Time, Change and Reality

A New Theory of Persistence

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Abstract

In my thesis I will be proposing *situationalism*: a new theory of how it is that things change over time. It is B-theoretic, eternalist and endurantist. The central contention of the theory is that *what is true* can differ in a metaphysically significant way from time to time.

The theory emerges as a solution to the problem of change. In my first chapter, I argue that change is genuinely problematic (*contra* some of the recent literature). There are at least three ways to generate problems from change, and I elucidate problems from the law of non-contradiction and the indiscernibility of identicals. In the second chapter, I examine the nature of change and contend that the current major solutions to the problem fail to uphold our intuitive notion of change. Chapter 3 introduces the idea of a *situation*; a part of reality. The fourth chapter applies situations to the problem of change and comes up with a new solution. The solution relies on a denial of *universal persistence*; the denial of the idea that what is true in a situation *s* is thereby true in every situation of which *s* is a part.

Chapter 5 considers the infamous Ship of Theseus case, and concludes that situationalism can also solve this problem. The situationalist account of the Ship of Theseus puzzle enables us, in Chapter 6, to briefly demonstrate the analogous application of the solution to a series of other persistence puzzles.

The seventh chapter discusses the metaphysical consequences of such a view. The core claim is of the primacy of parts of reality over reality as a whole. It is a position according to which truth in situations is fundamental and situations needn't cohere. I hold that the theory has significant costs but also substantial benefits. For this reason it is worth serious consideration.

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Introduction

In the chapters that follow, I will be proposing a new theory of how it is that things change over time. Although the theory is offered to anyone who will find a use for it, I take it to be a theory according to which objects endure through B-time. The central thesis of the theory is that *what is true* can differ in a metaphysically significant way from time to time (and, indeed, place to place). This introduction will provide an overview of what is to follow by outlining each of the chapters and explaining the scope of the inquiry.

In the first two chapters I try to establish an initial motive to develop such a theory of persistence, given that there are a range of competitors already on the market. Having a theory of change over time is a good thing in general, but the need is made more pressing by puzzles that challenge the whole coherence of the notion. The first chapter argues that there are indeed significant metaphysical puzzles about persistence through change, *contra* some of the recent literature. It develops three versions of a problem from change, problems which need to be solved. All three problems arise from a central tension between sameness and difference. The problems use the law of non-contradiction and the indiscernibility of identicals. The second chapter argues that the dominant alternative theories of persistence are not able to solve the problems that change poses without sacrificing an intuitively attractive conception of change. Particularly, they seem unable to keep hold of substantial incompatibility. In effect, they solve the problem of change by proposing a revision of the *prima facie* notion of what change is. It would be better if we didn't have to make this sacrifice, and hence it is worth looking for a further solution to the problem.

My solution to the problem aims to keep hold of what I consider the intuitive notion of change. It makes use of *situations*, which are philosophical entities used in various places, including in semantics and in theories of information. Situations are parts of reality. To get a conceptual grip on them, we can think of them as parts of possible worlds (though situation theorists would take situations to be more primitive than worlds). In the third chapter I introduce situations, and in the fourth I show how they can be used to solve the problems of change. It is essential to this solution that situations do *not* have the following property: what is true in a situation is true in any larger situation that contains it. The property, confusingly called persistence (strictly, universal persistence), is one that some situation theorists accept and others deny. Our situation theory is not universally persistent, i.e. we hold that something can be true in some situation and not in a situation of which it is a part. This generates a solution to the problems of change.

The fifth and sixth chapters take the solution to the problem of change and apply it more broadly to other puzzles of persistence. Chapter 5 spends some time considering the infamous Ship of Theseus case, and concludes that situations can indeed solve the problem in a similar way by denying persistence. In solving the problem, it becomes apparent that the necessity of identity cannot be as straightforward for us as it is for many. The situationalist account of the Ship of Theseus puzzle enables us, in Chapter 6, to briefly demonstrate the analogous application of the solution to a series of other persistence puzzles.

Chapter 7 is of a slightly different nature. It comes in two parts. In the first I develop a picture of temporal situations, which are the situations corresponding to times. I use these to demonstrate the compatibility of situationalism with relativity, and to speculate on the

relationship between situations and time. In the second, I look at the metaphysical commitments of situationalism, drawing on some related theories for comparison.

From these seven chapters, I draw certain conclusions. In the first place, there are problems of change and there's sufficient worry with the current major solutions to investigate other possibilities. Second, if we construe situations and their relationships in a certain way they can provide us with a novel solution. Third, this situationalist position also solves the other puzzles of persistence. Fourth, the theory is straightforwardly compatible with relativity (unlike presentism). Fifth, the theory generates a distinct understanding of the nature of time and of the nature of reality.

So much for the outline of what is in this thesis. For the rest of this introduction, I wish to briefly account for some things which are *not* in the thesis. There will always be omissions, but here I give reasons for at least some of these.

The title of this thesis is '*Time, Change and Reality*'. But, in their different ways, each of these three has been the target of scepticism. Scepticism about reality is generally scepticism about the *nature* of reality and our *access* to it. To challenge the *existence* of reality would be thoroughly extreme scepticism, and is perhaps incoherent: even Cartesian doubt stopped short of this. I shall not say anything to try and defend the nature of 'reality'; the thesis I propose could even be seen as a revision of reality. Nor shall I take on the sceptic over the issue of our access to reality. Our access to reality is a topic I leave for epistemology. I shall, however, say at least a couple of words about sceptical attitudes to the other two aspects of the title: time and change.

It will be an absolutely fundamental assumption in my discussion that time and change exist. A very quick way to undermine what follows would be to deny this

assumption. There is historical precedent for such a sceptical denial. Parmenides and the Eleatics argued against the existence of change at the beginning of philosophical thought, and McTaggart's seminal argument for the unreality of time in the early 20th Century tries to demonstrate the inconsistency of time and change.[1] The very fact that change is problematic might make us suspicious of its existence. And the seeming intractability of the nature of time, despite centuries of investigation, might give rise to worries.

However, despite it being fundamental to my project that time and change exist, I will not attempt to argue for them. I take time and change to be such basic parts of our world and our worldview that to deny their existence is to rule oneself out of the philosophical conversation. I would, of course, be delighted to find a convincing *argument* for the fact that these two exist. But, as is the case with a variety of different types of scepticism, it is difficult to find watertight arguments against the sceptic. Even though the denial of time or change seems wildly counterintuitive, we shall have to be content with just assuming their existence.

Perhaps, then, I can simply restrict this philosophical debate to those who *do* accept that both time and change exist. This thesis can then be seen as a contribution to that particular debate. After all, those who don't believe that both time and change exist are unlikely to find what follows interesting.

There are a few other points to be made before we begin. In the thesis I try not to get drawn into too detailed a discussion of situation theory. In particular, I try to remain as uncommitted as possible about nature of situations. An example of the sorts of questions I don't consider at depth is whether there is such a thing as a situation containing all other

[1] Such scepticism is present in non-Western philosophy too, including in the Upanishadic thinkers in the Hindu tradition.

situations. I leave these questions aside for two reasons. In the first place, I want my theory to make as few assumptions as possible, and therefore to be available to as many people as possible. Taking a side in the debate about questions in situation theory would undermine this. I therefore only make stipulations about the nature of situations and their relationships when this makes a material difference to the account I presented. Secondly though, and more practically, I feel that it would be better to give space in the thesis to the implications and uses of situationalism rather than to situation theory *per se*. It is interesting to investigate what situations are like, but it is even more interesting to investigate what they can do.

Another notable absence from the coming chapters is a full consideration of the criticisms that can be levelled at the situationalist account. We do, in Chapter 7, distinguish situationalism from the A-theory and thereby avoid worries from relativity. We also point out several consequences of situationalism that will raise, if not objections, at least eyebrows. These include; in Chapter 4, the denial of universal persistence to propositions across situations; in Chapter 5, the denial of a strong form of the necessity of identity and of a strong form of the distinctness of discernibles; and, in Chapter 7, the primacy of parts of reality over reality as a whole, so that what is true in smaller situations is more fundamental. But we don't seriously consider the palatability of these consequences, or arguments against the theory from them. The reason for this is relatively simply: the project is primarily a constructive one. Trying to second-guess criticisms runs the risk of incorrectly judging where the weak points lie. It seems better to me to let others determine where the situationalist theory is susceptible, and the nature of its weaknesses.

A final explanation of omission: I do not consider in any depth the merits and faults of the alternative theories that are available. I suggest that the popular choices fail to uphold real change (Chapter 2), but say little about their persuasiveness compared to situationalism and nothing about their persuasiveness compared to each other. This is not meant to give the impression that they are fatally and irrevocably undermined by my criticism in Chapter 2. Obviously there is more to-and-fro to be had. All I seek to do in my discussion of the alternatives in Chapter 2 is to motivate a search for some further options. To ascertain the comparative strength of all the theories would be a significant and interesting topic but, again pleading the issue of space, I have chosen to focus on the constructive project of fleshing out the possibilities of situationalism. This means that what is to come is not an argument for situationalism, but an exposition of it. I do hope that some merit is found in the theory, and in particular in the univocal way that it deals with the puzzles surrounding persistence. But I do not here try to suggest that it should be adopted as the 'best' theory available. There is a lot more work that would need to be done to convince anyone, myself included, of that.

Chapter 1

The problem(s) of change

Introduction

Persistence and change are concepts that play a fundamental role in our picture of reality. We all accept (or at least we should) that things change, and continue to exist through change. A poker is hot at one time and cold at another. A candle is first straight and then later bent. A man has long hair before a haircut and short hair afterwards. These are the sorts of thing that we often say and that have a significant role in how we think things are. The persistence of objects through changes is crucial to the practical fields of law and ethics as well as in causation and personal identity. The fact that things *do* persist through change is widely accepted, but *how* things persist through change is a matter of debate. There is no obvious answer to the following question: how is it that things can exist through time and change their properties? Or, in other words: how can things which change their properties survive?

In this chapter we shall be arguing that there *is* a problem of change, and we shall be proposing three forms of that problem. To begin with, though, we'll outline the current state of the debate and what is needed for something to count as a problem.

The state of play

The current debate has an interesting dialectic. Although difficulties with change have a long history,[1] David Lewis developed a modern problem with change in his *On the Plurality of Worlds*.[2] There he considered it briefly as an analogue to problems of trans-world identity across different concrete possible worlds. He identifies some properties as intrinsic: properties like bent, straight, hot and cold. They are intrinsic because an entity has these properties without depending on anything outside itself. Lewis's puzzle examines intrinsic properties that entities have at some times but not others. The problem of temporary intrinsics, as he coins it, is supposed to demonstrate conclusively the superiority of Lewis's view of the persistence of objects: perdurance. The alternative solutions to the problem he considers (properties as relations and presentism) are rejected. Thus, the problem is seen initially as an argument for the claim that objects have temporal parts.

There were a couple of different types of reply to Lewis. Some suggested that he dismissed the competing solutions too hastily.[3] Others claimed that the alternatives he presents do not exhaust the possible solutions.[4] Some even saw the argument as favouring their own position over the temporal parts theory.[5] Lewis and his followers, in turn, renewed their arguments against the old solutions and argued against the new ones.

All sides now seemed to claim that they had convincing solutions to the problem and, often, that their competitors did not. The discussion appeared to reach a stalemate,

[1] As mentioned in the introduction, change is a longstanding philosophical issue. Parmenides in the 5th Century B.C. seems to have denied that change occurs. McTaggart at the beginning of the last century famously argued that real change leads to contradiction.
[2] Lewis (1986). The passage is found on pp. 202-205.
[3] E.g. Mellor (1981), (1998), and Zimmerman (1998).
[4] E.g. Parsons (2000) and MacBride (2001).
[5] E.g., Merricks (1994) and Hinchliff (1996), who see the argument from temporary intrinsics as favouring presentism.

and Sider in his influential *Four-Dimensionalism* in 2001 did not see the problem of change as a major consideration in the debate between perdurance and endurance. Sally Haslanger (2003) saw the problem as a more substantial issue, but also identified a range of possible solutions that were available. It seemed the problem had lost its sting and its dialectical force. It was unclear who, if anyone, it favoured.

More recently still, three papers have been published that question whether there is a problem here at all. Hofweber (2009), Rychter (2009) and Hansson (2007) all contend that there is no real problem of change and that the problem of change should therefore play no role in deciding what view we should have of persisting objects.

It seems that the problem of change is petering out. Perhaps there never was a problem in the first place. At the very least, the three recent papers have made clear that the problem has no settled and obvious structure. There are a number of different understandings of the issues involved. It cannot be satisfactory any longer to gesture towards a vague problem before setting out one's solution. In order to see if there really is a problem here we will need to go into some detail about the dynamic by which change is supposed to give rise to difficulties.

When is something a 'problem'?

We are aiming to show that change is philosophically problematic. In order to do so, it will be helpful to start by saying what we're looking for. Unhelpfully, none of Hansson, Rychter and Hofweber provides us with an account of what it is for something to be a problem, so we will have to give our own interpretation. We can start with a platitude: a

problem is something that requires a solution. It is a difficulty that motivates some further work, the purpose of which is to overcome this difficulty. In philosophical terms, we might say we have a problem when we have a collection of thoughts, intuitions or concepts that do not appear to fit well together. Solving the problem seems to require either explaining why these do fit well despite appearances, or adapting some or all of them to make them cohere comfortably. So, to show that there is a problem with change we need to show that some features of change cases require further work to show how the collection of thoughts, intuitions or concepts involved can, in fact, cohere well together.

It is worth noting, though, that we have just *stipulated* that if change satisfies these conditions then it generates a problem. It is always open to those who deny a problem here to offer an alternative view of what problems are, under which change doesn't generate a problem. It is going to be hard to rule out all such possible views, but I don't think we need to. We aren't especially tied to the term 'problem', so if it transpires that change does in fact give us concerns about the coherence of some group of concepts we hold it doesn't much matter whether we call it a problem or not. Once we have got that far it becomes a terminological dispute, and if all that is claimed against the 'problem' of change is that it doesn't satisfy some necessary and sufficient conditions for some technical use of the term 'problem', then the main battle has been won.

But I don't think that's what Hofweber, Rychter and Hansson are claiming. By saying that there is no problem of change I take them to mean that there is nothing puzzling about change; nothing to worry us and nothing that we should spend time on. Their independent conclusions along these lines all suggest that we should consign the problem of change to history, and this must be because they feel there is no significant *issue* raised by change. We

hope to show that there is. And if we manage to show this much, we won't be too concerned with whether such an issue can be called a problem.[6]

The central tension

So, we have some clarity over the recent history of the problem of change and what it takes for something to qualify as a problem. In the coming sections, we will expound three forms of the problem from change. All three spring from the same central tension, however. It is this tension that we shall examine here.

On the one hand, change seems intuitively to involve some sense of variation or alteration. If there is change, there is difference. And if there is no difference, there is no change. Difference is a necessary condition for change. But on the other hand we are talking about change in persisting objects. There is a continuing thing that exists before, during and after a change. The thing before the change is identical to the thing after the change; it is the same thing. If it is not, then nothing has persisted. Identity, or sameness, is a necessary condition for persistence.[7] So in cases of persistence through change we have both difference and sameness, and these intuitively seem to be in tension.

This tension can be cashed out in a number of different ways. The most basic way to try to generate a problem would be to argue something like the following:

[6] We shall focus on the question of whether there is an issue here, to the exclusion of questions about such an issue's metaphysical import and how this illuminates the place of metaphysics in general. These are questions looked at in Raven (2011). But Raven only spends a couple of paragraphs on whether or not there *is* an issue, and his defence of it seems unconvincing. Einheuser (forthcoming) argues against Raven and defends the no-changers. As we aren't following Raven's criticism of the no-changers, and are offering a criticism of our own, we shall not discuss her reply.

[7] This should not be understood as begging the question against the fourdimensionalist. In both standard fourdimensionalism and the stage view there *is* something identical throughout the change, namely the worm. If there is not, then nothing has persisted.

> Difference is a necessary condition for change. Sameness is a necessary condition for persistence. Nothing can be both different and the same. So either there is change and no persisting object or there is a persisting object but no change. We cannot have both persistence and change.

However, we can distinguish two types of identity and difference at work here: qualitative and numerical.[8] Qualitative identity is having all the same attributes or properties; numerical identity is being the same thing. It is clear that no thing(s) can be qualitatively identical and qualitatively different. Nor can any thing(s) be numerically identical and numerically different. But what is required for change in a persisting object are qualitative difference and numerical sameness. The question we then need to ask is whether qualitative difference and numerical sameness are consistent. To show change causes a problem, we need to give reasons that qualitative difference and numerical sameness *aren't* consistent. If they are not, then persistence of changing objects is impossible.

There are two broad ways we could go about this. In the first place, we could argue that qualitative difference implies numerical difference. Numerical difference and numerical identity are clearly inconsistent. Hence, if the argument works, qualitative difference and numerical identity are inconsistent. And if change in persisting objects requires both, it is not possible. We shall argue for this form of the problem using the law of non-contradiction. This is Problem 1.

In the second place, we could argue that numerical identity implies qualitative identity. Qualitative identity and qualitative difference are clearly inconsistent, hence the

[8] Hofweber recognises this: see his (2009): 294.

argument would also show that numerical identity and qualitative difference are inconsistent. Again, the persistence of changing objects requires both and hence is impossible. We shall present this form of the problem using the indiscernibility of identicals. This is Problem 2.

We shall also offer a third problem, of a slightly different type. Problem 3 is an alternative version of the problem in propositional terms. Identity and difference will play their part in this problem too, but it is *propositions* which will display the identity and difference. We will not, however, spend too long considering the connection between Problem 3 and the other two forms (or, indeed, on the connection between Problems 1 and 2).

The three problems should present a robust case, as any one of the three would be sufficient to show that there is a problem from change, and motivate the search for a solution. In fact, I think that all three are viable problems, but if my arguments are not found convincing for any one of the problems, either of the other two will do.

Problem 1- a problem of change from non-contradiction

The first version of the problem relies on the law of non-contradiction, so we shall begin by briefly describing this law. [9] We shall then move on to the problem itself.

[9] As a matter of interest, the most popular way of formulating the problem of change in the literature is by recourse to the law of non-contradiction in the context of properties.

The law of non-contradiction

The law of non-contradiction is a term which actually covers a number of principles in logic, metaphysics and semantics.[10] In each of these fields, its essence is that it cannot be the case that *P* and not-*P*. What *P* stands for varies. At the level of propositions, it amounts to the claim that no proposition and its negation can both be true. In first order logic, the law of non-contradiction is treated as a schema: $\forall x \neg[Fx \wedge \neg Fx]$.

The law of non-contradiction is very hard to deny. But some philosophers do indeed deny it. Graham Priest, for example, believes that in certain cases contradictions can be true: this view is called dialetheism. One example of such cases are Liar sentences (e.g. 'this sentence is false'). Priest holds that in an instance of a Liar sentence, the sentence is both true and not true. This is highly controversial. If it is an assumption of our formulation of the problem of change that the law of non-contradiction always holds it seems that one way to avoid the problem is to reject this assumption. We shall not, therefore, assume that non-contradiction always holds. But we shall assume the more restricted claim that non-contradiction holds in cases of change: there may be logico-linguistic arenas where we should deny non-contradiction but we cannot deny it of the concrete world. Priest, however, does precisely hold that change cases are cases where non-contradiction is violated.[11] I have two comments to make on such a position. In the first place, dialetheism in cases of change is even more controversial than the controversial denial of the universality of non-contradiction. Secondly, we stated that some phenomena generate a philosophical problem if they require further philosophical work to cohere with our intuitions and concepts.

[10] See Detlefsen, McCarthy and Bacon (1998).
[11] See the latter chapters of Priest (2006).

Dialetheism about the concrete world constitutes a revision of our intuitions. Thus Priest's position, though consistent, doesn't undermine the fact that there's a problem from change. For these reasons, we shall ignore such a possible response, and take non-contradiction to hold in the scenarios we are considering.

In the context of the problem of change, the law is usually presented in terms of properties of objects. For example, Haslanger's third principle in constructing the problem is:

> "*Law of non-contradiction*. Nothing can have incompatible properties, i.e. nothing can be both P and not-P."[12]

Kurtz provides similar wording when presenting her 'non-negotiable' principle:

> "CONSISTENCY: Nothing can have incompatible properties. (CONSISTENCY follows from the law of noncontradiction: Necessarily not, for any object *x*, *x* has the property *F* and *x* lacks property *F.*)"[13]

Hinchliff and Lombard, too, seem to be relying on some such principle when they say, respectively:

> "There can be two candles with incompatible properties; but if the straight candle persists, it is the bent candle. So there is only one candle with incompatible shapes, which is impossible."[14]

[12] Haslanger (2003): 316.
[13] Kurtz (2006): 2.

> "But eternalism...appears to imply that the object in question is then both *F* and not *F.* But, this is impossible."[15]

Despite the fact that non-contradiction is frequently understood this way in the literature, it isn't made explicit what the precise connection is between contradictions and incompatible properties. Why does non-contradiction entail that nothing has incompatible properties? What account of incompatible properties should we give that connects them to contradiction? It is therefore unclear why the principle that is stated should be called the law of non-contradiction. We shall later return to this issue,[16] but for the moment we just simply grant the principle that nothing can have incompatible properties. Working with this principle, we can construct our first problem of change.

Problem 1

The law of non-contradiction tells us that nothing can have incompatible properties. Thus if x and y have incompatible properties then x ≠ y. If we are to use the law of non-contradiction to argue that in change cases qualitative difference implies numerical difference, we need to show that the difference required for change is the difference of having *incompatible* properties. If this were so, qualitative difference would be inconsistent with numerical identity and objects wouldn't be able to persist through change. But because

[14] Hinchliff (1996): 119.
[15] Lombard (2003): 166.
[16] The issue will motivate our preference for a slightly different version of the problem under the first reply to our upcoming version.

it is a metaphysical datum that things *do* persist through change, if change requires incompatible properties then we have a problem. Let's investigate, then, whether when things change they have incompatible properties.

As we have said above, it is a necessary condition for change in objects that there is *some* difference in properties, i.e. some qualitative difference. For, if there is no difference in properties, how can something have changed? This difference implies that an object first has a property and later lacks it (or *vice versa*). So, it is a necessary condition for something to change between two times that it has some property *F* at one but not both of these times. We do not yet have *incompatible* properties. But let us define another property *G* as simply the property *not F* ($\neg F$).[17] If something has *F* at some time but not another, it has *F* at the former time and *G* at the latter. We can therefore state that a change occurs if something has both *F* and *G* (at different times). *F* and *G* are clearly incompatible, as the latter is the negation of the former. Generalising from *F* to all properties, change in objects therefore requires objects to have incompatible properties, though consecutively.

