought about space to satisfy the Generality Constraint:

> "the subject must be able to think about the relation in which he stands to a tree that he can see as an instance of the relation in which (say) the Albert Hall stands to the Albert Memorial. That is, he must think of himself as one object among others; and he must think of the relations between himself and objects he can see and act upon as relations of exactly the same kind as those he can see between pairs of objects he observes. This means that he must be able to impose the objective way of thinking on egocentric space." (1982, 163).

The difficulty the Generality Constraint generates for egocentric thought has to do with our thought about the relations between objects and places, rather than thought about the places themselves. Our concepts of such spatial relations as 'to the right' and 'in front of' must conform to the Generality Constraint, so that when we think of something we can see as being 'in front of' us, we are conceiving it to stand in the same spatial relation to us as that relation we can perceive two objects to stand in (this is really just to say that our concepts of spatial relations are uniform). The difference between thinking of an object as being in front of me, and thinking of one object as being in front of another, is that in the former case I must think of myself as one of the relata. If we are to think of ourselves as one relata of a spatial relation we think of as describing the spatial relations between objects, then we must conceive of ourselves as spatially located objects or, as Evans puts it, "as one object among others". Our thought about ourselves as objects must satisfy Russell's Principle, and if it is to do so we must be able to "fundamentally identify" ourselves. We identify ourselves in the same way in which we identify other material objects: by our spatio-temporal location; so a fundamental identification of ourselves consists in knowledge of what it is for us to be located at a particular position in space, one

must "know what is involved in locating oneself in a spatio-temporal map of the world" (1982, 211); we must, that is, identify ourselves with an object located on a cognitive map (1982, 151-2, 223). It follows that egocentric thought about spatial relations will not be able to satisfy the Generality Constraint.

But the problem is not generated by the requirement that our thought satisfy Russell's Principle alone; the difficulty is rather that an egocentric representation of objects and places will not provide a basis for thinking of ourselves as objects in this way. I have already argued that we cannot represent the object which constitutes a frame-of-reference, or relative to which places are identified, from within that frame-of-reference, so we cannot represent our own location using an egocentric frame-of-reference (see my discussion of the self-location problem) and we cannot therefore represent the spatial relations in which we, as objects, stand to other objects using an egocentric frame-of-reference. To represent our own location we must use an alternative frame-of-reference, an environment-centred frame or what Evans calls a cognitive map. It is only by thinking of ourselves as objects located on a cognitive map that we can think of the spatial relations we stand in with objects we can perceive as the same as those relations that exist between two objects. This problem remains for as long as we accept the Generality Constraint's requirement that we must think of the relations we stand in to objects we can see and the same as those relating objects. It is a consequence of the self-location problem and does not depend on our accepting Russell's Principle, nor Evans's conception of a fundamental identification of an object.

If thought about spatial relations is to satisfy the Generality Constraint we must be able to represent our own location on a cognitive map. That is the solution to a problem concerning our thought about spatial relations. Thought about places generates a different problem. In order to think about a particular place we must know which place it is that we are thinking about, where that, Evans argues, requires that we be able to locate it on a cognitive map. Thus in order to identify a place thought about egocentrically, and hence know which place it is, we must know what it would be for that egocentric place to be identical with a place identified on a cognitive map (1982, 162). Egocentric thought about places cannot satisfy Russell's Principle because we cannot distinguish places thought about egocentrically from all other places. The identity of places in the world is

determined by the spatial relations of those places to objects and to other places, and hence we can only identify places - distinguish them from other places - using an environment-centred frame-of-reference. We are ourselves objects in the world, but we cannot identify places in the world relative to ourselves (egocentrically) because we move and cannot represent our movement using an egocentric frame-of-reference. Thus, as a consequence of the movement problem that I discussed earlier, egocentric thought about places cannot satisfy Russell's Principle.

Evans suggests that we know what it would be for an egocentric place to be identical with a place identified on a cognitive map if we have an ability to impose our knowledge of objective spatial relations - our knowledge of places represented on a cognitive map - on places represented in egocentric space. Anyone who is able to represent their own location on a cognitive map must be able to make just such an imposition since, once you know your own location on a map, you will be able to identify all the places you think about egocentrically with places on the map - they are the places on the map in front and behind, to the left and right of your own location. If you are thinking of a place egocentrically as 'in front', then you can identify that place on a map on which you have identified your own location: it is that place 'in front' of your own location on the map. If you are able to make such an identification then you can be said to know the location of all egocentric places on the map in a way that will meet the 'know which' requirement (1982, 162, 222-3). Therefore, in order to identify egocentric places in a way that will satisfy Russell's Principle, and hence meet the conditions necessary for thought about those particular places, we must be able to locate ourselves, represent our own location, on a cognitive map.

Knowledge of what it is for us to be located at a position in space represented on a cognitive map consists in a practical capacity to locate ourselves in space by means of what Evans calls a "primitive theory of self location". We are employing such a primitive theory, he says, when we reason in the following sorts of ways: "I perceive such-and-such, such and such holds at p, so (probably) I am at p"; "I perceive such-and-such, I am at p, so such-and-such holds at p"; "I was at p a moment ago, so can only have got as far as p', so I should expect to perceive such-and-such", and so on (1982, 223).

Suppose, for example, someone has a cognitive map of Bloomsbury. In order to locate herself on that map such a person must be able to reason in certain ways: she must be able to work out that if that is Gordon Square behind her, and that over on the right is Dillons, then that building in front must be the Warburg Institute. In doing this she is using her knowledge of the egocentric location of buildings which she sees to be in front of her, to the right of her, and so on, together with her knowledge of the location of those buildings on a cognitive map to work out where she is on the map. She may be uncertain as to her exact location, there may be more than one place on the map where she could plausibly be, and supposing herself to be at each particular location "will generate hypotheses about what [she] should be able to observe if oriented in this or that direction, and what [she] would observe if [she] moved in this or that direction" (1982, 162). In locating herself by working out where she is, in exercising an ability to find her way about in this way, the subject is identifying egocentric places with places on a cognitive map, and hence identifying egocentric places in a way that will satisfy Russell's Principle.