More formally, we can propose the problem for a changing object O as follows:

(1) No one thing can have incompatible properties (principle of non-contradiction)

(2) If something changes then a property it has before the change is incompatible with a property it has after the change (principle of change)

(3) O changes (premise)

(4) A property O has before the change is incompatible with a property O has after the change (from 2 and 3)

[17] The existence of such a negative property is somewhat controversial – we look at this in the next section.

(5) O is one thing before and after the change (from 3)

(6) O is one thing which has incompatible properties (from 4 and 5)

But (1) and (6) contradict. We have a *reductio* of the intuitive concept of change and persistence.

There are, however, a number of issues that have been skated over in our quick presentation of this problem. By discussing these, we can move towards a more robust form of the problem.

Replies to Problem 1

(a) The sparse properties view

We can imagine a response to this argument that denies (2). One way to do this is to deny that if any object changes with respect to any property *F,* it will thus have another property *G* which is the property of *being not F.* We might challenge this on the basis that *G* isn't a legitimate property. For example, one might think that there are only 'positive' properties (for some sense of positive that rules out *G*).

But can we demonstrate that change requires incompatible properties while only appealing to positive properties?[18] We could define *H* as a positive property incompatible with *F.* This may be the complement of *F*; if *F* were *hot*, *H* would be *cold*. If *F* were *hungry*, *H* would be *full*. But it need not be, for if *F* is *red*, *H* could be *green*, or *blue*, or *white*. Likewise,

[18] An anonymous assessor of a previous draft has pointed out that there are a number of other ways to deal with the sparse properties view. One would be to frame the problem in terms of predication, as it is uncontroversial that for any predication Px the predication of its negation is permissible.

if *F* is *10kg mass* then *H* can be any of a range of other masses. Given (1), that nothing can have incompatible properties, we can derive the problem just as easily from *F* and *H* as from *F* and the putative property *G.* The question, then, is whether change in an object entails that the object has both *F* and some incompatible positive property *H*.

This is controversial. It appears conceptually possible that an object could acquire an additional positive intrinsic property without losing any of its previous positive properties.[19] In such a case, there is no property incompatible with the newcomer which the object has before the change. We can run the example the other way too; it seems conceptually possible that an object loses a positive intrinsic property without gaining any additional positive intrinsic properties. In these cases, the object doesn't have both *F* and *H*, and we have a counterexample to the hypothesis that in every case of change in an object that object has incompatible properties.

We should note that Problem 1 is still relevant for the sparse properties view in *most* cases of change, for in most cases of change an object *does* have incompatible positive properties. It is only in exceptional cases that an object changes without having incompatible properties. So if we are looking at everyday cases of change then (2) will apply and Problem 1 remains. And presumably Problem 1 is still a problem for change even if it's not a problem for *all* instances of change. So, if a poker changes from being hot to being cold *everyone* will be caught by Problem 1.

I think, though, that we can do better than this. We can revise Problem 1 to include *all* cases of change, and in so doing we end up with a more satisfying argument. Even in the counterexample cases the following holds: the object has a property before the change and

[19] Plausibly things can and do gain positive *extrinsic* properties without losing some, but these would be examples of Cambridge change.

lacks it afterwards or *vice versa*. So we can still uphold the claim that if something changes with respect to any property *F,* it is *F* at one time and not at another. This is enough to recreate Problem 1 for the positive properties view, making a few adjustments:

(1') No one thing can both have and lack a property (principle of non-contradiction)

(2') If something changes then it has a property at one time and lacks it at another (principle of change)

(3') O changes (premise)

(4') O has a property at one time and lacks it at another (from (2') and (3'))

(5') O is one thing before and after the change (from (3'))

(6') O is one thing which both has and lacks a property (from (4') and (5'))

We have changed our principle of non-contradiction; it now differs from the principles given in the literature. How plausible is (1')? I take it to be very plausible. In fact, I take it to be more plausible than the principles that use the incompatibility of properties. For starters it more obviously follows from the logical form of non-contradiction.[20] But it also doesn't require any additional notion of incompatibility between properties. It's hard to see how we could deny (1'): how could one thing both have and lack a property? If O is *F,* this seems to rule out it being the case that O isn't *F.* Thus (1') is able to tie together numerical and qualitative difference at least as well as (1) does.

[20] This is quite straightforward: the propositional law of non-contradiction is: $\forall p\ \neg[p \wedge \neg p]$. Thus $\neg\exists p\ [p \wedge \neg p]$. Substituting Fx for the proposition: $\neg[Fx \wedge \neg Fx]$, which is our statement (1') (thanks to Josh Parsons for this).

(2’) has also changed: it now states that a changing object has a property at one time and lacks it at another. But this is no less plausible than (2), the claim that a changing object has incompatible properties at different times. I take it, then, that this form of the argument is also valid and is sound.

I prefer the second version of Problem 1. Although it does not have the weight of the canon behind it, it seems to avoid a few issues that the original form does not. It is this version, therefore, that I offer as Problem 1.

(b) Misuse of non-contradiction

A second challenge to Problem 1 comes from the recent papers by Hofweber and Rychter. They are replying to a version of Problem 1 that uses incompatible properties in its description of the law of non-contradiction. It will be easier for us, therefore, to discuss the challenge with reference to this version of the problem. Appropriate translations could be made at each stage to apply it to our preferred version of the problem.

Although almost everyone accepts the law of non-contradiction, Hofweber and Rychter both claim that (1) is not merely a statement of that law. We can identify two readings of (1), and neither of the readings provides us with a decent argument. The readings are:

(1a) No one thing can have incompatible properties at one time

And

(1b) No one thing can have incompatible properties, even at different times

The task Hofweber and Rychter set for the proponent of Problem 1 is to choose one of these readings and show how it creates the problem.

(1a) is uncontroversial but will not do the required work in the argument. If (1a) is all that (1) claims, then it does not contradict (6). For while (6) states that O has incompatible properties, these properties are had *at different times*. Before the change, O has one property. After the change O has another and lacks the first. The only way to use (1a) would be to supplement it with some premise that claimed that, if an object has a property at one time, it has it at all times. This is clearly a highly dubious claim. If the argument is to have any force, then, (1b) must be what is meant.

How plausible is (1b)? As Rychter points out, Aristotle's formulation of the law of non-contradiction is (1a), not (1b).[21] Despite this, Kurtz claims Aristotle as an authority to support her atemporal formulation, and even quotes a passage where Aristotle clearly mentions the qualifications of time and respect.[22]

There is good reason to reject (1b). Simply put, it rules out our intuitive concept of change. If change involves incompatible properties being had by one and the same thing then the phenomenon of change is genuinely inconsistent with (1b). (1b) gives us a world of changeless objects. This makes it seem at least *prima facie* unreasonable to stipulate that an object cannot at any time have a property that is incompatible with properties it has at any other time. (1b) therefore appears unpalatable.

We can give another reason to reject (1b). We can make an intuitive distinction between two types of property. The first are permanent properties; if an entity has a

[21] One example of this can be found in the *Metaphysics* IV 6: 1011b13–20.
[22] Kurtz *op. cit.*: 25.

permanent property at any time, it has it at all times. Examples of permanent properties include necessary or essential properties (like being a man) but are not restricted to these. *Always red* and *born on a Wednesday* are also permanent properties. The second type of properties are temporary properties. These are the properties that can be had at one time and not another. Examples include *bent*, *4 metres from a tree* and *the tallest person in the room*.

The issue is that (1b) makes all properties permanent properties. Being red implies being always red, for if something is a different colour at some time then this violates (1b). A red thing cannot ever be yellow, or green, or blue etc. It must always be red. Something red at some time cannot have any other colour at another time. All properties are permanent, none are temporary. (1b) does away with our intuitive distinction between temporary and permanent properties as it does away with the intuitive notion of change. This counts against (1b). The initial evidence therefore suggests that a temporal version of the law is much more acceptable. And the temporal version isn't enough for Problem 1.

So it seems like there is no problem of change from Problem 1, as there is an ambiguity between two readings of one of the premises of the argument. However, I believe that this appearance is mistaken, and that there *is* a problem here. Despite the fact that (1b) is implausible, Hofweber and Rychter have failed to show that Problem 1 is not a problem. For in order to distinguish readings (1a) and (1b) we must assume a difference between them that is exactly what the problem of change highlights. Let's examine this thought more closely.

(1) is the claim that nothing can have incompatible properties. What Hofweber and Rychter offer us are two ways to understand 'have' in this claim. In the first case, (1a), we could understand it as 'have at one time', in the second, (1b), having is understood as 'have at any time'. The ambiguity that is crucial to their case is found in the ways in which things have properties. Specifically, the ambiguity is between two ways to temporally index the having of incompatible properties in (1).[23] They contend that an object having incompatible properties at the same time is impossible, but that having incompatible properties at different times isn't. But why this difference? Why is one impossible and the other possible?

These questions take on further significance when we reflect on the case of a persisting object having incompatible intrinsic properties. For intuitively the having of intrinsic properties doesn't depend on anything other than the object itself. In particular, it doesn't depend on what time it is. If a candle is straight at some time *t,* we want to say it *just is* straight. If it is bent at a later *t'*, it *just is* bent. In such a case, it doesn't seem like (1) is ambiguous at all. It simply states that nothing can (just) have incompatible properties.

Hofweber and Rychter could simply be claiming that all instances of having of properties are temporally loaded. This would be fine, but it's a *solution* to the problem, called adverbialism. It isn't a good way to show that there is no problem by proposing a solution. And if we have the intuition that in at least some cases of change things just have properties, further work will need to be done to show why this intuition is an error. This qualifies Problem 1 to count as a problem.

It's worth considering a particular example to demonstrate that Hofweber and Rychter have not 'dissolved' the problem of change. Consider the following hypothetical

[23] In the version of Problem 1 that we prefer, this translates to an ambiguity between two ways to temporally index having and lacking a property in (1'). My reply is the same.

case: An object changes between *t* and *t'* by having the property *F* at *t* and later having some incompatible property *G* at *t'*. However, imagine that, at *t'*, the object travels back in time to *t,* and in so doing doesn't change with respect to *G.* Thus, at *t* we have an object which both has the property *F* and the property *G,* with which it is incompatible.

In such a case, if it is conceptually possible, we have a scenario in which even (1a) would be violated. This shows that the distinction between readings (1a) and (1b) doesn't conclusively undermine the problem of change. If (1a) is supposed to be inviolable, we need an explanation of what's going on in the time-travel case. It seems plausible that what's going on in the time-travel case is a special case of what occurs in a normal change case. We should therefore expect the explanation of the time-travel case to also have something to say about how the normal cases of change do not violate non-contradiction. Such an explanation will not appeal to some distinction between a temporal and atemporal reading of non-contradiction.

This demonstrates that temporally indexing the having of properties will not be sufficient to rule the problem of change a non-problem: if it doesn't get rid of the problem in all cases, it doesn't get rid of the problem.

So, to conclude the discussion of Problem 1: we have seen that tension between identity and difference can be developed by the law of non-contradiction. Our first pass, following the literature, was to use incompatible properties. If two properties are incompatible, one object cannot have them both. Difference in properties is qualitative difference. But if this difference is between incompatible properties then qualitative

difference implies numerical difference. If there is numerical difference, nothing persists. As it is *incompatible* properties that are necessary for change, change causes a problem.

The second, refined version of the argument used non-contradiction as the assertion that nothing can have and lack a property. Difference in properties entails that something has and then lacks a property. But no one thing can have and lack a property, so qualitative difference implies numerical difference. Once more; if there is numerical difference, nothing persists. This is a problem. The second version of the argument is our preferred form of Problem 1. Problem 1 is a problem, and it survives the two challenges.

Problem 2- a problem from the indiscernibility of identicals

Let's turn then to the second way to generate a problem: by showing that numerical identity entails qualitative identity. First, we shall introduce a principle that ties these two together.

The principle of the indiscernibility of identicals

The indiscernibility of identicals is a principle that brings together qualitative and numerical identity. It states that for any thing x and any thing y, if x is identical to y then any property x has, y will have too. Or, as it is sometimes expressed, anything true of one of the things is true of the other. Numerical identity entails qualitative identity.[24] It is the converse of the identity of indiscernibles, which states that if two things are qualitatively identical

[24] Perhaps it is more than this, as two things which are identical would share *everything*. If there is more to this 'everything' than qualities then they would share these too.

they are numerically identical. Both of these principles are dealt with at length by Leibniz so they are jointly and separately called Leibniz's Law. The former principle seems much less controversial than the latter. If x and y are identical, surely they have all the same properties? They are the same thing! To suggest that one and the same thing both has and does not have a property violates non-contradiction.[25]

Indiscernibility of identicals is intuitively a very plausible principle. But before we go on to see how it might be used to formulate a problem of change, we shall need to say a little more about it. We can put it more formally: for any x and y and any property *F,* if x and y are assigned the same thing then if x is *F* then y is too: $\forall x \forall y \forall F\ [x=y \rightarrow [Fx \rightarrow Fy]]$. This is perfectly natural. For the two terms refer to the same object, and the object either has or doesn't have the property.[26] Anything one can predicate of the object referred to by one term will be predicable of the object referred to by the other: they are the same object. We can emphasise the plausibility of the principle by considering the following question: what would have to be the case for the indiscernibility of identicals to be false? We would have to have some x and y such that x = y but x satisfied some predicate that y didn't. This seems manifestly absurd. The indiscernibility of identicals therefore seems unassailable.

Despite this, however, there is a group of alleged counterexamples to the principle that need to be considered. Imagine a person, call him Fred, who knows that George Orwell wrote the novel *1984*. But Fred doesn't know that George Orwell was the pen name of Eric Blair, i.e. that Eric Blair *is* George Orwell. Thus, Fred doesn't know that Eric Blair wrote *1984*.

[25] The principle of non-contradiction therefore entails the indiscernibility of identicals. But they are not equivalent, for the indiscernibility of identicals doesn't entail the principle of non-contradiction. There is no inconsistency in the following: suppose that the indiscernibility of identicals is true. Suppose also that some sentence, for example the Liar sentence 'this sentence is false', is in fact both true and false. In such a case, the indiscernibility of identicals is true but the law of non-contradiction isn't.

[26] We shall set aside the question of vagueness, which is not relevant to our considerations here.

But if Eric Blair is George Orwell, then they should share all properties. But it seems that George Orwell has the property *known by Fred to have written 1984* and Eric Blair doesn't. This is a violation of the indiscernibility of identicals.

The best response to this sort of example is simply to say that it doesn't threaten the indiscernibility of identicals. Instead, it is a challenge to a related but distinct principle: the principle that co-referential terms can be substituted for one another without altering the truth-value of the sentences in which they occur. We can show that it is this latter principle that is challenged by the following observation:

What Fred doesn't know is that 'George Orwell' and 'Eric Blair' are terms for the same thing. He doesn't know the reference of the term 'Eric Blair'. So the *term* 'Eric Blair' lacks a property that the *term* 'George Orwell' has, namely the property of *being known by Fred to refer to the writer of 1984*. But the thing referred to by both of these terms is not what's causing the issue here. For this to be a violation of the indiscernibility of identicals, a property would have to be predicated of the referent of 'George Orwell' that isn't predicated of the referent of 'Eric Blair'. And that's clearly not what's happening.

So, although it is a problem, it's not a problem for the indiscernibility of identicals. The counterexamples suggest that substitutability needs to be refined in certain contexts.[27] The important point is that the indiscernibility of identicals works in all contexts. Therefore we will take the principle as an assumption in what follows.

[27] See Taylor (1998) for further discussion and alternative solutions.

Problem 2

So, how might we formulate a problem of change from the indiscernibility of identicals? As we noted when discussing the central tension, in cases of change we require numerical identity for persistence and qualitative difference for change. But the indiscernibility of identicals tells us that numerical identity entails qualitative identity. If numerical identity entails qualitative identity, then in cases of change we have things which are qualitatively distinct but qualitatively identical. This is a contradiction.

Let's put this more formally using an example of a man who has a haircut. Call the man before the haircut Longhair and the man after the haircut Shorthair:

(a) Shorthair is short haired (premise)

(b) Being short haired entails not being long haired (premise)

(c) Shorthair is not long haired (from (a) and (b))

(d) Longhair is long haired (premise)

(e) Longhair = Shorthair (premise)

(f) If *a* = *b* then all properties *a* has *b* has too (indiscernibility of identicals)

(g) Shorthair is long haired (from (d), (e) and (f))

(h) Shorthair is not long haired and Shorthair is long haired (from (c) and (g))

We have a contradiction. Premises (a), (d) and (e) are a description of persistence through change, and are assumptions for the *reductio*. Premise (f) is the indiscernibility of identicals. Premise (b) is a statement about the properties *short haired* and *long haired*. It says that

they are incompatible; that they cannot both be had by an object. Shorthair has short hair, and this rules out his having long hair. These premises seem plausible, and they produce a contradiction. Change appears problematic.

Another way to see the problem is to consider the formulation of the indiscernibility of identicals: $\forall x \forall y \forall F [x=y \rightarrow [Fx \rightarrow Fy]]$. This is equivalent to $\neg \exists x \exists y \exists F [x=y \wedge [Fx \wedge \neg Fy]]$. If we substitute Longhair for x, Shorthair for y and the property *long haired* for *F,* we violate the principle. Longhair is long haired but Shorthair isn't. So it seems like we've found another significant version of the problem of change.

Reply to Problem 2

The above argument looks like a problem. However, Hansson, in his (2007), claims that the problem begs the question. Specifically, he argues that there is no challenge here for a B-theorist who endorses endurance. We shall show that there *is* a challenge, albeit one that has possible replies. Hansson's presentation of the issue is different from ours; he sets up two distinct problems. The first is directly from the indiscernibility of identicals and claims, simply, that there is something true of Longhair that isn't true of Shorthair, namely that he is long haired.[28] Hansson rejects this argument by contending that Shorthair is, in fact, long haired. The second argument follows from this reply and concerns the incompatibility of properties. The reply to the first argument suggests that Shorthair is both short haired and long haired. But this seems absurd because *short haired* and *long haired* are incompatible. Hansson claims this isn't absurd because the incompatibility doesn't

[28] Hansson uses the example of a candle changing from being straight to being bent, but this is incidental to the argument.

obtain across times. It is worth looking more closely at Hansson's two arguments and replies.

In the structure we have given to Problem 2, Hansson's alleged dissolution of the problem amounts to the following: he accepts (a) and (g) but denies (b) and hence (c). In other words, Hansson accepts that Shorthair is short haired and that he is long haired, but denies that being short haired entails not being long haired and thus denies that Shorthair is not long haired. So he claims that the argument is question begging because it assumes (b), and this is just what the endurantist B-theorist will deny.

The obvious worry here is that *long haired* and *short haired* are supposed to be paradigmatically incompatible properties. If there is any sense to be made of incompatible properties, *long haired* and *short haired* ought to be incompatible. But doesn't the incompatibility of *long haired* and *short haired* give us (b)? Not according to Hansson. According to him, the endurantist B-theorist ought to claim that the properties *long haired* and *short haired* are not incompatible *simpliciter*. Rather, "he will insist that they are incompatible only under certain circumstances – namely when they are instantiated by one and the same object *at a single moment in time*."[29] So (b) must have the phrase 'at the same time' included in it before it is acceptable. This is parallel to the move that Rychter and Hofweber make in response to Problem 1. Hansson then provides interpretations of (a) and (g) whereby they do not assert the incompatible properties of the same object at a single moment of time. His interpretations are: 'Shorthair is short haired at at least one time' and 'Shorthair is long haired at at least one time' respectively.[30] This does not generate a contradiction.

[29] Hansson (2007): 269. The italics are his.
[30] This is found in his footnote 8 *ibid*.

Hansson's proposal may seem promising. We can say that Shorthair is (at at least one time) long haired and that Shorthair is (at at least one time) short haired but still hold that being long haired and being short haired are incompatible because they cannot be true of anything at the same time.

But it will not quite do. First, let's distinguish it from the Hofweber/Rychter reply to Problem 1. They claimed that non-contradiction must be understood as temporal, and that a temporal version of the law isn't violated in cases of change because nothing both has and lacks a property *at any one time*. The object before the change has the property and it lacks the property after the change. This cannot be Hansson's position, for the indiscernibility of identicals shows that after the haircut Shorthair *does* have the property *long haired*. This is the cause of the problem! Hansson's suggestion is rather that properties are only incompatible when had at the same time, and that (a) and (g) assert something that doesn't require this. Premises (a) and (g) are to be understood *tenselessly*; they assert that Shorthair's having of the incompatible properties is tenseless. Hansson takes tenseless having to encompass 'was, is or will be'. In this sense of tenseless, one thing can (tenselessly) have incompatible properties.

However, Hansson's explanation is incomplete. Surely (a) and (g) are saying more than just that Shorthair is short haired at at least one time and long haired at at least one time? Granted, (a) and (g) do entail the tenseless claims Hansson describes, but this is not all they say. They say that Shorthair *is* short haired, and that he *is* long haired; they say that Shorthair *has* the property *short haired* and *has* the property *long haired*. This is the root of the problem. Even if incompatibility is understood as an inability to be simultaneously

instantiated, the premises (a) and (g) might seem to be asserting something which entails that. Hansson's proposed interpretation of (a) and (g) misses something vital.

This can be made more apparent if we run the argument with explicit reference to the present time. Take (a) and (g) to be asserting that Shorthair is presently short haired and that he is presently long haired. Even if we use a temporal version of (b), being presently short haired and presently long haired is incompatible. The argument goes through if we stipulate that the copula in (a)-(h) is to be understood as present tensed (*contra* Hansson).

What could Hansson say against a present-tensed version of the argument? He is defending a B-theory endurance picture, so cannot appeal to some robust notion of which time is the present to rule that *either* (a) *or* (d) is true at any time, but not both. Given a B-theory picture, it seems that if (a) is true at any time, it is true at all times. The same goes for (d).[31] So, at the very least, Hansson owes us an explanation of why the present-tensed version of the argument is inadmissible.