Notice, by the way, that the ability to locate oneself in this way depends essentially on the ability to think egocentrically about places. It is only because we can think of places both objectively, on a map, and egocentrically in relation to ourselves, that we can work out where we are on a map and hence identify egocentric places with places on a map. There is a circularity (or holism) here, we don't first identify our own location and then that of egocentric places, nor do we identify the location of egocentric places and then use them to identify our own location, we do both simultaneously over time. We can be said to know the location of egocentric places on the basis of our knowledge of our own location, and we know our own location on the basis of our knowledge of the location of egocentric places (this is analogous to the interdependence between the identity of objects and places emphasised by Strawson). This is why it is right to say that self-location is an ability which involves forming 'hypotheses' about one's location, which subsequent experience will confirm or falsify.

This sort of self-location presupposes the possession of a cognitive map, an objective representation of the spatial world. It presupposes that the subject has an ability to form objective representations of the spatial environment which include a representation of her own position as one object among others. Thus, egocentric thought about places

presupposes the ability to form of an objective conception of space, and there can be no adequate thought about places in the absence of such a conception. Objective thought about space is a necessary condition of egocentric thought about space: egocentric thought is dependent on objective thought.

But there are good reasons for thinking that thought about, or reference to, places in objective space is dependent on egocentric thought about space, and Evans argues that since an objective conception of space is itself dependent on egocentric thought about space, there is an *interdependence* between objective and egocentric spatial thought. If we were persuaded by Strawson's argument that all reference to particular things which we cannot directly locate requires that we pick them out by reference to their objective spatial relations to something we can directly locate, then such reference requires that we are able to locate objects in egocentric space. (An alternative way of putting this would be to say that we must identify the things we refer to by reference to the objective spatial relations in which they stand to us. To represent the objective spatial relations between ourselves and other objects requires representing our own location in a unified spatio-temporal framework - or on what Evans calls a cognitive map). Evans similarly thinks that thought about particular things will only satisfy Russell's Principle if we can locate ourselves. But the interdependence between objective and egocentric thought runs deeper: we would never, Evans says, be entitled to attribute an objective representation of space to someone "if he cannot make sense of that idea that *he* might be at one of the places representable within his map" (1982, 163).

To understand why this is so we need to look in more detail at Evans's conception of a cognitive map. In discussing representations of space I have, so far, been almost exclusively concerned with what is involved in the representation of particular places, but a spatial representation is both the representation of places and of the spatial relations between places. As Campbell remarks (1993, 66), the conception of a place as one among a network of spatially related places is as fundamental to our thought about space, as is thought about the particular places themselves.

It is therefore essential to our conception of space that a genuine representation of space represent the spatial relations between several distinct simultaneously existing objects and

places (Evans 1982, 152). Evans contrasts this idea of objects or places existing simultaneously with the idea of objects and places existing serially or successively: a representation of the relations between places might represent them as relations between simultaneously existing or between successively existing places. The point of drawing this distinction is to emphasise an aspect of the way we think about space - our thought about space is thought about relations between simultaneously existing places.

The distinction can be made clearer by drawing an analogy with two different ways in which the fact that the places a, b, and c lie in that order in a straight line might be established. Someone might tell that they are arranged in a line by means of the sorts of movement needed to pass through each, together with the temporal order of their experiences of a, b, and c. Alternatively someone might just *perceive* them all to be in a line. Corresponding to each way of apprehending the fact there is a way of thinking about the places and their relations each of which "have different presuppositions and sustain different kinds of reasoning" (Evans 1985b, 284). Thus, for instance, if we think of a, b and c as existing together at the same time (simultaneously) and as arranged in a line, "then if b is perceived and a and c are not, then a and c are conceived to exist, though not perceived, in exactly the same sense in which b, now perceived, exists" (1985b, 287). That is, if we are thinking of the three places in this way then the fact that we cannot, for example, see one of them, does not mean that we think of it as not existing, or as existing in any different sense to those places which we can see. If we think of it as existing simultaneously with the places we can see, then we must think of it as existing out of our sight, and as standing in some spatial relation with the places we can see: just that spatial relation which we could see it to stand in if we were to look. If, on the other hand, we think of the places as existing serially or successively then this is not the case: our concept of their spatial arrangement is "conditional in form: if such and such an experience is had, followed by such and such another, then an experience of a third kind will intervene between them" (1985b, 287). If we are thinking of them like this, then perceiving one of the places has no implications for how we conceive, or represent, the existence of the others. But because concepts of serially existing places or objects are not a way of thinking about simultaneously existing objects, they are not obviously concepts of *spatial* relations between objects or places at all: our concepts of spatial relations just are concepts of relations between objects and places existing simultaneously (Evans 1985b, 288).

If this is right then a representation of space must represent the simultaneous existence of distinct objects and places. Egocentric space is, Evans claims, a representation of this form, it is a representation of the simultaneous existence of places, even when the subject is not perceiving or receiving information from two or more places simultaneously, in virtue of there being an indefinite number of simultaneously existing positions which define egocentric space (1985a, 388; 1982, 159). In the case of egocentric space, remember, the content of our representation consists in a complex network of dispositions. These dispositions relate simultaneously to distinct places defined in egocentric space.

But even if an egocentric representation is a representation of simultaneously existing places, how can we conceive of the simultaneous existence of places thought about non-egocentrically when we cannot perceive those places (and when we have no behavioural dispositions relating us to them)? In order to represent the simultaneous existence of unperceived places with perceived places we need to be able to represent places as existing unperceived; and that requires, Evans argues, the possession of a cognitive map of our spatial environment - a non-egocentric "representation in which the spatial relations of several distinct objects is simultaneously represented" (1982, 151).

In order to think of a place that I cannot currently perceive as, for example, over to the right of a place that I can perceive, I need to think of both as existing simultaneously and as being spatially related to one another. And to do that I must conceive of the place I cannot currently perceive as existing independently of my perception of it.