We have pointed out that Hansson's B-theoretic picture means that what (a) and (d) assert, if true, seems to be true at all times. Hansson's explanation of this as Shorthair being at at least one time short haired and Longhair being at at least one time long haired is inadequate. It doesn't include any temporal reference. There is a difference between some object having a property at a time and the same object having the same property at a different time. Hansson's tenseless translations of (a) and (g) won't capture this. The trouble is, we are given no explanation for the difference between having a property at one time and having it at another. It is this very difference that Hansson himself appeals to when

[31] The perdurance and relational properties solutions accept this, but hold that (a) and (d) do not contradict because of the accounts they have of objects and properties respectively.

defining incompatibility: properties are not incompatible *simpliciter* but incompatible only when had by one thing at the same time.

Hansson requires a notion of having a property at a time that permits his definition of incompatibility. This notion, however, must distinguish between (a) and (g) so that they don't fail his definition of incompatibility. But how can we draw this distinction within a B-theory endurance picture? What's the metaphysical difference between two properties being had at one time and two properties being had at different times, given the ontological parity of times? A conventional understanding of the instantiation of properties doesn't make a reference to the time of instantiation. Thus it is unclear how being short haired at some time fails to imply being short haired *simpliciter*.

There is a clue as to what underwrites Hansson's distinction. Towards the end of the paper, he refers to a picture presented by Johnston, Lowe and Haslanger where times are the temporal locations of token instantiations.[32] This is a version of adverbialism. We shall later develop a picture that isn't too far away from this view. Adverbialism provides an understanding of the having of properties that permits Hansson's notion of incompatibility and gives tenseless interpretations of (a) and (g) that do not fail it. It is B-theoretic and also gives Hansson a solution to the present-tensed version of the problem. It is the mechanism behind his position. But appealing to it here hardly shows that there is no problem of change: adverbialism is a *solution* to the problem of change. It requires us to revise our intuitive understanding of instantiation. Hansson makes the same mistake as Hofweber and Rychter: he takes a solution to the problem to show that there is no problem. But the view of instantiation that adverbialism proposes is hardly unobjectionable.

[32] Hansson *op. cit.*: 271.

It is important to note that Problem 2 is supposed to be a challenge to our intuitive notion of change. It is not explicitly an argument against an endurantist B-theorist (though the A-theorist and perdurantist may have better resources to deal with it). But given that Hansson suggests that the endurantist B-theorist doesn't have to face the problem, we have shown that in fact, she does.

Before moving on to Problem 3 and in order to make it even clearer that Problem 2 is problematic, we shall close the discussion of this version of the problem by looking at an analogy.

A modal analogue for Problem 2

The analogous argument we shall look at deals with modality. It is framed within a reputable interpretation of modal statements and makes a number of assumptions. But as we're only looking for an analogy here, nothing turns on these assumptions. One assumption is the following: the meaning of a modal statement is given by its truth conditions. A second is: trans-world identity is the right way of giving truth-conditions for modal statements. The truth-conditions for 'that man could have had short hair' use trans-world identity: it is true if in some other possible world the man has short hair, and false otherwise. This relies on that man *existing* in other possible worlds so that we can see how long his hair is. The man exists in other possible worlds and has differing properties in some of those worlds. But trans-world identity and variation over possible worlds together provide

a problem. Let's imagine a man who has long hair in some world but short hair in another. Call the man in the first world Longy and the man in the second Shorty:

(i) Shorty is short haired (premise)

(j) Being short haired entails not being long haired (premise)

(k) Shorty is not long haired (from (i) and (j))

(l) Longy is long haired (premise)

(m) Longy = Shorty (premise)

(n) If *a* = *b* then all properties *a* has *b* has too (indiscernibility of identicals)

(o) Shorty is long haired (from (l), (m), (n))

(p) Shorty is not long haired and Shorty is long haired (from (k) and (o))

This problem is very similar to Problem 2. In fact, there are a number of analogies between the solutions to these distinct problems,[33] though of course we have no need to solve the separate problems using analogous solutions. What is clear, though, is that the natural interpretation of modal statements is going to need some refining.

Shorty is short haired, and if being short haired is simply incompatible with being long haired he is therefore not long haired. Longy is long haired. If Longy really is Shorty, then by the indiscernibility of identicals they will have all the same properties. So Shorty is long haired. But this seems a contradiction, so we have a challenge to the interpretation of modal statements. We need to go back and revise our concepts to avoid this challenge.

[33] The denial of strict trans-world identity is comparable to the stage view, the primacy of the actual world over merely possible worlds is comparable to presentism, making properties world-relative is comparable to the relational properties view and making the instantiation of properties world-relative is comparable to adverbialism.

The strong analogy between this argument and the temporal version given as Problem 2 should encourage us to believe that Problem 2 is really a problem. It is perhaps easier to see the problem in the modal case, as variation across possible worlds is a concept less intricately involved with our experience than change over time. But in both cases, while there may well be solutions, there is certainly a problem.

Problem 3- another problem from non-contradiction

So we have two problems of change: one from non-contradiction and the other from the indiscernibility of identicals. To highlight a slightly different problem that change raises, we will construct a third problem which also relies on non-contradiction. It is different because we alter the entities under consideration. Instead of looking at objects and their properties, we will consider propositions.

First a brief note on terminology. Here and in what follows we shall be using the terms 'proposition' and 'statement'. A proper analysis of these terms would be worth a thesis in itself. We shall not provide one, but shall rather stipulate, for the time being, the following usage: we use the term 'statement' to refer to what would be said if a sentence were uttered in a context. We therefore allow that there are statements in cases where the relevant sentence is never actually uttered in the relevant context.[34] The same sentence can generate different statements in different contexts (e.g. if the sentence contains indexicals). We further stipulate that statements can bear truth-values. Their truth-values will be fixed:

[34] The notion of a statement distinguished from a sentence and as a bearer of truth-values is found in the classic Strawson (1950). It is not so clear he would be happy with statements when no stating has occurred.

what is said by a particular sentence in a particular context does not vary so its truth-value cannot either. An utterance of a sentence makes a statement.

We stipulate less at this stage about the use of the term 'proposition', for we want to allow different interpretations of propositions and their role. However, we take it that propositions also bear truth-values and are expressed by utterances of sentences (i.e. they are expressed by statements). Propositions are the meanings or contents of possible sentences. Whether or not a proposition has a fixed truth-value is a contentious matter that will be considered shortly. If propositions have fixed truth-values then they strongly resemble statements. The nature of the relation between propositions and statements is an issue we shall pass by. With this working model in place, we can move on to discuss the third problem from change.

Consider the following statements, stated at *t* and *t'* respectively:

(1) The poker is hot

(2) The poker is cold

Let us assume that (1) and (2) are both true, i.e. that the poker is hot at *t* and cold at *t'*. This amounts to a case of change. The truth of both of these gives us a *prima facie* worry. The propositional form of the law of non-contradiction states that no proposition and its negation can be both be true. Equivalently, no proposition can be both true and false.[35] (1) and (2) respectively seem to express the propositions that the poker is hot and that the

[35] This principle has a temporal and an atemporal reading. Which reading we adopt depends on whether we think propositions can change truth-value over time. We will discuss this shortly under the first reply to the argument.

poker is cold. But if so, it appears we can quickly construct such a contradiction from (1) and (2). The properties cold and hot are incompatible, hence (2) entails:

(3) It is not the case that the poker is hot

(3) is the negation of (1), and because it is entailed by (2) it is true. The proposition (3) expresses is seems to be the negation of the proposition expressed by (1). So, if (1) and (2) are both true, it seems that the propositions expressed by (1) and (3) are true together and non-contradiction is violated.

This *prima facie* worry is not too threatening. The very natural response is that we have left time out of the picture, and it is time which makes change possible. If this is all we need to say then calling Problem 3 a problem seems hyperbolic. We can construct an analogous 'problem of size' given that a house looks small from a distance but large close up. In this latter 'problem' we are forgetting to include perspective.

The problem does show that we need time somewhere in the interpretation of statements describing change. Without time there is a contradiction. Problem 3 is a problem because it's not at all obvious how time fits in: if we don't have a coherent account of the role of time in the propositions expressed by such statements then the natural response is unfinished. Problem 3 does raise a challenge, then: give an account of time and propositions that shows why the truth of (1) at *t* and (2) at *t'* is does not generate a contradiction.[36] Problems 1 and 2 are metaphysical and ontological in character; they ask us to look at

[36] This could equally well be expressed as the injunction to show why the truth of (1) at *t* and (3) at *t'* is not contradictory.

objects and the properties they have. Problem 3 is semantic: we are looking at the relationship between sentences and their meanings.[37]

There are a number of reasonable replies to Problem 3. The two broad options correspond to two views on the truth-values of propositions over time.[38] If propositions can change in truth-value, (1) and (2) can express propositions containing no temporal reference. If propositions cannot change in truth-value, (1) and (2) must express propositions that include covert temporal reference.

Before we examine these options, it is worth reiterating that Problem 3 does motivate a search for the semantic role of time. Although it is clear that time solves Problem 3, it is not clear how. More philosophical work needs to be done to complete the solution. And, according to our interpretation of what a philosophical problem is, this vindicates the claim that Problem 3 *is* a real problem.

Replies to Problem 3

(a) Temporalism about propositions

The first way to respond to Problem 3 takes it that propositions can vary in their truth-values over time. The propositional form of the law of non-contradiction, according to this view, should be formulated in a temporal way: no proposition and its negation can be true *at the same time*. This formulation has no problem with them being true consecutively. Thus, although the truth of the propositions expressed by (1) and (2) at the same time would lead to a violation of non-contradiction, their being true successively does not. This

[37] This corresponds to the distinction in Lowe (1988) between the metaphysical and semantic problems of change.

[38] These alternatives are noted by Haslanger *op. cit.*: 121.

reply to Problem 3 is therefore similar to the response to Problem 1 offered by Hofweber and Rychter.

It's hardly an accepted thesis that the law of non-contradiction for propositions has a temporal element. But we ought not to rule out such an interpretation without reason. As this move sounds like the move made by Hofweber and Rychter to Problem 1, we should ask whether the parallel with the failed reply to Problem 1 gives us reason to reject a temporal version of propositional non-contradiction. Well, the reply described here doesn't fall foul of Hofweber and Rychter's exact mistake, for it doesn't assume that the having of properties by objects is time-indexed. But it does make the corresponding assumption that the 'being true' of propositions is time-indexed. Or, in other words, whether a proposition is true or not depends on what the time is. For this to work, we need an account of propositions that allows them to have different truth-values at different times, and this is controversial. Not everyone accepts that propositions vary in their truth-value over time. We can grant that this is an effective reply to Problem 3 only if propositions can vary in truth-value. And this needs to be shown coherent.

Let's outline how the solution would work: it accepts that (1) and (2) at *t* and *t'* respectively do assert the bare, atemporal propositions 'the poker is hot' and 'the poker is cold'. It further accepts that (2) entails (3). It also accepts that the truth of (1) and (3) (or, more precisely, the propositions expressed by (1) and (3)) would constitute a violation of the law of non-contradiction. But it relies on a temporalist view of propositions that maintains that propositions do not have fixed truth-values. The proposition expressed by (1) is true at *t* and false at *t'*. Likewise, the proposition expressed by (2) is false at *t* and true at *t'*. Thus (3) is also false at *t* and true at *t'*. There is no time at which (1) and (3) are both true. According to

a temporal version of non-contradiction we therefore have no contradiction and the problem is solved.

This outline shows how the response to Problem 3 works if propositions can change truth-value. We now need to ask whether they can, for if they can't then the solution is no solution at all. How could they?

We should note here that the temporalist doesn't deny that some propositions have fixed truth-values. Necessary truths or falsehoods don't vary in truth-value. Contingent truths or falsehoods that are true or false (respectively) at all times also have fixed truth-value. In fact the temporalist can allow that there are propositions expressed by 'the poker is hot at *t'* that differ from the proposition expressed by 'the poker is hot' uttered at *t.* Such a temporally loaded proposition 'the poker is hot at *t'* will have fixed truth-value, but it is *not* what is being expressed by (1).

So, the temporalist does allow propositions with stable truth-values over time, but she claims that not all propositions are like this. There are a number of issues facing such a view of propositions. One, from Mark Richard, is that it seems attributions of belief cannot be adequately treated on the temporalist picture.[39] Consider the following statement, uttered at *t*:

(4) Joe believes that Tony Blair is Prime Minister

If the temporalist is right, what (4) expresses is that Joe believes the bare atemporal proposition expressed by 'Tony Blair is Prime Minister', and (4) expresses this every time the

[39] Richard (1981).

sentence is used: (4) always expresses the same proposition. But consider what we can say at *t'*, some time after *t*:

(5) Joe believed that Tony Blair was Prime Minister

If (4) is true at *t* and *t'* is later than *t,* then (5) is true at *t'*. But suppose, further, that Joe doesn't change his mind about anything between *t* and *t'*:

(6) Joe still believes everything he used to believe

Let's give truth-conditions for these. (6) is true at *t'* iff there is a *t* earlier than *t'* such that for all propositions, if Joe believed a proposition at *t* then he believes it at *t'*. (5) is true at *t'* iff there is a *t* earlier than *t'* such that at *t,* Joe believes the proposition that Tony Blair is Prime Minister. (4) is true at *t* iff, at *t*, Joe believes the proposition that Tony Blair is Prime Minister.

A problem then arises, for the natural truth-conditions given for (4), (5) and (6) suggest that (5) and (6) jointly imply (4). For, on the temporalist account, Joe still believing at *t'* what he believed at *t* implies that any proposition that Joe believed at *t* he also believes at *t'*. The proposition expressed by (4) is one such proposition. But this should be an invalid implication, for we do not conclude from fact that, at *t'* Joe's believed that Tony Blair used to be Prime Minister and the fact that he still believes at *t'* what he believed at *t* that Joe believes at *t'* that Tony Blair *is* the Prime Minister. But the temporalist seems committed to such an implication. So it seems like the temporalist view of propositions allows an invalid inference.

Another issue: a good model for propositions is that they are, like numbers, abstract entities. They are therefore outside of time. Abstract objects cannot have intrinsic (i.e. non-relational) properties that vary over time. The content of a proposition is intrinsic to it, so the content of a proposition cannot vary over time. Abstract objects, though, can have relational properties that vary with time; being talked about by Amy could be a property of the number 8 at some times but not others. It seems therefore that the temporalist is committed to truth being a relational property that a proposition has at some times but not others. But we have already seen that the contents of a proposition cannot change over time, so if the truth-value changes, something else must change. The natural way to explain this is that a proposition has the property true at a time if and only if the contents of the proposition correspond to the way the world is at that time. What changes the truth-value of the proposition is that reality alters from time to time.

This sounds plausible. But it actually makes uncomfortable reading for a B-theorist about time. For how does reality alter from time to time? According to the B-theory, the sum total of reality is static; there is no dynamism in her picture of reality as there is no metaphysical significance to which time is the present.[40] So why does the relational truth picture seem uncomfortable for a B-theorist? Well, on her account no facts about the world can change from time to time. But which propositions are true *does* change from time to time. Recalling that the contents of propositions are stable, the world must be what causes these propositions to change their truth-value. But the world (considered as a temporal whole) doesn't change; there is no metaphysically interesting difference between reality at different times. What is it about reality that changes to make the propositions change in

[40] Though see Oaklander (forthcoming) and Deng (forthcoming) for arguments that the B-theory or something like it is as dynamic as the A-theory.

truth-value? So one thing remains unclear: how propositions can vary in truth-value when neither reality as a whole nor what the time is varies.

Interestingly, this question can be seen to derive from a tension between sameness and difference. On the temporalist picture, there is sameness and difference when propositions describe a change. What stays the same are the contents of the propositions. What changes are their truth-values. The demand for further explanation can be seen as a demand to give an account of this sameness and difference. Without making too much of this, it's a parallel with the tension from which we derived problems 1 and 2.

I don't think the questions raised by sameness and difference are unanswerable, but this is not the place to attempt to answer them. If we want to be B-theory temporalist we've got some work to do. Perhaps, then, temporalism about propositions meshes better with an A-theory about time. The trouble is that the A-theory faces serious challenges (in particular from relativity). It seems like either way, the temporalist owes us some explanation.

The Richard observation and the sameness/difference considerations are by no means knock-down arguments against the coherence of the temporalist position, and we haven't even considered possible replies. There are certainly semantic options to explore. And, in fact, the temporalist picture is close to one we will adopt later on. But in the dialectic, we only need to show that temporalism isn't an overwhelmingly obvious position in order to show that Problem 3 is problematic. The issues we have discussed show that there are challenges for the temporalist to overcome. There is work to do before temporalism gives us a sufficient reply to Problem 3. This justifies the claim that Problem 3 really is a problem.

(b) Time-specific propositions

We can now turn to the second alternative for dealing with the problem. According to this alternative, the truth-values of propositions are *fixed*. As propositions do not change their truth-value, we cannot appeal to a temporal version of non-contradiction to escape the problem. For suppose we were to use a temporal form of non-contradiction: this would state that no proposition and its negation can be true at any one time. But, for the eternalist, if a proposition is true at one time, it is true at all times. Thus, if a proposition and its negation were both true at different times, they would also both be true together at all times.

Instead the claim is that the temporal reference of statements is part of the proposition that they express. The temporalist and eternalist agree that there are time-specific propositions. What the eternalist denies is that there are atemporal propositions that vary in their truth-value over time. Statements contain implicit reference to times and the time contained in a statement is essential to the proposition it expresses. For example, (1) implicitly refers to the present, to the time of utterance. Therefore, (1) uttered at *t* is implicitly:

(7) The poker is hot at *t*

It expresses the temporal proposition that the poker is hot at *t.* Likewise, (2) uttered at *t'* is more informatively written:

(8) The poker is cold at *t'*

The proposition expressed is temporal. The proposition expressed by (3), which is the entailment of (2), is thus more accurately represented by the sentence:

(9) It is not the case that the poker is hot at *t'*

The truth-values of the propositions expressed by (7), (8) and (9) are thus always true, hence the term 'eternalism' for this view. But there is no contradiction, because (9) is not the negation of (7). (7) and (9) can both be true as they don't violate even an atemporal version of the law of non-contradiction.

This account deals with the problem by insisting that all propositions contain temporal elements covertly.[41] Like the first alternative, this appears to be a viable option. As it stands, though, we only have a sketch of the proposal. Cashing out the account will not be a simple matter, as it will have to operate between narrow constraints. We shall explain why.

Once again, the tension between sameness and difference appears. Consider the following statements made at *t'*:

(10) The poker is hot

(11) The poker is black

(12) The tongs are cold

(13) The tongs are black

[41] Perhaps we could be happy with some propositions having no temporal reference: necessary truths, for example, or maybe even contingent truths that are always true.

The truth of the propositions expressed by these statements and the truth of the proposition that the poker is hot expressed by (1) at *t* does not constitute a change. In the case of (10), this is because nothing is different. In (11) there is the wrong sort of difference. (12) has the difference but lacks some important similarity to (1), and (13) lacks both the similarity and the difference required for change. The truth of the propositions expressed by (1) and (2), however, *does* constitute a change. Why is this?

We can capture the sense in which the propositions must be both different and relevantly similar by the term *incompatibility*.[42] There is incompatibility between the propositions expressed by (1) and (2); they make competing claims about the way the world is.[43] Their claims compete because there is something *the same* between the propositions and there is something *different*. It is in virtue of this sameness that the propositions are similar. So if the eternalist account of propositions is to make space for real change, it must make space for some notion of incompatibility between propositions. It's not immediately clear how to do this, however.

An intuitive account of incompatibility between propositions might be something like: proposition *p* is incompatible with proposition *q* if *q* entails $\neg p$. So, for example, the proposition that the earth is flat is incompatible with the proposition that the earth is not flat. The proposition that the ball is red is incompatible with the proposition that the ball is green. The trouble is, the propositions expressed by (1) and (2) obviously fail this account of incompatibility on an eternalist reading: in this case of change they are both true. An

[42] We shall talk more about incompatibility in the next chapter. Here we are using it simply to suggest some pressure on the working-out of an eternalist account of propositions.

[43] One thought that this might lead to is that the incompatibility necessary for change might not be between propositions but between, say, properties or states of affairs. But if two properties or states of affairs are incompatible, the propositions describing them should also be incompatible.

atemporal reading of (1) and (2) gives incompatible propositions, but these are exactly the propositions that the eternalist does not allow.

We might try and loosen our notion of incompatibility to find one that the eternalist view allows. We could do so by introducing time into the equation. So *p* is incompatible with *q* if, for any time *t,* if *p* is true at *t* then *q* isn't true at *t* (and *vice versa*). But this won't do either, as the propositions expressed by (1) and (2) are both true concurrently at all times according to the eternalist picture. An atemporal reading of (1) and (2) would satisfy this conception of incompatibility as well, however.

An even looser version of incompatibility between propositions might propose that *p* and *q* are incompatible if they would be unable to be both true if the temporal reference were the same in each of the propositions. Such a counterfactual seems to capture the notion that *p* and *q*'s incompatibility implies that something in their contents contradicts. We compare their non-temporal contents in order to find incompatibility; both contents cannot be combined with the same temporal reference. This looks like the most promising route for the eternalist to explore in order to save change. But it has certain consequences.

In the first place, speaking about the temporal reference and non-temporal content of propositions suggests that they are constructed somehow from these two elements; it is the claim that propositions are *structured* or *compositional*. By itself this is not particularly damaging: propositions might well be structured. There is a further consequence, though, which is that the non-temporal elements of structured propositions look very much like the temporalist's atemporal propositions. So the eternalist must allow that these atemporal 'propositions' do latch onto something, just not propositions. They are rather some

separable non-temporal content of propositions, the temporal reference having been taken away. And this separable content is something we're able to speak about.[44]

It seems, then, that the eternalist must have an account of propositions that allows us to say all these things if she is to make space for change in her picture. Incompatibility needs propositions to be structured and contain separable non-temporal content.

The second constraint applies pressure in the opposite direction. As we have seen, temporally specific propositions must be structured and contain separable, non-temporal content in order for there to be incompatibility. But we cannot allow that there are propositions that express this non-temporal content, for once we take the temporal element out of propositions describing change we are left with a bare contradiction. Consider the atemporal content of (1) and (2). These contents are incompatible in the strongest sense as they cannot both be true. Further, the eternalist takes propositions to be *always* true or *always* false. So if the atemporal content of (1) and (2) are themselves propositions we have a problem. Such putative propositions would be true at *t* and *t'* respectively because the poker changes from being hot to being cold. Hence they would *always* both be true. But they cannot both be true.

To avoid this, we need to tie the temporal aspects of the propositions to the rest of the content so tightly that it is plausible to deny that the atemporal propositions exist; i.e. we need reasons that the non-temporal contents don't count as propositions.[45] We need a semantic account of the role of the temporal elements of the sentences that binds time so

[44] We might also want to be able to identify the non-temporal content for independent reasons. For example, such content would give a neat explanation of the resemblance between the proposition expressed by an utterance of 'the cat is on the mat' at *t* and an utterance of the same sentence at *t'*.

[45] It appears rather *ad hoc* to propose as such a reason the fact that the non-temporal content would change in truth-value if it were a proposition!

closely to the meaning of the sentences that we cannot drop the temporal modification and end up with anything propositional. The semantics must show that the content of the proposition expressed by sentences like (1) and (2) essentially involves time. This constraint is one the temporalist shouldn't be especially worried by: it falls out from the temporalist's denial of propositions without temporal reference. But the risk of allowing atemporal propositions must be avoided. In seeking to avoid the first constraint, we must not lose sight of the second.

These two constraints show that not just any account of propositions or of semantics will work for the eternalist. The temporal element of the proposition must be tied loose enough to come apart from the rest of the content for incompatibility, but tight enough that without the temporal part the proposition isn't a proposition. There are a number of alternatives, however, that will do this job. But these constraints on an expansion of the solution demonstrate that avoiding the seemingly simple Problem 3 will not be a simple matter. The eternalist solution is pressed at both sides, needing to identify distinguishable non-temporal content to propositions but also to make temporal reference inseparable from the content of the propositions. She must uphold both the difference and the sameness necessary for change: the incompatibility between the propositions. Until an account has been provided that does this, the problem of change from non-contradiction has not been solved. This therefore supports the claim that Problem 3 is a genuine problem.

To sum up, we have attempted to formulate a third version of the problem of change that also really is a problem. This formulation differs from Problems 1 and 2 because it talks

at the level of propositions, not of objects having properties. Examining cases of change at the propositional level generated a second problem using the law of non-contradiction. The problem is a problem that asks for further explanation; it requires us to investigate more fully the meanings of what we say when we talk about change. There were two strands of reply to the problem, depending on whether we took propositions to have a fixed truth-value or not. In either case, the role of time in the meaning of propositions needed to be looked at more closely.

The further questions that the temporalist and eternalist faced had connections to the initial tension we identified between sameness and difference. This drives the worry for the temporalist about the way that propositions can have the same content and differ in truth-value. It also underwrites the constraints within which the eternalist must expand her picture, for the propositions involved in a change are *incompatible* but not contradictory; and incompatibility here stands for the combination of sameness and difference between propositions that is constitutive of change.

Given this recurrence of the tension, it would be an interesting project to investigate the relationship between Problems 1 and 2 and Problem 3. This would, however, be tangential to our main purpose in the chapter – to establish that there is a problem of change. Space, therefore, dictates that examining the connection between the problems is a project for another occasion.

Conclusions

In concluding this section we shall draw together what we have argued so far. Before attempting to solve the problem(s) of change we ought to be clear just what the problem is we are trying to solve. A number of philosophers are content simply to gesture towards the problem, but we have found that there is no single, well-formed problem that is the target of this gesture. A number of formulations of the problem have recently been found wanting, which has led some to conclude that there is, in fact, *no* problem of change. We have therefore tried to give three versions of the problem that avoid these criticisms.

The tension that we can identify in the persistence of objects through change is a tension between sameness and difference. This tension can be developed into a problem either by showing that qualitative difference entails numerical difference (Problem 1) or by showing that numerical identity entails qualitative identity (Problem 2). These are substantial metaphysical issues with persisting objects changing. An alternative route to a problem from change is via propositions, where the law of non-contradiction states that no proposition and its negation can both be true. Problem 3 requires of those who want to talk about change that they give an account of the meaning of sentences that describe change that doesn't violate non-contradiction. This account will describe the semantic role of time in such sentences.

There are thus metaphysical and semantic issues raised by change. All three problems (or, if you prefer, versions of the same problem) require substantive work to solve. We therefore claim that change does, indeed, provide us with philosophical problems.

Chapter 2

Incompatibility and the other solutions to the problem of change

We have said that the truth of the following statements encapsulates a change:

(1) The poker is hot

(2) The poker is cold

(1) is truly uttered at *t* and (2) is truly uttered at *t'*. When the poker is hot at one time and cold at another then it has changed. This is an instance of the general phenomenon of change. In this chapter, we shall propose an interpretation of what it is for something to change. A number of solutions to the problem of change are already available. We shall argue that, given our interpretation, these solutions are not successful defences of real change. This will motivate what comes in subsequent chapters: our own solution to the problem of change.

Change and incompatibility

So we begin by looking more closely at the nature of change. This will draw on some of what we have said in the previous chapter. We have an ability to identify intuitively which pairs of statements are examples of change and which are not. It is an *assumption* that we have this ability, but one without which investigation of the nature of change seems

fruitless. Using this ability to identify change, we can try to provide a conceptual analysis of the intuitive notion of change.

We noted in Chapter 1 that there is a central tension between difference and identity when it comes to change. This tension can be encapsulated by a notion of *incompatibility*. The statements (1) and (2) seem incompatible. It is not immediately obvious in what this incompatibility consists, however. Statements, as we have used them, have fixed truth-values: they are always true or always false. This is because they are what is said *in a context*. In this way (and in other ways) they resemble eternalist propositions, and hence have a similar problem in explicating incompatibility. We will find it useful to have a term for what (1) and (2) say that *doesn't* have a fixed truth-value, to side-step this worry. I propose the term 'proposition'. I do not intend, by doing so, to be asserting the claim that *propositions* are capable of having different truth-values at different times; I am not asserting temporalism about propositions. I avoid this commitment because I use 'proposition' ambiguously. If one is a temporalist about propositions, 'proposition' simply means proposition. If one is an eternalist about propositions, however, 'proposition' means the content of a proposition once it is stripped of its temporal reference. For eternalists, in other words, 'proposition' is shorthand for atemporal propositional content.[1]

Why do I do this? There are two answers to this question. In the first place, it is useful to have a term for the contents of (1) and (2) that *can* have different truth-values because it then gives us an easy explanation of incompatibility.[2] The 'propositions' expressed by (1) and (2) are incompatible because they cannot both be true at any time. But

[1] See the last chapter, pp. 42-45, for more detail on what shape this content will have.

[2] The eternalist about propositions might deny that there is *anything* which can have different truth-values at different times, as statements and propositions have fixed truth-values and they exhaust the possible bearers of truth-values. As we have pointed out in the previous chapter, though, they will have to make sense of incompatibility somehow, and however they do they can substitute this in in what follows.

I don't want to assume any particular interpretation of propositions at this stage, and using the term 'proposition' in this way allows me to speak to both temporalists and eternalists about propositions in this chapter. I could have written 'proposition (for the temporalist) or atemporal propositional content (for the eternalist)' in place of every occurrence of 'proposition' in the chapter; the meaning would be the same. But the shorthand is more convenient.[3]

So, we have a notion of incompatibility between propositions: two propositions are incompatible when they cannot be simultaneously true. Incompatibility is a concept that applies to a number of entities: two properties are incompatible if no one thing can have both at the same time; states of affairs are incompatible when they cannot simultaneously obtain; events are incompatible when they cannot occur at the same time.[4] This notion of incompatibility, which seems to translate into these different mediums, has at its core the following idea: when there is an instance of incompatibility something occurs which would be impossible without a difference in time.

I take this notion of incompatibility to be constitutive of change. I shall focus on the incompatibility of properties and of propositions in giving an analysis of change. At these two different levels of discourse I take the following to be necessary and sufficient conditions for change:

> Propositions- The truth of two propositions produces a change iff they are incompatible and true (at different times).

[3] Why not use a different term? Well, in later chapters I develop a picture according to which propositions can change in their truth-values and the terminology anticipates this. A neologism would probably hinder rather than help understanding. From now on we will be dropping the warning quotation marks for 'proposition'.
[4] There may be other realms of discourse where we might find incompatibility. We do not intend to have given a complete taxonomy of incompatibility.

Objects and Properties- An object changes iff one and the same object has incompatible properties (at different times).

The clauses in parentheses are strictly redundant, as what precedes it leads to a contradiction unless there is a difference in time. But it is useful to include it for clarity.

I take the necessary and sufficient conditions provided above to give us a conceptual analysis of change or, if you prefer, *real* change. It is a conceptual analysis that relies on the notion of incompatibility. It is open to debate whether this is the right analysis of change. But I believe it is, and I believe that with such an analysis the candidate solutions to the problem of change can be prosecuted with the charge that they fail to uphold real change.[5] So, let's look at the three canonical solutions to see where these difficulties appear.

Relational properties and incompatibility

The most obvious relational properties view deals with the problem of change by taking properties to be temporally relativised. We can call this the 'properties' view. According to the view, in (1) the poker doesn't have the property *hot.* Rather, it has the property *hot-at-t*. Likewise, the same poker in (2) has the property *cold-at-t'*.

This is intended as a solution to the problem of change because the contradiction that change threatens is avoided; one thing can clearly have both of these relational properties. But the worry is that the relational properties approach throws the

[5] Of course, one could simply deny that there is such a thing as change and the problems disappear. But, as we said in our introduction, this is a sceptical position we shall ignore.

incompatibility out with the contradiction. Rodriguez-Pereyra (2003) expresses this worry as follows:

> "[C]hange is having *incompatible* properties or relations at different times, but in the relational theory's picture of change this incompatibility disappears."[6]

Consider our example, described by (1) and (2). The poker has the properties *hot-at-t* and *cold-at-t'*. These properties are clearly not incompatible, as one thing can have them at the same time. One thing *does* have them at the same time; the poker has both of these properties simultaneously at all times that it exists. This clearly violates the condition we set above for incompatibility at the level of properties. The properties are not incompatible, so the account does not capture change.

According to the properties version of the relational properties view, there is no incompatibility between the propositions describing a change either. For them to be incompatible, they cannot both be true at one time. But the relational properties interpretation of the statements is that they assert the poker has two compatible properties (*hot-at-t* and *cold-at-t'*). The propositions expressing this can be both true simultaneously. Granted, if the sentences in (1) and (2) were uttered at the same time (say *t*) they would express incompatible propositions. They would then express the propositions that the poker has *hot-at-t* and that the poker has *cold-at-t* which are plausibly incompatible. But if (2) were uttered at *t* then it would express a *different* proposition by the relational properties' lights. The way the poker is said to be by (2) is different if uttered at *t* to the way it is said to be if uttered at *t'*. In a proposition that predicates a property of an entity the time of

[6] Rodriguez-Pereyra (2003): 191-192. The italics are his.

utterance is part of the property. The same sentence uttered at different times therefore expresses different propositions.[7] The actual propositions expressed by (1) and (2) are such that they could be simultaneously true. In fact, they *are* simultaneously true, at every time. Thus the propositions that are expressed are not incompatible.

So the properties view of relational properties fails to uphold incompatibility in cases of change. However, there is a further version of the relational properties view to consider. According to this version, (1) asserts that a relation holds between the poker and the time *t*: the *hot-at* relation. Similarly, (2) asserts that the poker bears *cold-at* to *t'*. If bearing the relation *F-at* to *t* is simply having the property *F-at-t* then the two formulations are equivalent. But there is space for a view where this is not the case.

In order to see how this version fares with respect to incompatibility, we need to investigate incompatibility at the level of relations. Let's start with an example: Liking and disliking are incompatible relations.[8] Why are they incompatible? The answer seems to be because it is not possible that something bear both these relations to the same thing at one time. At *t*: x likes y → ¬(x dislikes y) and *vice versa*. So we can infer a more general principle, which coheres with the notion of incompatibility given in the previous section: for every pair of relations R and R', R and R' are incompatible iff: ∀t∀x∀y at *t*: [[Rxy → ¬R'xy] ∧ [R'xy → ¬Rxy]]. *Hot-at* and *cold-at* seem to be incompatible in this way, so it seems the relational properties view might be able to maintain incompatibility after all.

However, there is a problem. In the definition of relational incompatibility we have given the relata are the same in each relation (the xs and ys). To see why this needs to be so consider the example of liking again; if Mike likes Tom at one time and dislikes him at

[7] Recall that we are using 'proposition' here to mean a temporalist's proposition or the atemporal content of an eternalist's proposition; this makes the claim look worse.
[8] This example is from Rodriguez-Pereyra *op. cit.*

another then Mike's opinion of Tom has changed. But if he likes Tom at one time and dislikes Tim at another time then no change has occurred. For incompatible relations to describe a change the things involved must remain constant.

But, as Rodriguez-Pereyra points out, this is exactly what fails to happen in this version of the relational properties solution. In order for the poker to change, it must bear incompatible relations of *hot-at* and *cold-at* to the same thing. However, it bears them to different things; to different times. There is no incompatibility here, for the poker can and does bear these relations simultaneously: it bears the *hot-at* relation to *t* at all times and the *cold-at* relation to *t'* at all times. The relations are indeed incompatible, but the situation as described by the relational properties view doesn't save the incompatibility because there is a shift in relata.

In terms of propositions, this variety of relational properties suffers from the same issues as the properties version. The propositions expressed by (1) and (2), construed as containing temporal relata for the *hot-at* and *cold-at* relations, can be true at the same time. They are hence not incompatible. On either the properties version or the relation version of the view, then, and whether at the level of properties and relations or propositions, it seems that incompatibility is lost.

What might the relational properties theorist be able to say about this? Let's consider the properties version first. Perhaps he can agree that, strictly speaking, the properties *hot-at-t* and *cold-at-t'* are not incompatible. But there is another level of explanation available to him. Properties can be grouped together; *hot-at-t*, *hot-at-t'*, *hot-at-t''*... can be grouped as *hot* properties. *Cold-at-t, cold-at-t', cold-at-t''*... can be grouped as *cold* properties. These groupings make intuitive sense because they correspond to what we

normally call the properties *hot* and *cold*. The groups have one and only one member for any particular time.

Of course, any collection of properties can be grouped together. But *these* groups of properties might be thought to be a natural grouping; a group that 'carves nature at its joints'. Their members plausibly bear resemblance relations to one another, for *hot-at-t* does seem in some sense to resemble *hot-at-t'.*[9] One way of explaining the relationship between *hot-at-t* and the group *hot* would be to borrow from the temporal parts theory; *hot-at-t* is an instantaneous part of the multiply temporally located *hot.*[10] However we choose to cash out this relationship, the concept of these groups of resembling properties might give the relational properties view a significant resource. In particular, they may be able to explain why, although the properties that entities have are not strictly incompatible, they do have some sort of incompatibility. How might this go?

Hot-at-t is not incompatible with *cold-at-t*' because they can both be had by an entity at one time. However, the groups *hot* and *cold* can be said to be incompatible. It is impossible for an entity to have both of the corresponding properties from these groups, namely *hot-at-t* and *cold-at-t*, or *hot-at-t'* and *cold-at-t'*, or... (the correspondence here is simply explained as sharing a temporal reference). Change, then, could be entities having properties from *groups of properties* that are incompatible, rather than entities having properties that are strictly incompatible.

[9] We might be concerned that there is this resemblance only because there is some more basic property *hot*. But, as the relational properties theorist denies the existence of this property, the resemblance cannot rely on this. There needs to be a legitimate, non-arbitrary way of grouping these properties together. It's not obvious what this will be. We shall, however, pass over this concern for the moment. We have other, more serious, worries about the solution.

[10] This idea is found in MacBride (2001).

This proposal can be reformulated for the relational version of relational properties. Although when the poker bears *hot-at* and *cold-at* to different times we do not strictly have a case of incompatibility, there might still be some derivative incompatibility here. Consider a function that takes entities, relations and times and produces values like 'the poker bears *hot-at* to *t*' and 'the poker bears *cold-at* to *t*''. If we leave the entities' argument as a free variable, we end up with statements of the form, 'x bears *hot-at* to *t'* and 'x bears *cold-at* to *t*''. These statements can be grouped in a similar way to the temporally loaded properties above. One group would be made up of *hot-at* relations and times: x bearing *hot-at* to *t,* bearing it to *t'*, to *t''* and so on. Another group will be of *cold-at* relations and times: x bearing *cold-at* to *t,* bearing it to *t'*, to *t''* and so on.

There is incompatibility between these two groups as no entity can bear the relations from different groups to the same time. No single entity can replace the free variable in corresponding members of each group. Nothing, for example, bears *hot-at* to *t* and *cold-at* to *t.* So, by bearing *hot-at* to one time and *cold-at* to another the poker participates in these incompatible groups. The relational theorist might argue that this is the incompatibility necessary for change.

It seems that these are the best possible replies the relational properties theorist can make to the charge that they do away with incompatibility. However, we contend that these proposals are still not sufficient to maintain the incompatibility that change requires. We can start with the latter version of the relational theory. Let us return to the example of a pair of incompatible relations: *likes* and *dislikes*. Suppose Mike likes Tom and dislikes Tim. We could certainly create a group of relations made up of 'x likes Tom', 'x likes Tim', 'x likes Ted'… for all people that x could like. We could, similarly, create a group composed of 'x

dislikes Tom', 'x dislikes Tim', 'x dislikes Ted'… for everyone x could dislike. These groups seem incompatible in just the same way as the *hot-at* and *cold-at* groups. The statements 'x likes Tom' and 'x dislikes Tim' belong to these groups in the same way that 'x bears *hot-at* to *t'* and 'x bears *cold-at* to t'' belong to their groups. And Mike *does* like Tom and *does* dislike Tim, as the poker bears *hot-at* to *t* and *cold-at* to t'. But, as we have already argued, Mike liking Tom and disliking Tim is *not* a change. For it to be a change Mike must like and then dislike *the same person*. Nothing that has been said distinguishes this case from the case of the poker, so we can conclude that there is no change in the poker case either. This move doesn't avoid the problem we raised; this formulation of the relational theory fails to uphold real change.

The properties version of the relational properties theory has a slightly more robust form of incompatibility. But it is still flawed. As we noted at the outset, the properties *hot-at-t* and *cold-at-t'* are not incompatible. The statements (1) and (2), interpreted by the relational properties view, are not incompatible either. What is incompatible is the *group* of properties to which *hot-at-t* and *cold-at-t'* belong. This group is itself derivative, as the fundamental properties are temporally relativised. The incompatibility consists in the impossibility of the dual instantiation of properties from the two groups containing the same temporal reference.

Our worry is that whatever the 'incompatibility' offered by the relational account is, it is not genuine incompatibility. Consider the properties *hot* and *cold*, thought of as fundamental and strictly incompatible properties. The relational theorist cannot suggest that the poker has *these* properties in virtue of having *hot-at-t* and *cold-at-t'*. If they admit this, then the solution doesn't work; it is the basis of the solution that the poker *doesn't*

have such temporally unqualified, fundamental and incompatible properties. If the poker does, then the solution has got nowhere. So the poker doesn't have these strictly incompatible properties (in fact, the relational properties view holds, there are no such properties).

But is having *hot-at-t* and *cold-at-t'* sufficient for incompatibility, even given the relational theory's gloss? No; all the gloss shows is that *hot-at-t* is incompatible with *cold-at-t* and that *cold-at-t* can be grouped with *cold-at-t'* under some intuitive notion of coldness. It does not show that *hot-at-t* and *cold-at-t'* are truly incompatible. *Hot-at-t* and *cold-at-t'* cannot be truly incompatible for the solution to work, and the weak incompatibility that is offered is insufficient to count as a change. The relational properties view is caught in a dilemma about the strength of the supposed incompatibility between these two properties. Too strong an incompatibility and the solution doesn't work. Too weak an incompatibility and change is lost. There is, I contend, no happy medium.

Of course, the relational properties theorist might say our conditions for incompatibility are too strong; weak incompatibility is all change needs. The solution can then be seen as a revision of our initial, intuitive conception of change as strict incompatibility between the properties some entity has (or strict incompatibility between propositions). But if we can find a solution that doesn't revise our intuitive view of change then this counts heavily against the property relativiser. We should prefer not to give up on real change if we can avoid it. So, then, let us turn to the temporal parts solution to see if it makes the necessary space for change.

Temporal parts and incompatibility

Fourdimensionalism is a very popular solution to the problem of change. While Lewis thought that the problem was decisive in favour of temporal parts, nowadays there are a number of other reasons why its proponents hold the view. However, if it cannot properly account for change, and if there is a viable alternative, the case for perdurance will have been considerably weakened. Lewis describes his solution to the problem of temporary intrinsics thus:

> "Third solution: the different shapes, and the different temporary intrinsics generally, belong to different things. Endurance is to be rejected in favour of perdurance. We perdure; we are made up of temporal parts, and our temporary intrinsics are properties of these parts, wherein they differ one from another."[11]

We avoid contradiction because the properties ascribed to entities in statements about change are actually ascribed to different entities; the properties are ascribed to temporal parts of fourdimensional objects. So, the property bearer in (1) is not the same thing as the property bearer in (2) in virtue of the fact that (1) and (2) are uttered at different times. The property bearers are instantaneous temporal slices of the poker.

However, we ought to ask if the fourdimensionalist account of what is going on allows for change as we have understood it. Recall that a pair of propositions produces a change if the propositions are incompatible and true (at different times). That is, if the proposition are true but incapable of being *simultaneously* true. Is this so if things have

[11] Lewis (1986): 204. The shapes Lewis refers to are bent and straight, his examples of temporary intrinsics.

temporal parts? The best route to answering this is by looking at the level of properties and entities. At this level, a change occurs iff genuinely incompatible properties are had by one and the same entity. This latter part of the condition seems to be under threat in the temporal parts solution.

It is essential to the temporal parts solution that in an example of change the things having the properties are distinct. Sider remarks:

> "The temporal parts account of change is that incompatible properties are had by different objects, different temporal parts of the whole. Change is therefore no more remarkable than the variations of a road with some bumpy stretches and some smooth stretches."[12]

It is the fact that there are distinct objects having the properties that allows the perdurance account to solve the problem of change. If the incompatible properties are not had by different objects, the temporal parts theorist doesn't have a solution at all. So it is vital that the solution really does take the properties to be had by different objects.

Does this mean that the temporal parts account fails our condition for change? It seems as though it does. The thing that has the property *hot* is not the thing that has the property *cold*, and it was part of our condition that one and the same thing have the incompatible properties. The propositions don't seem incompatible either; it can be true, at one time, that the temporal part of the poker at *t* is hot and that the temporal part of the poker at *t'* is cold. The following is not an example of change:

[12] Sider (2001): 93.