What makes it intelligible that something an individual can perceive can exist independently of their perception of it is that its existence is not alone sufficient for them to perceive it; in order to perceive it further conditions are required which may or may not be met. Thus, for such an individual to make sense of the idea of existence unperceived she must have some grasp of what are sometimes called the 'enabling conditions' of perception. In the case of thought about space these enabling conditions consist in the fact that what we perceive is determined by our location in an objective spatial world, so that in order to see something one must be correctly oriented with respect to it, in order to touch something one must be spatially contiguous with it, and so on (Campbell 1986, 161). For an

individual to make sense of the idea of places existing unperceived she must take her experience to be explained or determined in this way by the way things objectively are in her spatial environment, on one hand, and her particular place in that environment, on the other.

Having a grasp of such enabling conditions is sometimes described as possessing and using a "primitive theory of perception" (Evans 1985b, 261-2) where this does not involve anything like an understanding of the mechanisms of perception, but simply an appreciation of the fact that what one perceives - the course of one's perceptual experience - is determined jointly by where one is and by how the world is at that place.

As Evans puts it:

> "Any thinker who has an idea of an objective spatial world...must be able to think of his perception of the world as being simultaneously due to his position in the world and to the condition of the world at that position. The very idea of a perceivable spatial world brings with it the idea of the subject being in the world, with the course of his perceptions due to his changing position in the world and to the more or less stable way the world is. The idea of an objective spatial world and the idea that he is *somewhere* cannot be separated" (1982, 222-3).

The interdependence of subjective and objective thought about space is, therefore, a consequence of the necessary conditions for thinking of an objective space at all. A further consequence of this argument appears to be that a non-egocentric representation of space, or a representation which employs a non-body-centred frame-of-reference, must be a representation of an objective space - of places and objects - conceived to exist independently of the subject's perception of them.[28] In the next section I will discuss

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[28] It might be thought that 'must' is too strong. Why couldn't we have non-egocentric frames-of-reference which only identified places we can perceive relative to something we can perceive? In fact I said that the "vestibulo-occulo reflex" provided an environment-centred frame-of-reference, so surely the claim *is* too strong. I'm not sure that it is. The vestibulo-occulo reflex maintains a stable eye position relative to the environment, but it is nothing like a frame-of-reference which could be used for identifying places, so doesn't constitute an environment-centred frame-of-reference of the sort I am concerned with. I discuss a subjective environment-centred frame-of-reference in section 9.

whether a representation of space which employs a non-body-centred frame-of-reference must be a conception of independent objective space.

The aim of Evans's argument is to show how we can meet the necessary conditions for *thought* about places and spatial relations and his conclusion, that such thought requires the possession of a cognitive map, might appear to depend conditionally on our accepting his two constraints on thought. In response, we might simply reject these constraints (Travis, for example, thinks we should reject the Generality Constraint (1994)); or, more importantly for my argument, we might doubt whether the constraints apply to representational states in general. In particular, it might just seem obvious that they will not apply to any non-conceptual representation of space. And that would leave open the possibility of arguing for a subjective non-conceptual way of thinking about space which was independent of objective thought about space. Indeed it might be one of our aims in characterising subjective representation of space that it should be plausible to ascribe such representational states to creatures lacking conceptual abilities. And if a subjective representation of space is non-conceptual, then it might seem that Evans's characterisation of egocentric space is a characterisation of just such a subjective way of representing space.

8. Evans, Peacocke, And The Argument Generalised

In the previous section I described Evans's argument for the claim that there is an interdependence between objective and subjective *thought* about space, but my original question concerned the distinction between subjective and objective spatial representation in general, and not just thought. Can Evans's conclusion be extended to all representational states with spatial content, or does it only apply to singular thoughts about places and relations?

Evans argues that the Generality Constraint and Russell's Principle are constraints that apply to thought, but we saw that constraints (the requirement that representation requires re-identification, and the tightness constraint) analogous to Evans's two principles govern the attribution of spatial representational states to an individual and hence apply to any representational states which have a role in the explanation of action. The requirement that in order for an individual to represent a place it must re-identify that place and the tightness constraint on content attribution are together sufficient to generate the same conclusion.

An egocentric representation - a representation which employs a body-centred frame-of-reference - cannot alone be a representation of places because it does not allow the re-identification of places, and it cannot therefore be a representation of the space of the external world at all. But a subjective representation of space must be a representation of the space of the external world, so an account of egocentric representation cannot be an account of the sort that I am aiming to give, of what the subjective representation of space consists in.

The interdependence argument can therefore be applied generally to representational states (including those, or any, with non-conceptual content), and not just to thoughts. It follows that an egocentric representation will only be a representation of space if it is related to a non-egocentric representation of space in the way described by Evans. Would Evans agree with this conclusion? Because Evans is only concerned with questions about reference and thought and not about the representation of space in general, he never explicitly considers whether an egocentric representation is genuinely spatial, and it is therefore difficult to be

sure what he thinks but, as Peacocke remarks (1992, 90), some of the things he says suggests that he was tempted by the claim that an egocentric representation is a representation of space independently of its connection with objective spatial thinking (Evans 1982, 128, 158).

One reason for thinking that this *is* Evans's position might be the supposition that he thinks the existence of an information link between a place and a representational state with egocentric content to be sufficient for the representation to be of the place; that an egocentric representation will be of a place in virtue of embodying informational content concerning that place. Perceptual input, Evans says, "acquires a (non-conceptual) spatial content for an organism by being linked with behavioural output" in appropriate ways (1982, 156). This looks like a claim to the effect that an egocentric representation is a representation of space.

But an egocentric representation cannot be a representation of places solely in virtue of embodying information with content which concerns that place. Information, as Evans characterises it, can be said to be of or from a place in the same way that a photograph is of an object. Its content can be specified *without* making reference to the objects it is of, "by means of an open sentence in one or more variables" (1982, 124). He distinguishes on one hand "an *a*-representation (i.e. a species of particular-representation, in a specification of whose content mention of *a* would figure: something which represents, or misrepresents, *a*), and, on the other, something which, without being an *a*-representation, is a representation *of a*." (1982, 125 fn.10). An informational state is a representational state of the latter kind and, I suggest, it would therefore be wrong to view an egocentric spatial representation as a representation of a particular place in virtue of its embodying informational content which concerns that place. Having information from a place may be a necessary condition for thought about that place,[29] but it will never be sufficient for a thought to be about a place, and what is true for thought is true for representational states generally. Just as in order to think about a place we must know which place it is so, in order to represent a place, we must be able to re-identify it.