(1) The poker is hot at t

(3) The marmalade jar is cold at t'

But the perdurance solution doesn't appear to distinguish between cases of change and cases like this. This would make the solution unacceptable.

Perdurance does, however, have a further explanatory level that distinguishes change from cases like the pair (1) and (3). For there is a spacetime worm in the fourdimensional picture.[13] In traditional Lewis-style perdurance, the spacetime worm *is* the object. The poker of (1) and (2) *is* the worm that is the collection of its temporal parts. The worm's parts have the different properties. According to the stage view of perdurance, what we are talking about when we talk about the poker is an instantaneous stage. In this case, the poker in (1) and the poker in (2) are different things, but they are bound together by belonging to a worm. Either way, it seems the fourdimensionalist has resources to explain why (1) and (3) aren't an example of change but (1) and (2) (construed in a fourdimensionalist way) are. The story would be something like this:

> The incompatibility necessary for change has two aspects. In the first place, the properties (or relations) ascribed to an object must be incapable of being had at the same time. Secondly, these properties must be had by the same object. According to my view, namely temporal parts, the first aspect is satisfied because the properties are genuinely incompatible. The second aspect is satisfied because there is an object that has both properties. This object is the spacetime worm made up of all the

[13] In fact, given the usual combination of fourdimensionalism with unrestricted mereological composition of temporal parts, there is a spacetime worm in the poker/marmalade jar case too. This might make change even more problematic for the perdurantist. We'll ignore the issue here, however.

temporal parts of the object. Whether we want to say that this *is* the object (with Lewis) or only that it exists (with the stage-theorist), there is an object that has both properties. It has both properties by having parts that have these properties. This is a familiar way of having properties with a clear spatial analogue. This allows me to say both that there is an object with both properties to satisfy this condition (the worm) and that the objects that have the properties (the parts) are not identical.

There is a problem with this story, however, and the trouble is encapsulated by the last line. There's an equivocation. A natural question to ask is: 'What is changing'? The traditional fourdimensionalist and the stage theorist will answer differently. Lewis would say that the spacetime worm is changing by having parts which are changing. The stage theorist would presumably say that the stage is changing by having an appropriate relation to another stage (this relation being *belongs to the same worm as*). Let us deal with these in turn.

Lewis says that the worm is changing. But the poker-worm isn't hot, nor is it cold. It is not even clear that *the worm* is hot at *t* or cold at *t'* (rather than just its parts being so). It seemingly has no properties that change.[14] And to appeal to the spatial analogue is no help. Think of a poker where one end is hot and the other is cold. If we understand 'hot' and 'cold' here to mean 'wholly hot' and 'wholly cold' then the poker seems neither hot nor cold. Even if most of the poker is hot and a small part is cold then the whole poker is not hot. It is certainly not true that the poker whose ends are hot and cold is *both* wholly hot

[14] It is interesting to consider which properties the worm *does* have. Does it have all the essential properties of the object? All the properties, essential and accidental, that the worm always has? Or no properties at all? Or does it have more complex properties like *being-hot-for-90%-of-the-time* or even relational properties like *being-hot-at-t*? It is not clear what the best answer is for the fourdimensionalist.

and wholly cold: this would be a contradiction. The poker has spatial parts that are wholly hot and spatial parts that are wholly cold, but the whole poker is neither.

If we understand 'hot' and 'cold' not to mean wholly hot and wholly cold, but rather 'having parts that are hot' and 'having parts that are cold' then the poker *is* hot and *is* cold. The poker is hot and the poker is cold, by virtue of having parts which are wholly hot and parts that are wholly cold. However, the poker doesn't have the same properties as its parts; the parts are *wholly* hot (or cold), and the poker is only hot (or cold) in part. Being hot and cold in parts is clearly not incompatible, as we are considering an example where one thing is both.

What we have said for the spatial case applies equally to the temporal parts case. The spatial analogy does not help, rather it hinders. For it makes clear what the worm theorist has to say about change. The worm is supposed to have the properties *hot* and *cold* derivatively, by having parts which have these properties. But if by 'hot' and 'cold' we mean wholly hot and wholly cold the worm cannot have these properties on pain of contradiction. If by them we mean partially hot and partially cold we have no change, for the properties are not incompatible. Furthermore, there are properties had by the temporal parts that are not had by the worm (*wholly hot* and *wholly cold*). The relationship between a part having a property and the whole having that property is not made clear, and it really needs to be. To reiterate: it seems that if the poker-worm really does have incompatible properties *hot* and *cold*, even derivatively, then the problem of change is not avoided. If the worm doesn't have the properties then it cannot be the thing changing, for whatever is changing has to have

the incompatible properties. The traditional fourdimensionalist is caught in an analogous dilemma to the relational properties theorist.[15]

The stage theorist is no better off. If the stage is the thing that's changing, then the stage should be the thing that has both incompatible properties. But clearly the stage only has *one* of the properties; another stage has the contrary property. As we noted in our incompatibility condition, it must be the *same thing* that has both properties.[16] But the stage of the poker at *t* has the property *hot*; it does not and cannot have the property *cold*. For, if it did, we would have a contradiction and the problem of change would not have been solved. As the stages of a worm are the referents of propositions like those expressed by the statements (1) and (2), there is not one thing having both of the incompatible properties. There is therefore not a change, as we've defined it.

It seems, then, that the temporal parts solution fares no better than the relation properties solution. Insofar as it solves the problem of change, fourdimensionalism fails to capture real change. Insofar as it captures real change, it fails to solve the problem. Of course, the fourdimensionalist can simply deny that our account of change is right. They can say that change occurs when incompatible properties are had by appropriately related temporal parts of an entity. But this is effectively an exercise in bullet biting, so we have gained further motivation for looking for another solution.

[15] Sider *op. cit.*: 215 appears to bite the bullet on behalf of the worm-theorist when it comes to this issue.
[16] In particular, a counterpart relation between two things having incompatible properties is not enough for change. The *identity* relation must hold between them.

Presentism and incompatibility

The third major established solution to the problem of change is presentism. Presentism is an ontological position that does not admit the existence of non-present objects. In other words: everything that exists, exists now. This ontology can be applied to the problem of change, and our task is to show that such an application doesn't preserve the genuine incompatibility needed for change.

There is one presentist 'solution' that not even a presentist should accept. But it will be useful to explain why. The 'solution' is to admit only the truth of statements about the present. We proposed above that the truth of the following two statements at *t* and *t'* respectively constitutes a change:

(1) The poker is hot

(2) The poker is cold

It does so because the propositions expressed by (1) and (2) are incompatible and true (at different times). The presentist could simply restrict the truth of statements to the present time. If so, then the proposition expressed by (1) is true if it is *t,* and otherwise not, and the propositions expressed by (2) is true if it is *t'* and otherwise not.[17] The propositions (1) and (2) express would then never be both true, so the worries that generate the problem of change never get started. The present moment does not generate a risk of contradiction (for any given present moment) and the present moment is the only one that matters.

[17] We are simplifying matters. (1) will be true not only when it is *t,* but also at all other times the poker is hot (likewise with (2)). This simplification does not affect what follows.

We should point out that this presentist idea is not simply the banal observation that what (1) expresses is true at *t* but not *t'* and that what (2) expresses is true at *t'* but not *t.* It is much more substantial. It is the claim that *nothing is true* except what is the case *now*. So, despite the proposition expressed by (1) being true when the present time is *t,* it is straightforwardly false if the present time is not *t.* There is nothing more to say about the poker's temperature than whether it is currently hot or cold. Just as all that exists exists now, all that is true is true now. The problem of change is dissolved.

But this dissolution clearly will not do. For one thing, it gives no explanation whatsoever of what change is. Secondly, if this is the right way for a presentist to assign truth to propositions then all statements about the past or future will be false. We cannot truly talk about the past or future. We have no tensed sentences. This is a very heavy price to pay, and one that most presentists will avoid.[18] Finally, on any plausible presentist view, there is at least one change happening: which time is the present changes. Thus there is additional motivation against a theory that fixes truth to only the (current) present time. The presentist solution must be something else.

Presentists might want to embellish the previous idea. They can give an ontological basis for taking tense seriously. So they might be able to solve the problem by saying that, while the propositions expressed by (1) and (2) are always *in some sense* true, they do not lead to contradiction because there is irreducible temporal reference in them. (1) and (2) express propositions which are true at *t* and *t'* respectively, but in reporting them the position of *t* and *t'* relative to the present must be taken into account. At *t,* for example, the poker *is* hot and *will be* cold. At *t'*, the poker *was* hot and *is* cold. After *t'* the poker *was* hot

[18] C.f., e.g., the second chapter of Bourne (2006) for an attempt to reconcile presentism with truths about non-present times.

and *was* cold but at different distances from the current time. The propositions expressed by (1) and (2) are therefore true at all times, when appropriately tensed with respect to the present. This solves the problem of change because there is no contradiction in the poker *being* hot and *going to be* cold, or *being* cold and *having been* hot. The irreducibly tensed aspect of the propositions doesn't allow the problem to gain purchase. The irreducibility of tense is grounded in the different ontological statuses of the past, present and future.[19]

We can get clearer on this view by looking at the level of objects and properties. The only things that exist are things that exist now. So suppose the time is *t.* The poker exists, and is hot. But the poker also bears a relation to the property *cold*. It bears the *going-to-be* relation to it. Suppose, later, that the time is *t'*. The poker is cold. And the poker bears the relation *has-been* to the property *hot*. The relations of *going-to-be* and *has-been* are primitive.

This presentist account makes a better effort to preserve our intuitive notion of change than the first one we considered. Any reply we offer to the presentist needs to take care not to illicitly assume eternalism. We shouldn't be presupposing eternalism in providing reasons against a non-eternalist solution to the problem of change. But we still have several serious worries with the presentist solution above. We shall go through these in turn.

The first we shall simply mention before passing over. The type of picture we have presented is extremely susceptible to McTaggart's famous argument. A great deal has been written on that argument, and its strength or weakness, but suffice it to say that the presentist defence of incompatibility we have given has an A-series of events, requires the

[19] This might seem to conflict with the meaning we gave to 'proposition': it is the temporalist's proposition and the eternalist's atemporal content of a proposition. In either case, it appears as though it shouldn't be tensed. We will allow the presentist this move, however, because we shall show it to be fruitless.

A-series orderings of past, present and future to be mutually exclusive, and will most likely add some claim about the passing of time. These together arguably present a problem.

The second problem concerns the relations *going-to-be* and *has-been*. These relations should be the future and past versions of the instantiation relation in order for them to contribute to a description of a change. If so, however, an entity should not be able to bear the same relation to incompatible properties. The poker should not be *going-to-be hot* and *going-to-be cold*. But clearly things can bear these relations to incompatible properties, because things can be hot at some time in the future and cold at some time further in the future. Similar considerations apply to *has-been* and the past.

The presentist has a reply here: they can multiply the number of relations in their ontology. Instead of simply one future-directed instantiation relation and one past-directed instantiation relation, we can have one for each instant of time separated from the present. Thus if it presently some time before *t,* the poker can bear *going-to-be-at-t* to *hot* and *going-to-be-at-t'* to *cold*. There is no contradiction because the instantiation relations are different. *Mutatis mutandis* the same can be said for the past. This type of reply is a form of adverbialism.

This is not, however, satisfactory. There are general concerns about adverbialism.[20] But in this particular case the problem is more specific. The presentist was able to ground the different relations *is*, *going-to-be* and *has-been* in the ontological difference between present, future and past. But there will be no such ontological grounding for the multitude of relations that we now have. *Going-to-be-at-t* and *going-to-be-at-t'* are equal from an ontological standpoint. What, then, is the reason that can be given for their existence? Or, if we put it in terms of propositions, there may be irreducibility of tense in propositions

[20] E.g. the risk of Bradley's regress once we interfere with the instantiation relation.

describing a change. But if both the propositions are propositions about the future, how is contradiction avoided? If it is avoided then strict incompatibility between the propositions must be done away with, so the presentist does not dodge this issue.

A final problem concerns propositions about entities that no longer or do not yet exist. The presentist model we have given works only for the past and future properties of entities that currently exist. Suppose Dino the dinosaur had a sore tooth at some time in the past. The model suggests that Dino bears the *has-been* relation to *sore toothed*. But Dino doesn't exist! Nick the Neptuneian is a yet-to-be-born inhabitant of Neptune. Nick the Neptuneian will be tired. Thus Nick bears *going-to-be* to *tired*. But Nick doesn't exist! How can non-existent entities have properties, even in some tense-sensitive way?

The presentist seems to have two options, neither of which are palatable. She could simply deny truths about entities that do not currently exist. This bullet-biting would not be as bad as denying *all* truths about the past and future, but it seems pretty bad nevertheless. Or she could say that these entities do somehow exist at the present time (perhaps as abstract objects, or in some ersatz way). But this seems bad too; it goes against the spirit of presentism, which asserts that only present things exist. And, having populated the abstract or ersatz realm with a multiplicity of entities, it needs to then explain how these things can bear relations of *going-to-be* and *has-been* to properties. All in all, the presentist seems in an unenviable position.

Conclusions

Thus it seems that the three major solutions to the problem of change do not allow for the change in the intuitive form we have outlined.[21] They fail to both i) solve the problem by explaining away the contradiction, and ii) uphold a genuine sense of incompatibility. They do not exploit the space between contradiction and incompatibility. In fact, because of the above discussion we might worry that there is no such space. Given the failure of these solutions, we have two options. We could admit that the intuitive concept of change we have given is flawed and revise it. We might say that philosophical analysis makes clear that some of our concepts in this area have to give, and that that is exactly what the solutions above are proposing. The trouble is this seems in effect to capitulate to the problem of change. Our second alternative is to look for another solution that *does* manage to uphold our intuitive notion of change. It is the latter course that we shall take. By articulating a solution that maintains the incompatibility without contradiction, we prove that there is space between these two. And if we can articulate such a solution, the failure of the relational properties, temporal parts and presentist approaches in this regard will provide good reason for our new solution. Of course, this will be a defeasible reason. But we are motivated to look for such a novel solution. In the next chapter, then, we shall lay the groundwork for the solution by introducing *situations*.

[21] There are other solutions, of course. In particular, we have not considered adverbialism. This theory bears some similarity to our later theory and to the relational properties view. If it is another solution that upholds incompatibility without contradiction then it is a viable competitor. We shall talk about adverbialism in Chapter 7.

Chapter 3

An introduction to situations

Introduction

The purpose of this chapter is to provide the groundwork and tools for the next chapter, where we spell out a solution to the problem of change. What we need for this solution is an understanding of *situations*. Situations have been used primarily in providing natural language semantics, and relatedly in information theory. To get a handle on the concept we can, for the moment, think of situations as parts of possible worlds. This view of situations will be examined more deeply shortly, but provides a useful scaffold at this stage.

Before we get going, it is worth pointing out a few things we are not trying to do. We are not arguing for situation semantics as the right or best way to do semantics. Nor are we recommending one version of situation semantics over any others. Furthermore, we are not trying to engage with or take a position on technical issues within a situation semantics. Rather, our project is simply to introduce situations, especially as they have been used in semantics. To do so, we shall investigate some of the key concepts of situation semantics before returning to the fundamental question of what situations *are*. Having laid this groundwork, we shall then develop a theory of situations and their application.

Situation semantics is a view of the meaning of language that takes situations as primary. It is compositional and truth-conditional. In other words, (a) the meaning of a complex linguistic expression is constructed out of the meanings of its parts and (b) giving the conditions under which some expression is true is to give the meaning of that

expression. These are generally accepted assumptions within modern semantics, so we shall not challenge them. There are other compositional, truth-conditional semantics. One of particular relevance is possible world semantics, where the meaning of a statement is related to the set of possible worlds in which the statement is true. Situation semantics emerged as a reaction to and development of possible world semantics.

So far, the only positive thing we have said is that situation semantics takes situations as primary. What does this mean? It means that situations are the tool for analysis of the meaning of natural languages. The project of semantics – to give a complete account of the meaning of languages – is to be undertaken by evaluating linguistic expressions with respect to situations. We have said above that situations can be thought of as parts of possible worlds. So, in these terms, semantics is carried out by looking at *parts* of worlds. But we have said that situations are primary, so it seems uncomfortable to be defining them in terms of some further concept of a world. Situations are not just primary in the sense that they are the fundamental unit for analysis of language. They are also primary in a metaphysical sense; it is more perspicuous to describe worlds as collections of situations than situations as parts of worlds.[1] We shall discuss the possibilities for understanding the nature of situations in the second part of this chapter. But we shall start by looking at the history of how situations came to be used and introduce some of the crucial elements of situation theory. This will give us an appreciation of the role of situations before we discuss what they can be.

One final note before we proceed. In Chapter 1 we stipulated an interpretation of statements as what is said by possible utterances of sentences in a context, and held that

[1] It would be possible to have a semantics based on situations while believing that worlds are more metaphysically basic. But I'll prefer the position that suggests that semantic priority is correlated with metaphysical priority.

they therefore have fixed truth-values. In Chapter 2 we used the term 'proposition' to refer to things which are capable of varying in their truth-values (for the temporalist about propositions this referred simply to propositions, for the eternalist about propositions it referred to the atemporal content of propositions). Although, as we shall see, these are uses of terms that will end up fitting with what we say, we no longer make these assumptions. These terms are released from the very specific meanings we outlined in previous chapters. The role of statements and propositions in our picture will emerge in our discussion below.

Austinian propositions

J. L. Austin is credited with originating the idea that the truth of a statement depends on the particular state of affairs that the statement is about.[2] According to Austin, two sorts of conventions are involved when there is an instance of truthful communication. On the one hand, there are *descriptive conventions* that correlate words (a stock of common symbols) with types of situation in the world. For example, the words 'the roof is on fire' pick out a type of situation in which a roof is on fire. On the other hand, there are *demonstrative conventions* that correlate uses of words with particular situations in the world. For example, the words 'the roof is on fire' uttered in the library at noon picks out an historical situation in which the library roof is on fire at noon. Austin's account of truth is that a statement is true if and only if the particular state of affairs that is picked out by the demonstrative conventions *belongs to the type* which the descriptive conventions pick out.

[2] Austin (1950). Statements, for Austin, were the primary bearer of truth.

Austin explains belonging to a type in terms of resemblance; the concrete historical situation must be 'sufficiently like' other standard situations that belong to that type.[3]

Austin's approach has some interesting consequences. Consider the following example from Barwise and Etchemendy (1987). Suppose that Emily is playing cards and has the three of clubs.[4] Suppose, further, that Claire is also playing cards elsewhere in the city and has the three of clubs. If I am watching Emily play and mistake her for Claire I might utter: 'Claire has the three of clubs'. On an Austinian account what I have said isn't true. For the particular situation I'm talking about doesn't contain Claire, so doesn't match the type of situation involving Claire having the three of clubs. In general, only the contents of the particular situation picked out by the demonstrative conventions can make a statement true. It matters, then, which particular situation is being picked out by a statement. This sort of contextual element is exploited by situation semanticists.

Situation semantics has an advantage here over possible world semantics if we don't want my utterance of 'Claire has the three of clubs' to come out true. Possible world semantics is coarser grained because the entities it considers (worlds) are larger than situations. Possible world semantics gives my utterance the value 'true' as Claire does indeed have the three of clubs in the world in which I utter the statement. This, then, can be seen as one example where situation semantics gives a distinctive interpretation. Kratzer (2011) describes some other areas within semantics where situations have been used productively.

[3] *Ibid.* his footnote 9.

[4] The example they use is in fact not ideal; by using a definite description it adds a level of complexity. But let's take it that by saying that someone has 'the three of clubs' we simply mean that they have *a* card with a certain property. The example would work at least as well with 'three clubs' rather than 'the three of clubs'.

But there's lots of work to do to move from an Austinian insight to a full blown situation semantics. In order to make this move, we need to introduce some key concepts. We shall start with the notion of truth in a situation.

Truth in a situation

For Austin, truth is a property of statements such that a statement is true just if the state of affairs picked out by one set of conventions properly resembles the state of affairs picked out by another. His insight is that what we do when we speak is talk about parts of the world: situations. It is worth rephrasing this insight in more familiar terms. One plausible way to do so is to suggest that a *statement* gives both a *proposition* and a *situation*. In less technical terms: statements give content and context. An Austinian model of truth at the level of statements might then be that a statement is true iff the proposition it expresses is true in the relevant situation. The proposition is, in Austin's terms, a type of state of affairs given by descriptive conventions. The situation is, in his terms, the token state of affairs given by the demonstrative conventions. The resemblance between the two is the truth of the proposition in the situation.

Obviously, this account of the truth of statements makes it dependent on a notion of a proposition being true in a situation. We do not intend to provide a complete definition of this notion. But it seems that the Austinian picture meshes especially well with a correspondence theory of truth, so that a proposition is true in a situation if what the proposition expresses corresponds to the way that part of the world is.[5] But it isn't obvious

[5] Resemblance and correspondence seem to be similar notions; a token state of affairs could be said to *correspond* to a type of state of affairs when they resemble each other appropriately. I'm not too concerned

that an Austinian view *requires* a correspondence theory. And, if we can avoid it, we don't want situation semantics to be tied to any particular view of what truth is.

Given this, let's explore some consequences of the Austinian conception of truth. In the first place, according to this notion of truth, a proposition can be true in one situation but not in another.[6] Statements, by contrast, are true or false *simpliciter*, as it is built into the statement both which proposition is asserted and of which situation it is asserted. This gives a degree of flexibility to situation semantics that isn't found in possible world semantics because a proposition can be true in some part of a world but not in another part of the same world. We can see this in the example above: the proposition expressed by 'Claire has the three of clubs' isn't true in the situation where I utter it, but it is true in another situation across town. The statements are different, and one isn't true and the other is.

It is worth giving some more examples to show more fully how the proposal works. Consider my cat, called Puddy, who is a tabby. The proposition expressed by 'Puddy is tabby' is true in situations containing Puddy being tabby. The statement asserting this proposition is true when it is asserted of a situation in which Puddy is tabby. But the proposition is not true, and neither is the statement asserting the proposition, in a situation that doesn't contain Puddy being tabby. The proposition that everybody is happy is true in situations in which every person is, in fact, happy. The proposition that at least a dozen people support Arsenal is true in situations in which 12 or more people support Arsenal. In general, situation semantics permits propositions to be true in some situations but not others.

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with exegesis of Austin, however, so I won't force the idea that situation semantics relies on a correspondence theory of truth.