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[29] It is necessary for information based thoughts, but of course Evans argues that not all demonstrative thoughts about places need be information based - we can maintain dispositional connections with places in the absence of an information link.

We may say that egocentric content is spatial in the sense that I mentioned earlier - the behavioural manifestation of egocentric content, the complex network of input-output connections, cannot be described in non-spatial terms - but it would be a mistake to think (or to think that Evans thought) that egocentric content represents particular places in the external world, or represents the space of the external world.

An individual will only be able to re-identify places if she represents them using a non-egocentric frame-of-reference. Representing places using a non-egocentric frame-of-reference is, for Evans, representing places on a cognitive map. Hence "[w]e say that the subject thinks of himself as located in space (in an objective world that exists independently of him, and through which he moves); only if this is so can the subject's egocentric space be a *space* as all" (1982, 167), and "the network of input-output connections which underlie the idea of an egocentric space could never be regarded as supporting a way of representing space (even egocentric space) if it could not be brought by the subject into coincidence with some larger spatial representation of the world as is constituted by a cognitive map." (1982, 163). (I don't want to press this as an interpretation since Evans says so little on the subject, and was not concerned to give an account of the subjective representation of space. I merely want to suggest how plausible it is to view his position as one held for the sorts of reasons that I gave for rejecting the possibility of an egocentric representation of space.)

What matters is that the interdependence argument can be applied generally to representational states with spatial content. Peacocke is someone who argues for the more general conclusion that there is an interdependence between subjective and objective representation of space. In chapter 3 of *A Study of Concepts* (see also 1992b) he gives an account of the (non-conceptual) content of perceptual experience. According to this account, we can individuate the content of an experience by specifying "which ways of filling out space around the perceiver are consistent with the representational content's being correct" (1992, 62). Such a specification is a specification of the 'scenario content' of an experience and will specify the location of spatial points relative to a frame-of-

reference centred on (some part of) the subject's body - scenario content will employ a body-centred frame-of-reference (1992, 72).[30]

Scenario content is supposed to capture the spatial content of experience but, Peacocke argues, we could never regard scenario content as spatial representational content unless states with such content were used by the subject in the construction of a cognitive map of the world around her, where a cognitive map is, as it is for Evans, a representation of an objective, independent spatial world (1992, 90). Peacocke argues, in other words, that there is an interdependence between the subjective and objective representation of space.

States with scenario content must have this role because we would only be justified in attributing representational states with genuine spatial content to an individual if they were to employ such states in identifying places over time (identifying places over time is what I called re-identifying places). The identification of places over time requires the subject to represent places using an environment-centred frame-of-reference, to construct and use a cognitive map. Therefore, for an individual to have a subjective representation of space, for her egocentric perceptual experience to have spatial content, she must have an objective conception of space, she must possess a cognitive map of her environment.

I have already argued that the representation of places requires an individual to re-identify them, and Peacocke's reasons for thinking this are similar to mine. States with scenario content have a role in the explanation of behaviour, and unless they had a role in explaining the subject's ability to re-identify places we could not justify attributing content to an individual going beyond "sensitivity to higher order-properties of stimulation patterns" (1992, 90). Unless scenario content was used to re-identify places we would not have any grounds for saying that it is genuine content concerning how things are in the external world (or has what Peacocke calls correctness conditions): we could explain all the subject's behaviour without attributing such content and so it would be wrong to do so.

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[30] This is required if the subject's thought is to conform to what Peacocke calls 'Evans's Thesis', which is the thesis that someone who grasps the first-person concept must be able to make *immediate* or *non-inferential* first-person spatial judgements on the basis of their perceptual experience of the world (1992, 71). The relation between perceptual experience and the first-person, and a defence of Evans's Thesis, are issues which unfortunately I do not have space to discuss. The important point for me is simply what consequences follow from the fact that scenario content is body-centred. For Evans's Thesis see (Evans 1982, chapters 6, 7).

An individual will only be able to identify places over time (or re-identify places) if they are able to represent places relative to a non-body-centred frame-of-reference. Representing places non-egocentrically requires the subject to "integrate the representational contents of his successive perceptions into an integrated representation of the world around him, both near and far" (1992, 91). This is because in order to re-identify a place the subject must identify, or recognise as the very same, a place represented egocentrically in experience with a place she has experienced before, where she might do this by identifying her "current location with one previously encountered" (1992, 90). If the subject is to identify places as the very same places over gaps in her experience of them, then she must conceive of those places as existing even when she is not perceiving them; she must, in other words, think of them as existing independently of her perception of them. (This is just another way of making the same point I made when discussing Evans's notion of a cognitive map. Compare it to Strawson's argument that the possession of a unified spatio-temporal framework requires us to re-identify objects. What Strawson calls a unified spatio-temporal framework is what Evans and Peacocke call a cognitive map). And we have already seen that to make sense of existence unperceived we need to represent places on a cognitive map.

That is Peacocke's argument in outline. It reaches a conclusion similar to, but more general than, the conclusion of Evans's discussion: that there is an interdependence between subjective and objective representations of space. It does so without appealing to constraints which apply only to conceptual thought. Peacocke's argument is precisely an argument about the non-conceptual content of perceptual experience.

9. An Independent Subjective Representation Of Space

I suggested that we might explain the difference between subjective and objective thought about space in terms of the frame-of-reference employed in identifying places. I went on to argue that no egocentric representation can be a representation of space, and hence that subjective thought about space cannot solely consist in a way of representing space that is egocentric. I have, furthermore, described arguments which conclude that there is an interdependence between subjective and objective thought about space. The subjectivity of subjective thought about space, on these accounts, consists in its being egocentric, but such thought only counts as spatial in virtue of its relation to an objective conception of space. Does such an account answer my original question about what the distinction between subjective and objective thought about space consists in? Does subjective thought about space consist in egocentric content related in a certain way to objective spatial thought?