[6] This is akin to temporalism about propositions. It is not quite the same as it, however, as a temporalist about propositions might not say that propositions can change in truth-value *within* times. Furthermore, we could imagine a situation semanticist who thought that propositions vary in truth-value across situations but not across times. This would be an odd position, but it emphasises the distinction. This is not the only way to develop the Austinian picture. Haslanger (2003) develops a SOFist view that is eternalist about propositions. We shall discuss this further in the second part of Chapter 7.

The spectre of subjectivity might appear here; we can imagine a sceptic using such context-dependence as a sign that what is true is not a matter of objective fact. But the sceptic misinterprets the Austinian position. The statements are true or false objectively. And the propositions are true or false objectively. The status of a proposition in a situation is fixed. But whether a proposition is true or not depends on some specified portion of a world. This can be cashed out in a number of ways, depending on your view of truth, but there is nothing *subjective* in the account: the subject isn't involved. The fact that whether a statement is true or not depends on what part of the world it is talking about is not subjectivity: it is simply a restatement of Austin's insight.

So truth in a situation doesn't lead to subjectivity about truth. But we still need to know how it works. We can draw on an analogy with possible worlds. Modal talk often speaks of propositions being true in worlds; proposition *p* is true in world *w*. How this is interpreted obviously depends on your general view of truth, but roughly stated it means that things are as *p* says they are in world *w*. This rough statement is what we can use for truth in a situation too: *p* is true in a situation *s* when things are as *p* says they are in *s.* Cashing this out in more detail will depend on your general theory of truth. Whatever you'd say about the world case you should say about the situation case too. For worlds, if there are such things, would be special sorts of situation according to the situation theorist.[7] So, for example, if you think that *p* is true in *w* iff, in *w*, *p* corresponds to the facts, then *p* is true in *s* iff, in *s, p* corresponds to the facts. If you think that *p* is true in *w* iff, in *w*, *p* coheres with some group of other propositions, then *p* is true in *s* iff, in *s, p* coheres with some group of other propositions.

[7] We'll say more on this in due course. In short, a standard definition is that worlds are situations that return a truth-value for all propositions. This doesn't quite work for us (see Chapter 4).

We have a basic understanding of what it is for a proposition to be true in a situation; it's broadly what it is for a proposition to be true in a possible world. What it is for a statement to be true is parasitic on this, for a statement is true when the proposition it expresses is true in the situation to which it refers. For any situation *s,* then, we can define an operator 'true in *s'* such that it is true in *s* that *p* if and only if, in *s, p* satisfies whatever your conditions are for truth. There is more to be said about truth in a situation. But we shall first set out two fundamental notions within situation theory.

Two key concepts of situation semantics: minimality and parthood

In this section we begin to look at some of the technical machinery of situation semantics. We begin with the concept of a *minimal* situation. Intuitively, this is the smallest situation in which something is the case: for example, the minimal situation in which Puddy is tabby is not the situation in which he is tabby and furry. It is, of course, the situation containing just Puddy being tabby. In general, for cases where *a* is *F,* the minimal situation in which *a* is *F* contains just *a*, *F* and their connection. An alternative way to couch minimal situation is in terms of truth and propositions. The minimal situation such that *p* (for some proposition *p*) is the situation containing the smallest number of particulars, properties and relations to make *p* true. There can be more than one minimal situation for a given proposition. Consider the proposition that Jones has a friend. If Jones has more than one friend, each situation containing Jones, a friend and their being friends would be a minimal situation for the proposition.

There is much more that could be said about minimal situations. There are a number of propositions for which it is unclear what their minimal situation(s) can be.[8] But it is not the task of this chapter to resolve questions over minimality for certain types of proposition. What *is* part of our task is explaining the relations between situations. This is what we shall investigate next.

Consider a situation *s,* the minimal situation for Puddy being tabby. It is vitally important to note that, in *s,* Puddy doesn't have all the properties that he in fact has in the actual world. He only is tabby. Even if Puddy is actually furry as well, the property furry isn't in *s.* This is the restriction we derived from Austin. So the situation which only consists in Puddy being tabby is distinct from the situations in which he is furry.

But we want to be able to talk about relations between situations. The fundamental, basic relation between situations is parthood; situations can be related by being parts of one another. For example, the situation containing Puddy being tabby is a part of the situation of Puddy being tabby and furry. It is also part of the situation of Puddy being tabby and Jones being happy. We can define this relation as follows: a situation *s* is part of a situation *s** if and only if *s** contains all the particulars in *s,* which instantiate all the properties and relations they do in *s.* We also call *s'* the *extension* of *s.*[9] Where '+' denotes a simple sum function, another way to put this is that *s* is part of *s** if and only if $s + s^* = s^*$.[10] Situations that are parts of other situations obviously cannot be bigger than them. If *s* is part of *s** then

[8] Among these propositions are negative existentials and those containing quantifiers like 'between a hundred and a thousand' and 'more than a mile'. See Kratzer (2011): sect. 6.

[9] See Elbourne (2005). This definition won't quite work for us, given the particular features that our situation theory will exhibit over the coming chapters. We will claim that there are some unusual situations in which particulars will not instantiated the properties and relations they do in parts of the situation (see, especially, Chapters 4 and 7). However, we can offer a definition that, *prima facie*, looks equivalent: a situation *s* is part of a situation *s** if and only if *s** contains all the particulars in *s* and no particular in *s** fails to instantiate any properties or relations in *s** that it does in *s.* The difference between these definitions will only become apparent later.

[10] Kratzer *op. cit*.

we write $s \leq s^*$. We can generate a partial ordering of situations on the basis of this relation; it is transitive, reflexive and antisymmetric. So, if *s* is a part of *s'* and *s'* is a part of *s''*, then *s* is a part of *s''*, all situations are parts of themselves and no situation is part of a situation that is part of it, unless they are identical. This brief outline gives us some grip on the relation between situations.

Minimality and parthood are fundamental notions within situation theory. We can, in fact, define the former in terms of the latter. A situation *s* is a minimal situation that *p* iff *p* is true in *s* and *s* has no other situation as a part in which *p* is true.[11] Having set out these two notions, we can return to the notion of truth in a situation, for there are a few further issues to address.

Further examination of 'true in *s*': indeterminate truth-values, necessity and persistence

Let us look again at 'true in *s'*. It can be considered an operator on propositions. It seems we have some choices to make about the way it functions. One initial area to investigate is what happens when *s* does not contain the constituents of the proposition on which 'true in *s'* is operating. Take the proposition that Puddy is tabby and the situation that corresponds to the Battle of Britain. It is clear from what we have said that the proposition is not true in the situation. But we have two interconnected questions: is the proposition *false* in the situation, and is *the negation* of the proposition true in the situation? The natural answer in both cases is no: the Battle of Britain has nothing to say about whether Puddy is

[11] Elbourne *op. cit*. This seems to imply that if there is an empty situation then this is part of every other situation. The notion of an empty situation is difficult to square with the idea that a situation involves one or more entities having properties and being related, however.

tabby or not, so leaves its truth-value undefined rather than false. 'It is not the case that Puddy is tabby' isn't true in *s* because Puddy isn't in the Battle of Britain so isn't not tabby in it.[12] It seems reasonable to suggest that propositions whose contents are not contained in *s* are neither true nor false in *s.* Or, to put it another way, a proposition that refers to an entity which is not in the situation of evaluation doesn't have a determined truth-value in that situation. The alternative would be to give every such proposition a truth-value, and it seems that *s* doesn't determine this.[13]

But if *s* fails to provide truth-values for propositions about which it says nothing then a couple of consequences follow. The first is that the operator 'true in *s'* isn't bivalent; it doesn't return either true or false for every proposition. The second is that, on an intuitive understanding of 'or', the operator doesn't obey the law of excluded middle. It is not always the case that the proposition that either *p* or not-*p* is true in *s* because there are some situations in which both *p* and not-*p* are neither true nor false.[14] These are not negative consequences (or, at least, we have not yet found that they are negative).

Another area worth looking at is necessity. Given that propositions can be neither true nor false in a situation, we have some decisions to make on what it takes for a proposition to be necessary. One way to characterise necessity would be by truth in all situations; *p* is necessarily true if it is true in all situations.[15] An alternative would be to

[12] We might want to compare the cat and Battle of Britain case with the possible world evaluation of propositions that mention unicorns in the actual world. It seems we get the same sort of answers.

[13] There are ways we could give every proposition a determinate truth-value in *s.* We could make any proposition with some content not contained in *s* false. This would permit *p* and not-*p* to have the same truth-value. Another alternative is to specify that any positive proposition with some content not in *s* is false and any negative such proposition true. We would then need to provide an account of positive and negative propositions.

[14] This is more precisely demonstrated when we give the conditions under which a disjunction is later in this chapter. See pp. 99-100 below.

[15] We shall also have to explain what falls under 'all' here. Are all situations actual? Or are there merely possible situations? This is covered on pp. 90-91 below.

define necessity by falsity in no situations: *p* is necessarily true if it is not false in any situation. The two alternatives differ over propositions which are never false but are sometimes neither true nor false. There is an analogous choice to be made with respect to necessary falsehood.

We favour the second alternative for necessity. The reasons for this will become clearer in Chapter 5, but at this stage we can simply point to an initial motivation. Situations are partial; they do not determine everything. If all necessary truths were true in all situations, any situation would contain a great deal. The Battle of Britain, for example, would have the following sorts of proposition true in it: 'all tabby cats are cats', 'all vixens are foxes' and 'squares are rectangles'. But the Battle of Britain doesn't seem to have any of the relevant entities in it. It gets more complicated still if we allow that the following proposition is necessary: 'If Puddy is a tabby cat, Puddy is a cat'. The individual to which the proposition refers doesn't exist in every situation, so how could the proposition be true in every situation? So we shall work on the basis that necessity is a matter of *never being false*.

The final examination of 'true in *s'* that we shall note is the most vital for our project. It concerns the truth of propositions in situations that bear parthood relations to one another. If some proposition *p* is true in *s* and $s \leq s^*$, does that entail that *p* is true in *s**? This is a question about the so-called *persistence* of propositions across situations.[16] It might seem natural to say that the entailment holds, i.e. that propositions always persist across situations. We have explained parthood by saying that the relation holds between *s* and *s** when $s + s^* = s^*$. This might appear equivalent to the claim that all propositions true in the part are true in the whole. It is not, however. In the next chapter, we shall look in some

[16] This terminology is particularly unhelpful for us, as it is liable for confusion with the term used for the continued existence of objects through time. It would, however, be even more confusing to introduce a new term for one of these. Apart from being vigilant to this ambiguity, then, there is little else we can do.

detail at this issue, and that is the place to deal with this concern. But at this stage, a couple of examples can give us pause. The proposition that there are exactly three bottles of beer seems true in some situation bounded by my fridge, but not in larger situations of which this is a part. The proposition that all the kittens are black can be true in some situation containing one litter, all of whose members are black, but not true in larger situations containing that litter and other kittens which are not black. We won't consider these examples further here. But it is worth flagging at this stage this question which properly belongs to an examination of the notion 'true in *s'.*

We have introduced truth in a situation, minimality of situations, parthood relations between situations and looked at a few interesting possibilities for truth in situations. But we have not yet said what situations themselves *are*. We have been working with a loose conception of situations as parts of possible worlds as a scaffold. It is now time to remove the scaffold and see what the real foundations are.

What are situations?

Kratzer tells us: "[T]here is no consensus about what situations are, just as there is no consensus about what possible worlds or events are."[17] There are two clearly distinguishable strands of the use of situations. The first strand comes from Barwise and his collaborators (especially Perry), who had interests in situation theory and information. The second strand is from Kratzer, Heim and, more recently, Elbourne; they have an instrumental view of situations as a semantic tool. Barwise *et al.* are concerned with foundational issues in

[17] Kratzer *op. cit.*: Introduction

situation theory, so we shall start by looking at how they give content to the notion of a situation.

It isn't easy to set out Barwise's view of situations, as his picture of situations changes over the course of his work with various collaborators. Terms are also not univocal over time. The central thread is that situations, whatever they are, are *partial*; they answer some but not all questions. In *Situations and Attitudes*, Barwise and Perry propose that there are two sorts of situations. The first are token situations; parts of spatio-temporal reality that are ontologically basic concrete objects. Individuals and properties are reduced to uniformities across token situations.[18] There are also abstract situations. These are structured, and constructed out of locations and situation types (where a situation type is a property of a situation).[19] The crucial point is that the 'real' situations, the token situations, are "individuals having properties and standing in relations at various spatio-temporal locations."[20] Although it is at times unclear what the direction of ontological dependence is between real situations and those things they contain, their considered view is that token situations are supposed to be basic. But in their fictitious interview (revealingly entitled 'Shifting Situations and Shaken Attitudes') for *Linguistics and Philosophy* in 1985 Barwise and Perry admit that their realism became richer in the process of writing the book. In particular, they realised that their attempt to provide a rich semantics based on austere ontology through set theoretic constructions "was an illusion".[21] In order to depict reality accurately, more needs to be added into the foundations of situation theory.

[18] They are thus not ontologically basic. A 'uniformity' is some similarity between situations. It allows individuation and identity of things across situations. See Barwise and Perry (1983): 7-8, 10, 50.
[19] A situation type is a property that is a partial function from *n*-ary relations and n individuals to the values 0 and 1. It is crucial for situation theory that this function is *partial*; it doesn't say all there is to say about an individual that is in a situation.
[20] Barwise and Perry *op. cit.*: 7.
[21] *Ibid.:* 113.

In fact, as situation theory developed, a number of different alternative views of situations were in use. As an example, we find Devlin (1992) understanding situations (presumably abstract or type situations) as mathematical objects akin to numbers. They were, he claimed, not fully explicable in terms of previous theory but should be accepted as a necessary tool for thinking about these things. Entities like states of affairs came to have a more prominent role. It was a pertinent ontological question whether properties and objects were basic or whether it was situations 'all the way down'. Drawing together the overlapping and competing views on situations that were floating around in the discourse into a coherent whole would be a significant project on its own, and anachronistic. It's a fairer representation to suggest that people were simply playing around with this new tool – situations – and that giving a systematic, definitional account of their use in these circles in the 80s and 90s is neither promising nor helpful.[22]

One particularly relevant article to support this conclusion is Barwise's 1988 'Notes on Branch Points in Situation Theory' in *The Situation in Logic*. In this article he details and embraces the fact that situation theory has a certain fluidity. He lists 19 choices that need to be made about what situations are, with some sub-choices. Examples of these include: whether the actual world is a situation, whether there are non-actual situations, whether every part of a situation is a situation, whether a situation could have different contents and so on. The trouble is, it's very hard to see principled reasons for selecting between these options. We can create perfectly reasonable accounts of situations that are incompatible. Barwise saw this flexibility in the notion of a situation as an advantage; different theories of situations can be developed to suit different fields of study and discourse. To use his

[22] Conversation with Jeremy Seligman has helped motivate this interpretation and my understanding of the history of situations in general.

example, an account of Japanese speaking that uses situations will have a different idea of situations to a situational account of a frog's perspective on the world. Barwise expresses the firm hope that each of these different 'spaces' which take different choices will be able to be mapped onto one another, much like translation between different topologies. But history suggests that the sheer flexibility of the notion and the lack of motivation for selecting one or other of the options in Barwise's Branch Points contributed to situations falling out of fashion. If our intuitions cannot get a grip on the notion of a situation, it's not going to be a good primitive notion for our theory. We can't seem to decide between the theoretic choices Barwise gives us on any basis, metaphysical or otherwise. Situations seemed to be tools that were too flexible to be used for any serious work.

So, looking for an account of situations from Barwise has led us to a rather pessimistic conclusion; that there is no settled view of situations and, further, that there doesn't seem to be much prospect for getting such a view. It's very unclear how to cash out these partial entities. But situations are still in use nevertheless. They are happily settled in semantics. Perhaps, then, we should see what the semanticists who use situations think of them. We shall look at Kratzer's account, more recently endorsed by Elbourne.

Kratzer turns to David Armstrong when trying to give some metaphysical content to the notion of situations. In his *Universals and Scientific Realism*, Armstrong argues for an ontology including both particulars and universals. The existence of universals is highly controversial. For Armstrong, universals are either properties or relations. An *n*-adic universal is a property if *n* is one and a relation if *n* is greater than one. Not every predicate corresponds to a universal; it is science which can tell us which universals there are. Armstrong defines a *state of affairs* as a particular's having a property or two or more

particulars standing in some relation.[23] States of affairs are themselves particulars. They are made up of particularity and universality; i.e. they are constituted by their particulars and the universals they have.[24]

There is more to say, however, as the particulars that are in a state of affairs can be understood in two ways. There are 'thick' and 'thin' particulars. A thick particular "is a thing taken along with all its properties", whereas a thin particular "is a thing taken in abstraction from all its properties."[25] A thick particular is itself a state of affairs: it is a particular with properties. A thin particular does have properties, but is considered apart from them. There is therefore an ambiguity between the sense in which terms like 'have' and 'instantiate' apply to thick particulars and the sense in which they apply to thin particulars. A thin particular is not identical to the properties it instantiates, a thick particular is identical to the particular's instantiation of all the properties.

It is important to note, however, that thin particulars are not *bare* particulars; that is they are not separately existing entities with no properties. Not only does Armstrong say that universals are nothing without particulars, but he also says that particulars are nothing without universals. There is no particular that instantiates no universal; there are no particulars that do not have any properties or relations. And, furthermore, there is no particular that instantiates no property; all particulars instantiate at least one monadic universal. So the abstraction involved in coming to thin particulars is just that: abstracting away from the way things are to some further conception.

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[23] Armstrong (1978) Vol. I: 114. Though this follows Armstrong's phrasing, it might be better to define a state of affairs as one *or more* particulars having one *or more* properties or relations. This avoids the impression that states of affairs are intrinsically minimal.

[24] But Armstrong's view on the ontological priority between states of affairs and the particulars and universals that make them up is not clear. This is an interpretive issue we shall pass over here.

[25] Armstrong *op. cit.*

There is a little more to say about thin particulars. Armstrong asks in what the particularity of a thin particular consists. Or, in less technical terminology, what makes something the thing that it is? His answer is the spatio-temporal location of the particular over the length of its career. The total position of a particular combined with the properties of the particular *is* the particularity of the particular. This puts some flesh on the account of thin particulars.

Are thick or thin particulars constituents of states of affairs? Armstrong answers that it is thin particulars. For, as we have said above, thick particulars themselves *are* states of affairs. They can't therefore be constituents of them.[26] So we can describe a thick particular as a thin particular having some properties. Clearly, then, *thin* particulars are the constituents of states of affairs. So a state of affairs for Armstrong is a thing, taken in abstraction from its properties, instantiating a universal.

For Kratzer, Armstrong's states of affairs are what situations are.[27] Thus situations are thin particulars having properties or relations. It is worth noting that Armstrong's account of universals is very controversial, so there is a risk of importing such controversy into situation semantics if the metaphysical background is spelt out in this way.

While this view of situations may allow the semanticists to get on with their primary task – providing semantics for natural language – it is worryingly bound up with a highly controversial metaphysical position on the nature of properties. I suspect that the best strategy for the semanticists is simply to avail themselves of the structure of Armstrong's states of affairs and allow a critic to slot in whatever theory of properties they prefer. But it

[26] It might be possible that thick particulars can be constituents of some larger states of affairs, but unless states of affairs are infinitely divisible we'll need a level at which *thin* particulars are the constituents of states of affairs. I take it that Armstrong thinks this is a reason to assert that thin particulars are always the constituents of states of affairs.

[27] Kratzer (1989): sect. 3.1, Elbourne *op. cit.*: sect. 2.2.1.

isn't obvious that this is permissible, for we might not be able to help ourselves to Armstrong's theory of states of affairs without the rest of his ontology. At best, then, we can say that Kratzer's account of situations is incomplete.

So, we have an incomplete theory of situations from Kratzer and a distinctly unsettled situation theory from Barwise. This doesn't look promising for the use of situations. One question we might ask at this stage is whether we actually *need* an account of what situations are: can't we make do without? One way to do so would be to claim that situations are basic in an explanatory sense; they are primitive at the level of explanation.[28] An account of them will not therefore be forthcoming. I do not, however, want to be forced into such a claim. Neither do I want to go through Barwise's 19 branch points and give reasons for a decision in each case. Nor do I want to argue for Armstrong's view of universals.

Instead in the next section I propose to do the following: stipulate some but not all features of situations, leaving their nature underdetermined. These stipulations will be on the basis of the uses to which situations are put in later chapters. The *justification* of these stipulations is simply the usefulness of such theoretical entities.

Some decisions on the nature of situations

I will take it as a guiding principle that situations have to do with predication. When we predicate something of something, we are referring (or attempting to refer) to a situation. This does not *explain* what situations are, as I've not said anything about what

[28] This is akin to the move in Devlin *op. cit.*

happens in predication. But it does show the space into which an account of situations will fit.

A first question to consider is the ninth choice Barwise details: are situations composed of individuals and relations or are they compositionally basic?[29] I will assume that situations are *not* compositionally basic; they are not fundamental in this sense. A situation is made up of the particulars it contains and relations they have.[30] There is a quite simple reason for this. We are trying to use situations to furnish a solution to the problem of change. This problem is premised on the idea that there are objects that change. If at the most fundamental level of ontology objects do not exist it is hard to see how this could be a *solution* to the problem of change. In purely situation-theoretic terms, it is an open question whether situations are compositional or whether they are simple (and so, for example, objects are abstractions across situations). It is not an open question for us. Situations must be compositional; it is not situations 'all the way down'.

A second key question is whether all situations are actual or whether some situations are merely possible. This is Barwise's Choice 4. As I am conceiving of them, there are non-actual situations. I stipulate this feature. Furthermore, I also stipulate that non-actual situations can have actual situations as parts; actual and merely possible situations can sometimes be combined to form larger situations. In the terminology of possible worlds, there are trans-world situations. This latter stipulation could be part of a broader claim: situations permit unrestricted mereological composition. Such a position would assert that for any two situations *s* and *s'* there is a situation *s** which is their unique sum.[31] However, I am not here asserting the unrestricted mereological composition of situations (though I am

[29] C.f. Barwise (1989): Choice 9.
[30] Having a property is here understood as having a monadic relation.
[31] If either *s* or *s'* are part of one another, *s** would be identical to the larger situation.

not unsympathetic to it). I am merely claiming that there are some situations which have both actual and non-actual situations as parts.[32]

Other than this, the theory of situations we shall be working with is intentionally uncommitted. In particular, I don't want my use of situations to require Armstrong's view of universals. I also don't want to be committed to the claim that there are some situations which are worlds. Although these are interesting issues, they are ones I'll side-step here.