Such an account of subjective spatial thought explains in what sense such thought is a representation of places from the subject's perspective, how it is tied to a point of view, and so on. And to that extent it answers my original question. But there seem to be examples of ways of representing space which are independent of objective thought about space: we must, for example, be able to say something about the way in which animals (and maybe young children) represent space. Many animals have extraordinary navigational abilities, and it is very plausible to explain such abilities by attributing to them some sort of representation of their spatial environment. But it may be implausible to attribute to them anything as sophisticated as a cognitive map. The possession of a cognitive map requires the subject to make a distinction between her experiences and what they are experiences of - to employ a primitive theory of perception - and that involves a grasp of some sort of first person concept (Peacocke 1992, 90; Campbell 1993, 92-3). The construction of such a map might also require the grasp of some sort of primitive mechanics or naïve physics (of which more below) which itself requires the possession of concepts of objects (Campbell 1984-5). All this involves a far greater conceptual sophistication than we suppose animals to have. Thus, if animals represent space they must do so in a way which is independent of the possession of a cognitive map.

A similar point can be made about the content of perceptual experience. It is undeniable that our perceptual experience informs us of the spatial layout of our environment, that it has spatial content. On the views I have considered, perceptual experience cannot have *spatial* content independently of its relation to a cognitive map. This may seem plausible, but it also seems plausible to claim that animals' perceptual experience informs them of the spatial layout of their environment, and hence that it too has spatial content. For the reasons just given, it is implausible to think the content of the perceptual experience of animals is only spatial in virtue of its relation to a cognitive map. If so, then there must be some account of the spatial content of the perceptual experience of animals which is independent of a cognitive map.

If we think that there must be some continuity between our experience and that of animals, then the supposition that the spatial content of animals' perceptual experience is independent of an objective conception of space gives us a reason for thinking that ours is too, and hence that we can give some account of the spatial content of our experience which showed it to be independent of objective thought about space. (We could, of course, deny any such continuity (cf. McDowell 1994, chapter 3 §7), and we could deny that animals' perceptual experience is spatial. But we must, nonetheless, be able to say something about how animals represent places.)

A final consideration in support of the idea that some account of subjective spatial thought independent of objective spatial thought must be possible is that thinking about space in terms of a cognitive map is, it is often said, a realistic way of thinking, where realism is understood, in Dummett's sense, as the thesis that there may be verification transcendent truths (Peacocke 1986, 86). Such thinking is realist because it requires the subject to employ a primitive theory of perception, which allows her to conceive of the possibility of the existence of things that she is not in a position to perceive, and such a conception seems to be ground the possibility of verification transcendent truths - they are the truths that no one was correctly placed to discover. A cognitive map is a way of thinking about space which is realistic in this way, but there are anti-realist arguments which deny the possibility of any such realist way of thinking. If these arguments are right, then we cannot conceive of space in the way characterised in terms of a cognitive map. But clearly we do think about space, we have some conception of space, and it must be possible to

give some (anti-realist) account of what such thought consists in. Whatever account can be given, it must be an account of a way of thinking about space which is not dependent of any conception of space of the sort provided by a cognitive map. (Whether such an account will be subjective in the intuitive way I described is, perhaps, a further question.)

10. A Subjective Non-Egocentric Representation Of Space?

I have been attempting to give some account of what the distinction between objective and subjective thought about space consists in, and I have tried to explain the distinction in terms of the frame-of-reference employed by an individual in re-identifying places. But that did not work. The necessary conditions for a subject to represent places cannot be met by any way of thinking which re-identifies places relative to a body-centred frame-of-reference. I suggested two general reasons for thinking that this is so, and I then examined in detail Evans's argument for the conclusion that the egocentric, body-centred representational content of a perceptual experience can only be genuine spatial content if it is related to an objective representation of space; and I described Peacocke's similar argument for the same conclusion. According to these views, subjective or egocentric thought about space is one aspect of an account of what it is to have to have a conception of an objective independently existing spatial world. Subjective thought about space is not, if these arguments are right, independent of an objective representation of space.

This position has only been reached, however, on the assumption that what is distinctive of a subjective representation of space is that it employs a body-centred frame-of-reference and that, in contrast, an objective representation of space is a representation which employs a non-body-centred frame-of-reference. Drawing the distinction in this way is plausible if we think that any way of representing space using a non-body-centred frame-of-reference must involve the possession of something like a cognitive map of the environment, with the consequence that places represented on a cognitive map are conceived by the subject to exist independently of her experience of them. Both Evans and Peacocke equate a representation which uses a non-body-centred frame-of-reference with a cognitive map of this sort, and one reason for doing this is just that, in employing such a reference frame, the subject must represent the spatial location of places which she cannot currently perceive, and that seems to involve a representation of places as existing

independently of the subject. Given this, we can see what a purely subjective way of representing space could be: it could be a way of representing space using a non-body-centred frame-of-reference which does not require the possession of a cognitive map - which doesn't require the subject to think of places as existing independently of her. John Campbell has described a way of representing space which seems to be just this (1993; 1994, chapters 1, 2), and it is to his account that I now turn.

So far I have distinguished ways of thinking about space according to whether or not they identified places relative to the subject: whether or not they employ a body-centred frame-of-reference. But we can make a further distinction amongst ways of representing space all of which employ a non-body-centred frame-of-reference in this sense. I have been arguing that a necessary condition for a representation to be a representation of places in the external world is that an individual be able to re-identify them (it is only through the possibility of re-identification that representations get spatial content) where that requires the use of a non-body-centred frame-of-reference. And it has been argued that in order to re-identify places using a non-body-centred frame-of-reference we must possess a cognitive map of our environment, with all that is implied by that.

Campbell approaches the question of what it is for a representation to represent the external world differently. We can distinguish two elements in our idea of an external world. One element is the idea of a physical world, by which is simply meant the subject's spatial environment, the place where things happen, processes occur, and things interact; the other element is the idea of an objective world existing independently of the subject. Once we have made this distinction then it seems that it might be possible to give an account of what it is that makes a representation a representation of the physical world - of the subject's environment - which is independent of an account of what makes a representation of a world conceived as existing independently of the subject.

Campbell argues that a general constraint on a spatial representation, if it is to count as a representation of the physical world, is that it should have physical significance. Thus an account of how an individual represents space must show what physical significance that representation has for the subject, how the subject gives the places and relations it represents a physical interpretation. And this can be done, Campbell argues, in two

different ways, one of which does involve the grasp of something like a cognitive map, but the other of which does not; and it is the latter which may constitute a subjective representation of space.

We can understand what is meant by the claim that a spatial representation must have physical significance for the subject by drawing an analogy with geometry (Campbell 1993, 69). A pure geometry of space, a mathematical theory, is not a representation of physical space, it is simply an abstract deductive system. We can ask whether such theories are consistent, and about the mathematical structure of the space that they describe, but it makes no sense to ask whether or not they are true as descriptions of the world; they have no empirical content so there is nothing for them to be true about. A pure geometrical theory only becomes a theory about physical space, an applied geometry, if we assign some physical significance to its terms. This can be done by correlating physical relations and properties with the geometrical concepts of the theory.[31] We might, for example, correlate the straight line of our geometrical theory with the path of a light ray in a vacuum (Van Fraassen 1970, 129 ff.). Once such correlations have been made and physical significance has been assigned to our geometrical theory then we have turned it into a theoretical description of the physical world. It then makes sense to ask whether or not it is true of the world, and it can then be described as a representation of physical space.

In the same way, a subject's thought about space can constitute thought about physical space - the space of the external world, or the subject's environment - only if it has some physical significance for the subject. We cannot "ascribe spatial representations to an animal which outruns their capacity to give causal significance to them" (1993, 69).[32] If a representation is to be of the subject's spatial environment then she must grasp the physical significance of the places and spatial relations that it represents. Campbell suggests that this might be done in one of two different ways. The subject might grasp the physical significance a representation in a 'causally indexical' way, or in a way that is 'causally non-

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[31] The status of such correlations is a subject of dispute - they may be thought to involve definitions, reductions, or merely conventions. From the point of view of this argument it doesn't much matter.

[32] This requirement seems consonant with my argument about the ascription of representational states on the basis of behaviour. Grasp of physical significance is manifested in behaviour, so if a creature is not manifesting a grasp of the physical significance of a place we should not attribute a representation of the place to them (cf. Campbell's comments on teleological accounts of content (1993, 70)).

indexical' (1993, section 4). This distinction between ways of thinking about space is not that between representations which employ body-centred frame-of-reference and those which do not, it is not just a matter of the subject's criteria for the identity of places, but has to do with how an individual understands the physical significance a representation. It of is, we might say, a distinction between two different sorts of meaning that a representation might have. I will attempt to explain Campbell's distinction before describing how he applies it to ways of thinking about spatial properties and to spatial representations.

Many of the concepts we use have a causal or physical significance, in the sense that judging correctly that the concept applies will have implications for how things in the world would behave. Understanding such judgements requires us to appreciate such implications. Thus, for example, the judgement that an object is spherical has implications for how the object will behave: that it would roll off the desk, perhaps, or that other objects won't balance on top of it. In understanding the judgement we must appreciate implications such as these, and one way in which we could do this is through some explicit, reflective, understanding of how the object will behave. We might, for example, have an explicit knowledge of what counterfactuals are implied by the judgement: that were it to be pushed the object would roll, that were something to be placed on top of the object it would fall off, and so on. But we might appreciate the physical significance of the judgement differently, through a *practical* grasp of its implications for the object's behaviour. This sort of practical grasp would not consist in the explicit knowledge of what counterfactuals are implied by the judgement, but rather in how we interact with and handle the object, in the fact that, for instance, we don't put it down on sloping surfaces, and that we don't try to place things on top of it. Terms whose meaning or physical significance an individual grasps in this practical way have what Campbell calls causally indexical meaning; this contrasts with the terms whose meaning is grasped at a reflective level, they are causally non-indexical terms.

There may be primitive terms having a physical significance whose meaning can be grasped in a causally indexical way by an individual who lacked full-blown concepts. In this case, the subject's understanding of the physical significance of the term would be manifested in the way that she reacts to recognition that it applies; she could manifest the fact that she understands the significance of the term "within reach" by, for example, only

reaching for things that are within her reach, or by behaving in other appropriate ways (1993, 84) (strictly speaking, these terms are those the theorist would use to characterise the content). An individual could understand such terms even if she lacked self-consciousness; she need not have any reflective understanding of the relation between her actions and perceptions, and the things she acts on and perceives. Nor need she have any reflective understanding of the consequences of her judgement that something is, for example, within reach. And she may not be able to apply such terms to cases other than her own: a subject may be able to judge that something is to her right and yet she may not be able to judge whether anything is to the right of any other object. Causally indexical thought is tied to the subject's own perception and action (causally indexical terms, therefore, will not satisfy Evans's Generality Constraint). It is this lack of generality, the subject-relativity of such thought, together with the lack of reflective understanding, which makes a grasp of causally indexical terms 'engaged', or 'immersed', and hence subjective. This contrasts with an individual's understanding of causally non-indexical terms. Understanding them requires the subject to have a general, reflective, understanding of how objects will interact with one another and with her. Grasp of such terms is therefore 'disengaged', or objective (Campbell 1994, 60-1).

A spatial representation will constitute a representation of the external world only if it has physical significance for the subject. How might a subject understand the significance of such representations?

An individual might assign such significance through some sort of theorising, in a way analogous to that by which geometrical theories get assigned physical meaning. It would, of course, be implausible to suggest that our everyday reasoning about space involves a grasp of anything as sophisticated as the theories of physics and geometry employed in the physical sciences, but many have argued that we can give physical significance to our thought about space through a grasp of a 'naïve' or 'intuitive' physics. In order to grasp such a physics an individual must have some sort of reflective understanding of the systematic relations that exist between spatial properties such as shape, size, and distance, on the one hand; and physical properties such as velocity, acceleration, and force, on the other. We employ such a physics and exercise such an understanding whenever we, for example, predict where a ball in flight will land, or when we try to work out whether a

table that we want to move will fit through a doorway, or when we wonder whether a cup will sit upright on an uneven surface.[33] This capacity to think about physical objects is one way in which an individual could give physical significance to her thought about, or representation of, spatial properties and relations.