So, we have an appreciation of how situations have come to be used, some of the key concepts of situation theory and a deliberately incomplete account of the nature of situations. We can now turn to the task of outlining more precisely what situations can *do* and how they work.

A working out of situations semantics

It helps to put some flesh on the bones of situation theory if we actually work through some of the technical material about the application of situations to semantics. In this section, we will be setting out the grounding for such a semantics. What follows is particularly indebted to Kratzer's picture in her 1989 paper 'An Investigation of the Lumps of Thought'. We should first, however, point out some theoretical differences between Kratzer's account and our own. She identifies propositions with sets of situations, and defines truth in terms of set membership. We do not want these commitments. We have already given our (deliberately) incomplete account of truth in a situation. We have an open mind about the nature of propositions. We certainly don't want to rule out, for example, that they are

[32] The restricted composition I claim does not entail that there are situations that have parts in which inconsistent propositions are true. Unrestricted mereological composition *would* entail this. As will become apparent in later chapters, this is not an entailment that I would find problematic.

structured entities. There are further theoretical differences, too, which will become apparent as we proceed. However, the best way of seeing these differences is seeing the way the differences manifest themselves as we set out what follows.

Let's first outline the ontological ingredients for situation semantics:

Ingredients and logical properties and relations

S - a set, the set of possible situations

A - a set, the set of possible thin particulars

$\leq$ - a partial ordering on $S \cup A$ such that at least the following conditions are satisfied:

(i) For no $s \in S$ is there an $a \in A$ such that $s \leq a$

(ii) For all $s \in S \cup A$ there is a unique $s' \in S$ such that $s \leq s'$ and for all $s'' \in S$: if $s' \leq s''$, then $s'' = s'$

P(S) - the power set of s, the set of propositions

We might prefer to label A as the set of possible individuals, but the difference is terminological. $\leq$ is intuitively understood to be the parthood relation. We do not assert that propositions are sets of situations (we are leaving the nature of propositions undetermined),[33] so we replace P(S) with:

P - the set of propositions

Kratzer also includes the following in her ingredients:

[33] See Soames (2008) for criticism of the idea that propositions are sets of situations.

W - a subset of *S,* the set of maximal elements with respect to $\leq$. *W* is the set of possible worlds. For all $s \in S$, let w_s be the maximal element of *s* related by $\leq$.[34]

This ingredient claims that there are world-sized situations which can be determined by maximality. Furthermore, in the third sentence it also claims that there is a unique maximal element (world) for every situation and hence every individual. This has the consequence that situations and individuals are world-bound. These two claims – that there are worlds and that situations and individuals are world-bound – are claims we do not want to make. This will have knock-on effects on the rest of our semantics. As an example, unlike Kratzer we will not need a counterpart relation for talking about an individual across a number of possible worlds. This semantics is non-classical in the sense that some propositions will be neither true nor false in some situations. This will have consequences below.

We can now set down the logical properties and relations. As we noted above, truth for Kratzer is set membership:

Truth

A proposition $p \in P(S)$ is true in a situation $s \in S$ iff $s \in p$.

By contrast, although we have discussed the notion of truth in a situation, we have not reduced it to some more basic concepts.[35] Truth, for us, is not therefore defined in terms of some other notions; it stands as a primitive in the theory.

[34] Unrestricted mereological composition between situations would entail that there is one maximal element; the fusion of all situations. Kratzer doesn't allow trans-world composition of situations. We aren't taking a stand on this issue here.

The other properties and relations are defined by Kratzer as below:

Logical consequence

A proposition $p \in P(S)$ follows from a set of propositions $A \subseteq P(S)$ iff p is true in all those $w \in W$ in which all members of A are true.

Validity

A proposition $p \in P(S)$ is valid iff p is true in all $w \in W$.

Consistency

A set of propositions $A \subseteq P(S)$ is consistent iff there is a $w \in W$ such that all members of A are true in w.

Compatibility

A proposition $p \in P(S)$ is compatible with a set of propositions $A \subseteq P(S)$ iff $A \cup \{p\}$ is consistent.

Logical equivalence

Two proposition p and $q \in P(S)$ are logically equivalent iff $p \cap W = q \cap W$.

[35] Of course, this could be done within our framework. But we're just not taking a position on how it should be done.

However, we cannot accept these as they stand; they all make reference to worlds and identify propositions as members of the power set of situations. For consistency and compatibility we can make some simple replacements to bring them in line with our view:

Consistency

A set of propositions A ⊆ P is consistent iff there is a $s \in S$ such that all members of A are true in *s.*

Compatibility

A proposition $p \in$ P is compatible with a set of propositions A ⊆ *P* iff A ∪ {*p*} is consistent.

Logical equivalence requires a bit more work, as we cannot use the concept of intersection between a proposition and a set of situations. However, we can use identity between sets of situations in which propositions are true:

Logical equivalence

Two propositions *p* and $q \in P$ are logically equivalent iff the set of situations B ⊆ *S* in which *p* is true and the set of situations C ⊆ *S* in which *q* is true are such that B = C*.*

But in order to strip out the world reference for logical consequence and validity, we shall have to introduce a further logical relation. This relation is necessary because in our picture it is not the case that a proposition is false whenever it is not true. We have a view whereby a proposition can lack truth-value; it can be neither true nor false. This 'gappiness' has

several consequences. One immediate consequence is that the definition of falsity does not directly fall out from the notion of truth in a situation. Falsity in a situation will be another primitive in our system.[36]

Using a primitive notion of falsity in a situation we can then duly define the final relations:

Logical consequence

A proposition $p \in P(S)$ follows from a set of propositions $A \subseteq P(S)$ iff there is no $s \in S$ such that all the members of A are true in *s* and *p* is false in *s.*

Validity

A proposition $p \in P(S)$ is valid iff *p* is not false in any $s \in S$.[37]

These notions provide us with a theoretical handle on the formal relations between situations.

[36] It might be possible to define falsity using the relations already introduced. For example, we might think that a proposition *p* is false in some situation $s \in S$ iff there is a proposition *q* which is true in *s* which is incompatible with *p.* This definition won't quite do, however. For there can be cases where a proposition is *not* false in a situation but is incompatible with something true in that situation:

> Consider a situation containing only happy people. The proposition, 'Everyone is happy' is true in this situation. Suppose the situation doesn't contain John. The proposition that John is happy should be neither true nor false in the situation. It is incompatible with the true, 'Everyone is happy'. Hence the definition would make it false.

So although there may be a reductive definition of falsity, it is not obvious what this would be. We shall operate on the basis that falsity is a primitive notion, but if it can in fact be reductively defined then so much the better.

[37] We have touched on this above, in the section entitled 'Further examination of 'true in *s*''.

Giving meaning to sentences

Once we have these foundations in place, we have the basis for a sketch of a semantics. This semantics is for a simplified version of English, and the role of the semantics is primarily to show how the notions of the logical connectives and quantifiers can be understood within the framework. We give the meaning for such sentences at the level of Logical Form. It will not be sufficient for us to give the truth conditions for sentences following a Tarski model; because we have two primitive notions (truth and falsity) we shall also have to give the conditions under which sentences are false. Again we shall be using and reacting to the definitions provided in Kratzer (1989).[38]

Let's begin with negation. The natural suggestion for negation, drawing on possible world semantics, is the following (Kratzer's numbering):

(D12) *Non-Persistent Negation*

For any variable assignment g: $[not\ \alpha]^g$ is true in $s \in S$ iff $[\alpha]^g$ is not true in s.

But this will not do. Kratzer wants propositions to be persistent, and this is not. This isn't a problem for us. But it *is* a problem that (D12) suggests that the negation of a proposition is true in any situation in which that proposition isn't true. This is a direct denial of our earlier assertion that 'true in *s*' is not a bivalent operator. It would mean that propositions would be true in situations which didn't contain their referents. For example, the proposition that is the negation of the proposition 'Puddy is tabby' would be true in the situation

[38] Unlike Kratzer, we don't give an account of the meaning of atomic sentences. Atomic sentences are true when the propositions they express are true in the situations to which they refer. We've discussed this notion already earlier in the chapter in the section 'Truth in a situation'.

corresponding to the Battle of Britain. For the proposition 'Puddy is tabby' is not true in that situation; Puddy isn't even *in* the situation. As we have said above, we don't want propositions to be true in situations which don't contain the referents of the proposition. So, we need a refined definition of negation. The fact that we have falsity in our armoury makes this easy:

Negation true

For any variable assignment g: $[not\ \alpha]^g$ is true in $s \in S$ iff $[\alpha]^g$ is false in s.

We must also give the conditions under which a negation is false. Again, this is straightforward:

Negation false

For any variable assignment g: $[not\ \alpha]^g$ is false in $s \in S$ iff $[\alpha]^g$ is true in s.

Conjunction likewise is pretty obvious:

Conjunction true

For any variable assignment g: $[\alpha\ and\ \beta]^g$ is true in a situation $s \in S$ iff $[\alpha]^g$ and $[\beta]^g$ are both true in s.

If either of the conjuncts is not true, the conjunction is not true.

Conjunction false

For any variable assignment *g*: [*α and β*]^{g} is false in a situation *s* ∈ *S* iff [*α*]^{g} or [*β*]^{g} is false in *s.*[39]

Situations are closed under conjunction: if *p* is true in *s* and *q* is true in *s* then [*p* and *q*] is true in *s.*

Disjunction is treated similarly, and also exhibits closure:

Disjunction true

For any variable assignment *g*: [*α or β*]^{g} is true in *s* ∈ *S* iff [*α*]^{g} or [*β*]^{g} is true in *s.*

A disjunction is true in *s* if one of the disjuncts is true in *s.* This might seem to go against the grain of what we have said earlier: a disjunction can be true in a situation even when a disjunct refers to something that is not found in the situation. So, for example, the proposition expressed by, 'Queen Elizabeth's coronation was in 1952 or England will win the 2014 World Cup' is true in a situation that spans 1900-2000, where the 2014 World Cup doesn't exist. But it is the nature of disjunctions to be capable of this. Disjunctions only require a disjunct to be true to be true (in a situation). So it is not always the case that a proposition lacks truth-value when it refers to something not in the situation. Of course, *atomic* propositions always lack truth-value when they refer to entities not in the relevant situation. But complex propositions are more complex.

[39] This gives a strong Kleene truth-table for conjunction. Our other connectives also have strong Kleene truth-tables.

The conditions under which a disjunction is false are given below:

Disjunction false

For any variable assignment *g*: [*α or β*]^{g} is false in *s* ∈ *S* iff [*α*]^{g} and [*β*]^{g} are false in *s.*

A disjunction is only false when both disjuncts are false. Disjunctions are neither true nor false if they do not satisfy either of the conditions we have provided.[40]

We shall now turn to universal and existential quantification. Let's begin with existential quantification:

Existential Quantification true

For any variable assignment *g*: [(*There is an x: α*)*β*]^{g} is true in a situation *s* ∈ *S* iff there is a variable assignment *g'* which is just like *g* except possibly for the value it assigns to *x* (call such an assignment an "*x* alternative of *g*") such that [*α*]$^{g'}$ is true in *s* and [*β*]$^{g'}$ is true in *s.*

Existential Quantification false

For any variable assignment *g*: [(*There is an x: α*)*β*]^{g} is false in a situation *s* ∈ *S* iff there is no *x* alternative of *g* such that [*α*]$^{g'}$ is true in *s* and [*β*]$^{g'}$ is true in *s.*

[40] The conditional is reducible, as with traditional propositional logic, to the other logical connectives. It is true and false in all the same cases as the negation of: [*α and not β*].

The conditions we have given have the consequence that existential quantification *always* receives a truth-value. It is bivalent; it is never neither true nor false. If there is something that satisfies it, it is true. If there is nothing that satisfies it, it is false. Our system exhibits closure under existential quantification: if John is happy in *s* then there is something which is happy in *s.*

Universal quantification is more complicated. We shall begin by giving the falsity conditions for universal quantification, as this is easier:

> *Universal Quantification false*
>
> For any variable assignment *g*: [(*For all x: α*)*β*]^{g} is false in a situation *s* ∈ *S* iff there is an x-alternative *g'* of *g* such that [*α*]$^{g'}$ is true in *s* and [*β*]$^{g'}$ is false in *s.*

Universal quantification is false in a situation if there is something in that situation which is not the way the universally quantified sentence says it is. A first thought for the truth conditions of universal quantification might be:

> *Universal Quantification true*
>
> For any variable assignment *g*: [(*For all x: α*)*β*]^{g} is true in a situation *s* ∈ *S* iff for all *x*-alternatives *g'* of *g* the following holds: If [*α*]^{g} is true in *s* then [*β*]$^{g'}$ is true in *s.* [41]

[41] This corresponds to Kratzer's 'Non-persistent Universal Quantification'. Her hand is forced by persistence worries, so she has to reject this account. Elbourne, like us, also takes propositions to be non-persistent and it is a useful aside to consider his lexical entry for 'every' (*op. cit.*: 51):

> [every]g = λf<<s,e>,<s,t>>. λg<<s,e>,<s,t>>. λs. for every individual x: for every minimal situation s' such that s' ≤ *s* and f(λs.x)(s') = 1, there is a situation s'' such that s'' ≤ *s* and s'' is a minimal situation such that s' ≤ s'' and g(λs.x)(s'') = 1.

However, there is a problem with such an account. Consider a sentence containing a restricted quantifier, such as, 'Everyone who is blue-eyed is happy'. Now consider a situation in which no one has blue eyes. Because the antecedent in the truth condition fails in every case, the conditional is true. Hence it seems 'Everyone who is blue-eyed is happy' is true in situations in which no one is blue-eyed. This is a problem, as it seems as though it should be neither true nor false. Universal quantification is not, unlike existential quantification, bivalent. So we need to create space for a proposition in such a case to be neither true nor false.

To make this space, we can simply add a second clause into the truth conditions. This clause is equivalent to existential quantification for the first element of the universal:

> *Universal Quantification true*
>
> For any variable assignment *g*: $[(\textit{For all x: } \alpha)\beta]^g$ is true in a situation $s \in S$ iff both i) there is an x-alternative *g'* of *g* such that $[\alpha]^{g'}$ is true in *s* and ii) for all *x*-alternatives *g*' of *g* the following holds: If $[\alpha]^g$ is true in *s* then $[\beta]^{g'}$ is true in *s.*

This gives a denotation for 'Every kitten is black':

(1) λs. for every individual x: for every minimal situation s' such that s' ≤ *s* and x is a kitten in *s',* there is a situation s'' such that s'' ≤ *s* and s'' is a minimal situation such that s' ≤ s'' and x is black in *s''.*

In plain(ish) English (1) reads: All the individuals in the situation under consideration that are kittens in some sub-situation have bigger situations in which they are black. This is equivalent to the conditions we have just given.

There must be at least one thing satisfying the description. This allows the possibility that neither the truth conditions nor the falsity conditions for a universal quantification are satisfied.

This brings to a close our sketch of a semantics in terms of situations. We have had to provide both truth conditions and falsity conditions for our logical connectives and quantifiers. In doing so, we hope that we have made it clearer how our theory of situations is to be understood and how it will work.

Conclusions

We have, then, the basis for interpreting natural language using situations. And we have discovered some things about situations in getting this far. Firstly, drawing on Austin's view of truth, we developed a general operator 'true in *s'* for some situation *s.* A proposition is true in *s* if and only if what *p* asserts is accurate to the facts that obtain in the situation. There are minimal situations for propositions: the smallest situations in which the proposition is true. Situations themselves can be related by the parthood relation $\leq$. So $s \leq s^*$ iff $s + s^* = s^*$, i.e. if *s* adds nothing to *s*.* Truth in a situation leads to gappiness; propositions can be neither true nor false in a situation. This means that necessity can be considered a matter of a proposition's never being false in a situation, rather than being true in all situations. We postponed the question of persistence: whether a proposition true in a situation is true in all larger situations of which it is a part.

We briefly examined the metaphysical status of situations; this is the task of explaining what exactly they are. Despite the lack of a convincing account in the literature,

we stipulated a few features situations will have for us, and left some issues deliberately unresolved. There will be more to say about situations once we have seen their uses in the following chapters.

Our final section sketched a version of situation semantics, drawing on Kratzer. There are significant departures from her view, as we uphold the notion that truth in a situation is partial: it is not a bivalent. Furthermore, we do not want to be committed to possible worlds as maximal situations. The sketch is merely that – it is not a fully developed account. But I hope it is a sufficiently informative gesture to indicate the direction such a full account would take.

So, we have outlined the theory within which we shall work. Now we should turn to the development of a situational solution to the problem of change within the theory. It will be crucial to this solution that we consider the postponed question of persistence.

Chapter 4

A situationalist solution to the problems of change

In the previous chapter we introduced *situations*, which are used in a number of philosophical contexts including semantics. There are a variety of different metaphysical pictures of what, exactly, situations are, and the alternatives are well described by Barwise's 'Notes on Branch Points in Situation Theory'. We have largely avoided deciding between these alternatives, but in some cases our hand has been forced. We take situations to be composed of particulars and the relations they have and we take there to be merely possible situations. But the most interesting feature of situations for us is the relations that hold between them. In particular, there is one question about situations that we have postponed: whether or not they are *persistent*. This is the question whether anything true in some situation *s* is also true in all situations of which *s* is a part. The question is central to our solution to the problem of change, and, indeed, to the further work we find for situationalism in later chapters. But we should start by re-describing the problem of change in terms of situations to see why the question matters before turning to the arguments.

The problem of change in situational terms

In order to see how situations might help to solve the problem of change, we will first frame the issue in terms of situations. Let's return to an example of change. A poker is hot at one time and later cold. At the former time, *t,* the following statement is true:

(1) The poker is hot

At the later time, *t'*, this statement is true:

(2) The poker is cold

The truth of these statements describes an instance of change. Putting this into situational terms, we can take *s* to be a situation at *t* that includes the poker. And *s'* is a situation at *t'* that includes the poker. In *s,* the proposition that the poker is hot is true. In *s'* the proposition that the poker is cold is true. So far, we have no problem. But the problem occurs when we recognise that (1) and (2) are both *actually true*. Hence *s* and *s'* are both parts of the actual world. Therefore there is at least one situation *s** that contains both *s* and *s'* (*s** could be the actual world or some appropriate part of the actual world). If we allow that propositions are persistent then any proposition true in a situation will be true in all situations of which the former is a part. Hence the proposition 'the poker is hot', which is true in *s,* will be true in *s** because it is a part of *s*.* But obviously (as *s'* is also a part of *s**) it will also be the case that 'the poker is cold', which is true in *s',* is true in *s*.* And these two propositions seem incompatible; they entail the negation of each other. So they can't both be true in a situation. This, in brief, is the problem.

Having put the problem in terms of situations, we can see an option that was previously obscured. We could deny the universal persistence of propositions across situations; we can suppose that for some situations *s* and *s** there is a proposition *p* such that: (i) *s* is a part of *s*,* (ii) *p* is true in *s*, and (iii) it is not the case that *p* is true in *s*.* If

persistence isn't universal, and if cases of change are instances of the failure of persistence, then we don't need to conclude from the fact that (1) is true in *s* that it is true in *s*.* Nor do we need to hold that (2) is true in *s** in virtue of it being true in *s'.* Hence we aren't forced to say that (1) and (2), two incompatible propositions, are both true in *s*.* Therefore, no contradiction can be generated and the problem is solved.

Why deny universal persistence?

The universal persistence of propositions across situations is *prima facie* a very plausible position. This is why the problem is problematic. To see what we have to push against, we'll first bring out universal persistence's plausibility.

As we noted in the previous chapter, Kratzer and Elbourne take the parthood relation to hold between situations *s* and *s** when *s** contains all the particulars of *s,* instantiating all the properties and relations that they instantiate in *s.*[1] If *s** contains all this, how could there be a proposition that was true in *s* but not in *s**? Even if we describe the parthood relation in more neutral terms, without appealing to particulars, properties and relations, it states that $s \leq s^*$ iff $s + s^* = s^*$. Hence *s* doesn't add anything to *s*,* and how then can a proposition be true in *s* but not in *s**? How could *s* contain true propositions that *s** doesn't? We can also express this worry in terms of information: $s \leq s^*$ iff *s** contains all the information of *s,* so how could a proposition that's true in *s* not be true in *s**?

All in all, it seems hard to understand how a proposition true in a smaller situation can be not true in a larger situation of which it is a part. The larger situation encompasses all

[1] As mentioned when the relation was introduced (pp. 79-80 and footnote 9), we use the slightly different formulation: parthood holds between *s* and *s** when *s** contains all the particulars of *s* and they don't fail to instantiate any property or relation they do in *s*. The two other definitions that follow are fine on our picture.

of the smaller situation; how can extending a situation cause propositions to no longer be true in the extension? We will have to be pretty convincing to make it plausible that persistence is not universal.

General problem cases

But there are indeed propositions that look like they undermine universal persistence. The most obvious was mentioned when we touched on this issue in the previous chapter: propositions including universals. Like most (or perhaps all) propositions, the proposition expressed by 'Every kitten is black' is true in some situations and false in other situations.[2] But what is unusual in this case is that the proposition can be true in a situation that includes only one litter and false in a situation that includes this *same* litter and a further one. It is true in a smaller situation and false in a larger situation of which the smaller situation is a part. This seems like a straightforward violation of universal persistence.[3]

[2] We have given the truth and falsity conditions for universal quantification in the last chapter, pp. 101-102. This proposition is neither true nor false in situations in which there are no kittens.

[3] As we noted in the previous chapter, Kratzer wants to keep hold of universal persistence, whereas Elbourne and Barwise and Perry were happy not to. But it is worth mentioning Kratzer's proposal to deal with such apparent counterexamples: she posits some implicit domain restriction in the proposition expressed to ensure that it is persistent. This works for the semantics, although it complicates it. The proposition expressed by 'Every kitten is black' in one situation is a different proposition to that expressed by 'Every kitten is black' in a different situation because the domain of quantification is implicitly restricted by context. Kratzer therefore ends up with a larger number of propositions, which are persistent. We won't try to evaluate this proposal and compare it to the denial of persistence. At the least, I take it that some of the other counterexamples that are to come are not dealt with by Kratzer's suggestion. But she also loses one of the key advantages of the use of situations: it allows us to read a proposition straightforwardly off a statement. If we add in implicit domain restriction we lose this ability. At any rate, I prefer a view that doesn't tinker with the propositions to make them persistent.