A subject could give physical significance to her thought about or representation of *places* at a similarly reflective or theoretical level, through the grasp of a simple theory of perception and location of the sort that I earlier described. In constructing and using a cognitive map of her surroundings, an individual gives physical significance to the places she represents: she has some explicit understanding of the relation between her location and what she can perceive, and of where she will need to move to in order to reach some particular place, or see some particular thing. The patterns of reasoning involved in locating oneself involve an explicit grasp of the relation between what one perceives and one's location. Anyone reasoning in this way can be said to appreciate the physical significance of places since "[t]he most causally significant aspects of location are their implications for whether and how a place can be perceived by a subject, and for whether and how it is possible for a creature to interact with that place, to avoid it or to reach it, for instance" (Campbell 1993, 88). Someone employing a cognitive map will therefore grasp the causally or physically significant properties of the places she represents.

Thinking about space using a cognitive map is thinking that is causally non-indexical: the subject has an explicit grasp of the causal significance of places and properties, and a reflective understanding of the way the world affects her and the way she affects the world, which goes beyond a practical ability to interact with it. In contrast to this sort of theoretical grasp of physical significance there is a different, more primitive way in which an individual could grasp the physical significance of a spatial representation. An individual would be giving significance to a representation of space if she used that representation in moving through space and in guiding her actions. The physical significance of such a representation would simply be a matter of its implications for the subject's own actions, for her perceptions, and in generating her perceptual expectations. An individual who re-identifies places can be said to grasp the physical significance of

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[33] The evidence for this claim, and a discussion of it, would take more space than I have. For an introduction to some of the issues involved in our possession of a naïve physics see the essays in Eilan et. al. (1993) section II, esp. 99-111.

those places, where that grasp may simply consist in the fact that the individual will go to places at which there are things she wants, and avoid places at which there are things she dislikes. A representation which was used in this way in planning and executing what are in fact the subject's actions and in generating what are in fact her perceptual expectations would be causally indexical: the places and spatial properties represented have physical significance for the subject solely in virtue of such practical implications.

Such a representation can be said to be subjective, in the same way that a grasp of causally indexical terms is subjective. The question we now need to address is whether there can be a causally indexical representation of space - could a creature represent places and their relations in a way that is causally indexical?

The navigation systems used by some animals appear to involve the use of just such causally indexical representations of places. Some animals, for example, are able to find their way to a particular place from anywhere within their territory.[34] Animals which can do this can be said to be able to re-identify that particular place. But animals' navigation systems are not restricted to goal directed systems; they may allow the re-identification of an arbitrary number of places. Campbell describes just such a navigation system, which John O'Keefe has proposed as an account of rats' ability to find their way around their environment (Campbell 1993, 76 ff.; O'Keefe 1991, 280 ff.). According to this model, in order to find its way around the animal first finds the overall 'slope' of its environment. This slope is a function of the visual cues in the animal's environment, and because the slope is constant at all locations no matter in which direction the animal is heading, it can be used by the animal to define a *direction* which is independent of it's own direction (the slope provides something analogous to a compass direction for the animal). Once the slope has been determined the animal must then find the 'centroid' of the environment which is a notional *point* identified relative to environmental cues (this point is defined as "the geometric centre of mass" of the environment (O'Keefe 1991, 283)), and which is stable relative to the animal's movement and position. Having worked out both the slope and the centroid of its environment (a fixed point and a direction) the animal is able to use them to identify particular places: a location can be identified by reference to its distance from the centroid and the angle the straight line connecting it to the centroid bears to the slope (this

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[34] Even Bees can do this (Cartwright and Collett 1982). For other examples, see Gallistel (1990, chapter 5).

distance and angle together make up the *vector* from the centroid to the place). If an animal can store this information then it can represent the location of a particular place or target. By working out the vector from itself to the centroid the animal can find out where it is, and can keep track of its position as it moves around. The animal can also work out where it must go in on order to get from where it is to any location it represents: given vectors from itself to the centroid and from the centroid to the location it wants to get to, it can work out the direct vector from itself to its desired location. Thus, no matter where the animal is in its environment, it is able to represent the vector from itself to any other place.

An animal using this sort of navigation system will be able to identify and re-identify an arbitrary number of places, and since the animal will be able to represent the direct vector between itself and any place it represents (even when that place is currently unperceived) it can be said to be able to re-identify places that it is currently unable to perceive. It seems, then, that an animal using this system will meet the conditions necessary for representing physical places, places in the external world - it will be able to re-identify such places, and it will be doing so relative to an environment-centred frame-of-reference.

An animal representing places using the slope/centroid model can only understand the physical significance of places in terms of the implications such places have for its own perception and actions. It does not understand the physical significance of places in the detached or theoretical way distinctive of causally non-indexical thinking (Campbell 1993, 86). I said that the animal 'works out' the vectors between itself and the places it represents, but of course the animal itself doesn't do any working out. Any calculations involved are nothing more than some sort of information processing carried out in the animal's brain. The animal simply has a practical navigational capacity. It seems then that we have in the slope/centroid model a causally indexical, and hence a subjective way of thinking about or representing space. A creature using the model has a representation of places in the world without necessarily being able to think objectively about space, without being able to represent its own location, and without having a grasp of the first-person. (This particular model of a navigation system is just one concrete example of how an animal is able to re-identify any number of places. There may be many alternative models which could explain such an ability. What matters is that this sort of account provides a causally indexical, and hence subjective, way of representing places.)

An animal re-identifying places in the way described by the slope/centroid model appears to meet the conditions necessary for representing places, but is a causally indexical representation sufficient for representing space? Is a causally indexical representation of space genuinely a spatial representation? There are two grounds for doubt, both concerning the animal's ability to represent the relations between places.

When discussing Evans's notion of a cognitive map I described his characterisation of two different ways in which we might conceive of spatial relations; we might conceive them to be simultaneous or successive, and I noted that we in fact conceive of spatial relations as simultaneous, as relations between simultaneously existing objects and places. This was one reason, I suggested, which led to the equation of a non-egocentric frame-of-reference with a cognitive map, a representation of places existing independently of the subject; since, in order to represent the spatial relation between a place currently perceived and a place currently unperceived, the subject must represent the existence of the unperceived place, where that requires the place to be represented as being independent of the subject's perception. A causally indexical representation of places of the sort provided by the slope/centroid model is not a representation of places as existing independently of the subject's perception. Its subjective, engaged, character could be said to consist in just that fact; but if that is so, can it really be said to represent the spatial relations between simultaneously existing places? Can a causally indexical representation represent the simultaneous existence of the places it represents?

Evans suggested that our egocentric conception of space is a conception of places as existing simultaneously in egocentric space in virtue of the simultaneous existence of dispositions relating to many different positions in egocentric space, and it might be thought that a causally indexical representation can be simultaneous in the same way. An animal representing places in a causally indexical way can be said to have dispositions relating it to all the places that it represents (they are dispositions to travel or navigate to those places, or to navigate in a way that avoids those places) and the animal can simultaneously possess any number of such dispositions. Thus, if the parallel is a true one, and a conception of egocentric space (as Evans conceives it) is a conception of

simultaneously existing places in egocentric space, then a causally indexical representation is a representation of simultaneously existing places.

But it is implausible to suppose that a causally indexical representation is a representation of simultaneously existing places, and for the same reason it is implausible to think that an egocentric representation is a representation of simultaneously existing places (this gives us a further reason for supposing that egocentric spatial thought is dependent on objective spatial thought).

On the slope/centroid model, an animal represents places in terms of vectors from itself to those places. It can do this even when the place is unperceived, but it need not be thinking of the unperceived places that it represents as existing unperceived, or existing irrespective of whether it is actually at those places. The animal grasps the physical significance of places in terms of the practical consequences they have for its action and perception, and there is nothing about such consequences that force an animal to conceive of places as existing unperceived, rather than as existing conditionally. Practical consequences are conditional on interaction with the places represented, a matter of what would happen were the animal to move in certain directions or go to certain places, or whatever. This is a conception of space which is much nearer to a successive conception of space than the conception of the simultaneous existence of places, with which Evans drew the contrast. It might be replied that the animal does represent the unperceived existence of places, since it represents them as the goals of its movements, and it must think of its goals as existing. But the animal need not represent the goals as existing when it is not at them, all it needs is that the goals will in fact be there if it travels to them. The animal, if it represents places in causally indexical way, simply does not have the conceptual resources to make sense of the simultaneous existence of places that it cannot perceive with those it can perceive. But if the animal is not representing spatial relations as relations between simultaneously existing places, in what sense is it representing spatial relations at all?

Campbell highlights a different, but related way in which causally indexical representations are limited (1993, 80-1). An animal representing space causally indexically cannot fully represent the connectedness of space, the fact that every place is spatially related to every other place. An animal navigating using the slope/centroid model can re-identify places,

but how does it represent the relations between places, in particular how does it give physical significance to such relations? It can do so, Campbell suggests, through its perception and action, "from any point in the space, it can act upon any other" (1993, 80). But there are restrictions on the relations to which it can give physical significance, and hence represent, in this way. The animal can only represent those relations of which it, or its location, is one of the relata - it can only represent places as the destinations of its movements, and so cannot represent the relations between arbitrary places, irrespective of whether it is itself at one of those places. Because of the way it represents its destinations (as vectors) the animal can only represent the direct route between itself and its destination, and not relations "of arbitrary complexity between two places" (1993, 81). Nor can the animal represent the configurational arrangement of a number of places, it cannot represent four places as standing in a square, for example. Contrast this with the way we think about space. Our thought about places is not restricted in this way: we can think of complex spatial relations between any number of places, we needn't think of ourselves as at one of those places, and we can gasp the configurations of the places we represent.

Does this difference in the way we think of the connectedness of space and the way in which a causally indexical representation is able to represent such connectedness mean that a causally indexical representation is not genuinely spatial? The matter is, to a certain extent, one of terminology. In describing the limitations of a causally indexical representation of space we can emphasise just how different a way of thinking of space it is from the way we in fact think of space. And yet it is plausible that animals represent space in a causally indexical way, and that they re-identify places using such a representation. I see no reason to deny that such a representation is a representation of space, or of the spatial environment, for as long as we recognise how it differs from the way we think about space. We might view the fact that a causally indexical representation is not a representation between simultaneously existing places in a similar way.

Perhaps that should satisfy us as an account of subjective spatial thought, it is the way creatures who lack concepts think about space. But recognising these limitations emphasises just how much is involved in our own everyday thought about space. We do not think in this causally indexical way.

There remains something of a puzzle concerning exactly how we should characterise the difference between causally indexical thinking about space, and thinking about space in the form of a cognitive map. The puzzle is just this: it seems that there will be no behavioural difference between an individual who represents space using a causally indexical representation, and an individual who represents space using a cognitive map - they will both be able to do the same things. But if that is so, then what reason could we ever have for attributing a cognitive map to someone? This question may be thought to be particularly pressing given that I have argued that attributions of content can only be justified on the basis of the behaviour they explain. The issues here are very complex, but there are at least two sorts of reason to which we might appeal to justify the attribution of a cognitive map. We might claim that what is in fact our conception of space can only be adequately characterised in terms of a cognitive map, we can only make sense of the way we think in that way. Or we might argue that self-consciousness requires it: self-consciousness requires self-location - a representation of oneself as an object located in space - and that requires the sort of detachment (the primitive theory of perception, and so on) provided by a cognitive map.

11. Summary Conclusion.

I have argued that all spatial thought and spatial representation requires the employment of a frame-of-reference, and I suggested that we might be able to explain the intuitive distinction between subjective and objective thought about space in terms of the difference between body-centred and non-body-centred frames-of-reference employed in identifying places. The suggestion was only partly justified: I discussed Evans's account of how we in fact think about the objective spatial world, and his conclusion that there is an interdependence between subjective thought about space (which employs a body-centred frame-of-reference) and objective thought about space (which does not). I suggested that there is a way of thinking about space that is both subjective and independent of objective spatial thought, and that Campbell's account of causally indexical spatial representation might be just that. But causally indexical spatial representation is very different to the way we in fact think about space, and if it does constitute a subjective way of thinking about space then that highlights just how much our own thought about space is dependent on an objective conception of space and the spatial world. Perhaps Strawson was right that, for

us at least, there is an interdependence between thought about places and thought about objects.

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