Universal quantification is not the only exception to persistence.[4] Quantifiers such as 'exactly two', 'fewer than five' and 'between 100 and 1,000' are relevantly similar to universal quantification and are also problematic. The propositions expressed by sentences containing such quantifiers can also be seen as non-persistent for reasons analogous to those we have just considered.[5] A proposition such as: 'Fewer than five of the students scored above 70' can be true when evaluated with respect to a situation containing only one class, but false when evaluated with respect to the whole school, region, or country.

The problem cases are much more numerous than even this, though. Consider the following: I'm at a dinner party and trying to identify my brother to a friend. I might say: 'My brother is the tallest brown-haired man'. This can be true in the situation which contains only the dinner party, but is obviously false in larger situations unless my brother is extremely tall. Superlatives seem affected by the situation of evaluation. Likewise, if I am discussing a recent holiday in France I might say: 'Most people were British'. This can be true in a situation if, for example, that situation only contains holidaymakers in a certain resort in France. But the resort situation is clearly a part of a larger situation that corresponds to France, and in this situation the proposition is patently false. There are also uniqueness implications in the use of the definite article; Barwise and Perry use an example of a dinner party for which my wife and I both cook. The statement 'I am the cook' will be false about the entire party food but can be true when said about a particular dish that I made. In general, it seems we can generate propositions that are context-sensitive in the relevant way quite easily.

[4] Negative existentials might seem like another category where non-persistent propositions occur. However, we shall take negative existentials to be covered by the same considerations as universals and lump them together.

[5] Kratzer (1989) recognises this, and takes a similar approach to them.

There is also a group of more esoteric propositions that are interesting in this context. Take, for example, the proposition expressed by, 'this situation is a minimal situation that *p*'. This will be true in all of *p*'s minimal situations but not in the larger situations of which the minimal situations are a part. Consider also: 'This situation is not a world-sized situation', which gives similar worries from the other end of the size spectrum. So it seems we can construct more problem cases when we start referring indexically to the situation in which the proposition is expressed, for this entity will evidently vary over situations and may have relevantly different properties.

All these kinds of problem cases for universal persistence seem to display a level of family resemblance; propositions containing them expressed in different situations have different entities relevant for their evaluation. For ease of reference, we shall group these cases together as the 'general problem cases'.

There are a couple of less general problem cases, to which we now turn.

Specific problem cases – (a) modals

Consideration of the general problem cases might lead us to doubt persistence across situations. A couple of other particular scenarios give us further reason to doubt universal persistence, and these scenarios are more analogous to the change cases. The first of these are modal scenarios. We can generate problem cases using merely possible situations.[6] Let's take an example: Ed Miliband won the 2010 Labour party leadership election. Call a minimal actual situation in which Ed won *s.* But it is possible that the election

[6] In the previous chapter one of our stipulations was that there are such situations. A quick way to get rid of these cases would be to deny that they exist.

was won by his brother, David. There are therefore situations in which the proposition expressed by 'David Miliband won the 2010 Labour party election' is true, though these situations will not be parts of the actual world. Call some minimal such situation *s'*. The obvious first worry is that there may be a totality of all possible situations that is itself a situation. This overarching situation, call it *s*,* has both *s* and *s'* as parts. But if the propositions persist, then the propositions expressed by 'David won the election' and 'Ed won the election' will be both true in *s*.* This seems impossible; a flat contradiction. So, as *s* and *s'* disagree as to who won the election, at most one of them can be true in any situation. Thus at least one of them is not true in *s** and there is a failure of persistence.

Now, there is some controversy over the idea of a total situation containing all possible situations. Maybe no such situation exists. But we don't actually need to assume such a total situation to create these problems. We can generate similar problems if we accept a weaker thesis, namely that situations are able to have parts from different worlds. This is something we permitted for situations in the last chapter; situations can be composed of parts from different worlds. Allowing such composition, consider the situation composed of *s* + *s'*. Which propositions are true in this situation? If we say that both 'Ed won the election' and 'David won the election' are true we face a contradiction, but if we deny that both propositions are true then we are denying the persistence of at least one proposition. The problem case therefore isn't reliant on the existence of a situation containing the totality of possibilities.

There is another, similar type of problematic modal case. Ed Miliband has black hair but it is possible that he has blond hair. Therefore there is an actual situation *s* in which the proposition that Ed has black hair is true. There is also a possible situation *s'* in which the

proposition that Ed has blond hair is true. In some larger situation *s*,* of which *s* and *s'* are parts, are both of these propositions true? If so, they seem to generate contradictions.[7] If not, then at least one of the propositions isn't persistent and we have another example of the failure of universal persistence.

So modals raise at least two types of problem cases for universal persistence. These problem cases rely on some of our choices in situation theory, outlined in the last chapter. The parallel with the case of change should be clear.[8] The next problem case is also one that bears similarities to cases of change.

(b) Time-travel of wholly present objects

The next counterexample to universal persistence that we will consider involves multiple spatial location. Some relatively detailed explanation will be necessary, but first let's describe the scenario:

> Suppose that one Tuesday Ruth completes her latest research project in the laboratory. The project is to build a time-machine. This machine is capable of sending an object backwards in time. As a first experiment, she decides to send her pencil back in time to the previous day, namely Monday. She decides to have the pencil arrive unobtrusively in the medicine cabinet, which is seldom used and wasn't opened yesterday. She operates the machine and the pencil is transported back to

[7] There are alternative ways of dealing with such issues. One possibility would be to introduce a counterpart relation (this is Kratzer's approach). According to such a view, there is no strict trans-worlds identity and particulars are world-bound. As we pointed out in the previous chapter, our situation theory is different.

[8] Modal analogues are often helpful in considering time. We have used a modal analogy ourselves earlier in the thesis: see the section on Problem 2 in Chapter 1.

the medicine cabinet on Monday. The pencil is therefore in the medicine cabinet. But the pencil is not just in the medicine cabinet. For on Monday Ruth had the pencil in her lab coat, ready to make notes on the time machine she was hoping to finish the following day. So the pencil is in Ruth's lab coat. As it happens, Ruth used the pencil a lot on Monday, so the pencil in the medicine cabinet is 3 inches long, and the pencil in the lab coat is 4 inches long. We have an object that has multiple spatial location, and different properties at those locations.

Before we can move on to investigate how situations would work in such a case, we need to give a bit more explanation of the example. A first key point is that the pencil *endures*; it is fully present both in the cabinet and in the coat. The pencil is not comprised of two spatially disconnected parts, one in the cabinet and one in the coat. If Ruth uses the pencil in her lab coat, she is touching the whole pencil. Similarly, she is touching all of the pencil, not a part of it, if she discovers and touches the pencil in the medicine cabinet.[9] At the same time, however, the pencil in her lab coat is the same as the pencil in the medicine cabinet. They are numerically identical. The description we have given is not obviously incoherent, so we are inclined to permit the metaphysical possibility of this form of multiple spatial location.[10]

[9] Of course, to be precise, we would need to say that if Ruth touches all of the pencil in front of her she touches all the pencil (for she is obviously not touching all the pencil if she only touches the tip of the one in front of her).

[10] Though see Gilmore (2007) and Eagle (2010) for discussion of time-travelling objects and their quirks. We used the metaphysical possibility of time-travelling objects in Chapter 1 as an objection to the no-changers, and we will refer to it in Chapter 7 as well (although as a constraint on our approach). It might be that the story we have presented is metaphysically impossible because this sort of time-travel is in general metaphysically impossible (for example, because time-travel to possibly causally connected spacetime generates logical or metaphysical paradoxes). But the burden of proof rests on those who think it is impossible to demonstrate the impossibility. We take it that it is a benefit if a theory can accommodate the possibility of such time-travel.

What does the metaphysical possibility of such a case suggest about the truth-value of propositions in situations that are related to each other by parthood? Let's frame the example in terms of situations. To get rid of any time worries, select an arbitrary time on Monday, say noon. And let *s* be the situation containing the medicine cabinet and the older pencil, let *s'* be the situation containing Ruth's lab coat and the younger pencil, and let *s** be the situation containing the whole laboratory, all respectively at noon. The pencil in the medicine cabinet is 3 inches long. Thus, the proposition that the pencil is 3 inches long is true in *s.* The pencil in the lab coat is 4 inches long, hence the proposition that the pencil is 4 inches long is true in *s'.* But here we face a problem. Situation *s* is part of *s** and so is *s'.* So, if we allow persistence in this case then it will be true in *s** both that the pencil is 3 inches long and that it is 4 inches long. This is a contradiction. We have suggested that the Ruth example is at least metaphysically possible. But if these propositions are persistent then it seems to lead to a contradiction. This gives us motivation for rejecting persistence in this case, and hence rejecting universal persistence.

So we have seen that there are some general propositions that appear non-persistent and that in the specific modal and time-travel cases a difficulty arises that appears similar to the change case. These counterexamples motivate the idea that persistence might not be universal. They militate against the initial thoughts we presented in favour of universal persistence. The cases appear sufficiently numerous and diverse to warrant the conclusion that persistence is *not*, in fact, universal.

So, persistence is not universal. One way forward from here would be simply to claim that universal persistence is defeated and hence that the problem of change is solved.

But this seems extremely insufficient. It fails to say anything about two key questions: i) why does persistence seem to work in most cases? And: ii) why, precisely, does persistence fail in the counterexample cases? These questions are especially pressing given the *prima facie* preference for universal persistence.

It would therefore be preferable to find a revised or restricted notion of persistence which tells us when persistence does apply and when it doesn't. This would mitigate the pressure from the natural inclination towards universal persistence. If we can find such a notion of restricted persistence which covers this variety of counterexamples to universal persistence then we would have a pleasingly broad account of the persistence of propositions across situations. It would also give us a principled reason for when we should resist the natural thoughts that push universal persistence. A restricted version of persistence would in turn provide support for the situationalist solution to the problem of change, for the problem of change would arise from a more general condition for persistence.

Restricted persistence

In each of the cases described above, there is a proposition *p* which is true in a situation *s* but is not true in a larger situation *s** of which the former is a part. But in all the cases we have considered there are *some* situations which have *s* as a part in which *p is* true.[11] So it isn't that these propositions are never persistent: they are just not always persistent. What we need to do is provide conditions under which extending a situation preserves the truth of a proposition. Such conditions would restrict the universal

[11] The possible exception to this is the esoteric propositions that refer to the situations they are in indexically.

persistence of propositions across situations to avoid the difficulties we have pointed out. The conditions will have to do with the characteristics of the larger situations and of the propositions, for these are the things that will determine whether or not a proposition persists from the smaller situation to the larger one.

The world restriction

As a starting point, let's look at the modal case, as it seems obvious that persistence should be restricted to worlds. Situations that have parts which are parts of different worlds are going to be problematic because different worlds are not consistent with respect to which propositions are true. So perhaps a first attempt at a condition would be:

> *World restriction*: if *p* is true in *s* and $s \leq s^*$ then *p* is true in s^* unless s^* contains a part which is not a world-mate of *s.*

Thereby, at a stroke, we avoid problems arising when considering situations that contain parts of more than one world.

It might seem reasonable that persistence should include a world condition. But this seems to get it badly the wrong way round. We are taking situations, not worlds, to be basic; this is a crucial tenet of our project. Worlds are defined in terms of situations, not the other way around. We *can* define worlds in situational terms, for example as the situations

that return a truth-value for every proposition.[12] But we have a standing preference for dealing with situations over dealing with worlds, as the former are a subcategory of the latter and are hence less primitive.

There are other worries about this condition too. It talks of situations being 'world-mates', but this is a concept that loses grip when we allow that more than one world can contain particular situations. Some situation *s* can belong to both world *w* and world *w'*. A world-mate of *s* is then presumably any situation in either *w* or *w'*. This complicates the world-mate relation; for one thing it becomes non-transitive. It also no longer seems to say what we want it to: two situations can be world-mates even if one is part of *w* and the other isn't. Perhaps then the world-mate relation between *s* and *s'* is more strict that having at least one world in which *s* and *s'* are both parts. But whatever way we want to take this discussion, it gets complicated quickly.

Here's another problem with the restriction: it seems far too stringent a limitation on persistence. Imagine a situation *s** that is comprised of two other situations i) *s*: the years 1000-2000 in England in the actual world and ii) *s'*: the state of an atom on Venus for a second 100 million years ago in some nearby world *w*. Consider the proposition that William won the battle of Hastings. This proposition will be true in *s* but not necessarily in *s*,* because *s** contains a part (*s'*) which is not a world-mate of *s.*[13] Of course, it may in fact be true in *s*,* but we won't be able to derive this truth from the truth of the proposition in *s* and the fact that *s* is a part of *s*.* The situation *s'* seems irrelevant to the truth of the proposition in *s*,* but the world condition makes it relevant. The condition is too coarse-

[12] If, like Kratzer, we take situations to be world-bound then there are even easier definitions. We do not consider situations or individuals to be world-bound, however. We also hold open the possibility that there are no such things as worlds. This precise definition will not work for us, for reasons that will become clear.

[13] We might be worried that there are worlds containing both *s* and *s',* but we can just manipulate the example such that *s'* and *s* are never world-mates, on any cogent definition of this relation.

grained, an accusation that is often levelled by the situation theorist against the use of worlds. As we have said, using worlds is not in the spirit of the situational approach we are taking, and this coarse-grained result is a good indication of why.

A final issue with the world condition is simply that it is not ambitious enough. If we could refine it, we might make it a condition that accurately rules out persistence in cases where the larger situation *s** contains *relevant* parts from different worlds. But there are a whole host of other counterexamples to persistence, as we have detailed above. It would be far better to have a condition that could be extended to cover all such counterexamples rather than a series of conditions dealing with them piecemeal.

So we have found a number of faults with our first attempt at restricting the conditions under which propositions persist across situations. To get a second and more promising attempt, we will look at our second specific example of the failure of persistence: time-travel.

The particular restriction

The crux of the problem in the time-travel scenario is that there is more than one pencil fully present in the laboratory-wide situation *s*,* and that these are the same pencil.[14] So when propositions are allowed to persist across situations, propositions from the smaller situations in which a single pencil is present contradict one another in the larger situation. If we call the pencil 'Pencil', then the problem arises when propositions persist across situations containing more than one Pencil. Let's have a restriction, then, that says that

[14] There are linguistic tangles here and in what follows; we are talking of one thing, but as it is multiply located we refer plurally to it. I suppose a certain amount of strain is put on the language by the unusual nature of the scenario.

propositions are only persistent across situations that contain the particular in the proposition at most once.

> *Particular restriction*: if *p* is true in *s* and $s \leq s^*$ then *p* is true in s^* unless s^* contains a particular picked out by *p* twice.

Applying this condition to the pencil case: because Pencil is multiply located in s^*, the propositions in *s* and *s'* that pick out Pencil do not persist to s^*. So, it seems this condition gets at least the time-travel example right.

There are a number of things to say about the particular restriction. The first is that it makes persistence dependent on the content of the situation into which the persistence of the proposition is questioned. The content of s^* is what determines whether *p* is true in it given its truth in a part of s^*. But what content is relevant depends on the proposition, because it depends on which particulars the proposition picks out. So the particular restriction is one that uses the content of the larger situation and the reference of the proposition.

A second is to clarify what we mean by saying that a situation 'contains a particular…twice'. To do so we shall first introduce a new term for a category of situations. An *existential situation* for some particular *a* is a situation containing *only* that particular and its properties and relations. It is a situation in which *a* exists and exhibits its characteristics. Nothing else is in the situation. It can be thought of as the situation containing the particular and the particular's intrinsic properties and relations.[15] It is

[15] Though, of course, we don't want to be committed to the distinction between intrinsic and extrinsic properties and relations. Think of the terminology as a way to get a handle on the term 'existential situation'.

existential situations that we use to count particulars. To say of some situation that it contains a particular twice is to say that there are two existential situations for that particular. In the case of Pencil and *s*,* there is an existential situation for Pencil in the medicine cabinet and there is an existential situation for Pencil in Ruth's coat. Hence there are two existential situations for Pencil that are part of *s*,* and so Pencil is contained by *s** twice.[16]

There's an anomaly in our definition of the particular restriction as it stands. If Pencil were to be transported back in time repeatedly and so be present in the laboratory more than twice, the restriction would be satisfied. This is clearly a mistake, arising from the details of the example we used. It is easily rectified; we replace 'twice' with 'more than once'.

So these two tweaks give us a new definition of the particular restriction on persistence.

> *Particular restriction*: if *p* is true in *s* and $s \leq s^*$ then *p* is true in *s*,* unless *s** contains more than one existential situation for a particular that *p* picks out.

To give a completely thorough account of this restriction, we would have to explain how propositions pick out particulars. But a theory of propositional reference is not central to

[16] There is an alternative to using existential situations to explain when particulars are present twice over. We could use *minimal* existential situations, where a minimal existential situation for a particular is a situation which contains just that particular having some property or relation. A proposition persists, then, unless there is any minimal existential situation in the larger situation which is not in the smaller one; i.e. unless the particular has a property or relation in the larger situation that it doesn't in the smaller. These formulations seem near equivalents, though the former requires a notion of a situation containing a particular and all and only the properties and relations it has and the latter requires the notion of a situation containing a particular with just one property or relation. If either of these commitments seems unpalatable, use the other formulation. Hopefully they don't both seem unpalatable.

our aims here, so we shall work on the basis that there is at least one viable theory of reference for propositions, and that such a theory would be consistent with the use we are making of propositions picking out particulars.

A final point to make on the condition at this stage is that the restriction tells us when a proposition *is* persistent, not when it is not. If a proposition *p* is true in *s* and $s \leq s^*$ but *s** contains more than one existential situation for a particular that *p* picks out, then *p might still be true* in *s*.* Satisfying the restriction is sufficient for persistence, but it is not necessary for it.

This might seem to raise a worry. Take the proposition that Pencil is made of wood and graphite. This proposition is true in *s.* It is also true in *s*.* Our particular restriction stops us from inferring the truth of the proposition in *s** from the truth of the proposition in *s.* Perhaps this seems like a mistake; the condition is too stringent, like the world condition. There are two replies that I'll consider.

One way to respond to the stringency issue would be to tinker with our condition for persistence so that we could, in fact, formally derive the truth of the proposition that Pencil is made from wood and graphite in *s** from its truth in *s* and *s'.* A tinkering might involve the content of the proposition, so that a proposition is persistence across situations unless the larger situation contains more than one existential situation for a particular picked out by the proposition *and the existential situations vary in ways relevant to the proposition*. Propositions would then be persistent unless things relevant to the proposition were different in the larger situation.

The advantage of this approach is that it allows us to make more valid inferences. But there is a significant disadvantage. It seems to reduce the restriction on persistence to a

glorified form of, 'a proposition persists unless it's not true in the larger situation'. This is clearly an unhelpful restriction. If it is not to reduce to this, it requires even more theory to explain what 'varying in ways relevant to the proposition' can mean. Describing the relevance of the variation in existential situation to the proposition without simply connecting it to the alteration of the proposition's truth-value will be difficult indeed. All in all, I don't think it's a helpful way to deal with the stringency concern.

My preferred way of accounting for the stringency of the particular condition is to reiterate that propositions don't have to be *false* in situations that are ruled out by the restrictive condition. The condition only tells us that they cannot be formally derived. So although the condition doesn't allow us to formally derive the truth of the propositions in every case in which they do persist, it isn't assigning incorrect truth-values to them. We can bite the bullet at this point. It doesn't seem unreasonable that our persistence condition describes the sufficient but not necessary circumstances for persistence. It tells us when propositions *must* persist, but not always when they *do*.

We shouldn't expect it to, though.[17] Returning to the example above: the pencil is made of wood and graphite in both *s* and *s**. But if the persistence of this proposition were guaranteed by the formal relationship between the proposition, *s* and *s** then we would have a problem. For it is only contingent that the pencil is made of wood and graphite. The situation *s* is the situation containing the older pencil. But suppose the older pencil is made of wood and graphite because it has recently lost its top, on which was a rubber surrounded by metal.[18] The pencil in *s'* is therefore made of wood, graphite, rubber and metal. It would be perilous, then, if the proposition that it is made of only wood and graphite were to

[17] We make a similar point in Chapter 7, when we consider this issue as a cost of the theory.
[18] We are supposing that the proposition under consideration is that the pencil is made of *only* wood and graphite.

persist; this would wreck the solution to the problem. It therefore doesn't seem a bad thing that the condition is this stringent.

A final observation may ease the taste of lead in the bullet-biting we propose. If Pencil doesn't vary at all between *s* and *s'* then propositions picking it out will not violate the particular restriction. Imagine the pencil remains unchanged throughout the time-frame we are considering. That is, the pencil on Monday that is in the laboratory is qualitatively identical to the pencil that is placed in the time-machine on Tuesday as an experiment, and remains qualitatively identical once it has been transported back to Monday. If Pencil is qualitatively identical in *s* and *s'* then in *s*,* despite the fact that Pencil appears to be multiply spatially located, there will only be *one* existential situation for Pencil. The existential situation for Pencil, recall, will be the situation containing only Pencil and the properties and relations of Pencil. If the pencil in the cabinet and the pencil in the pocket are really qualitatively identical, these situations will be qualitatively identical too. And for situations qualitative identity implies numerical identity. So there will not be more than one existential situation for a particular picked out by propositions about Pencil in *s*.*[19]

In general, then, the particular restriction will only apply if there are multiply located particulars in a situation, and those particulars differ between sub-situations. This eases our worry about stringency somewhat, as if a particular *is* multiply located in a situation and *does* have different properties or relations in the relevant sub-situations then we ought not to be surprised if the formal relationships between sub-situations and the larger situation

[19] Unless, of course, there is another particular that the proposition picks out that *does* have more than one existential situation in *s*.*

do not entail the truth of that many propositions. Persistence in such a case might well happen, but it shouldn't be a formal matter.[20]

So, we have a refined version of a restriction condition for persistence. Our discussion of the condition has been fruitful. The real test of the condition, however, is whether it correctly diagnoses the other counterexample cases. It is to this test that we now turn.

Refining and applying the particular restriction

If our restriction of persistence can explain why propositions aren't persistent in the other cases we outlined above, then it will be a holistic explanation of the circumstances under which propositions are persistent. So let's see if the restriction will work for the two modal examples, before moving on to universal quantification and other general cases.

The second sort of modal example we gave was one where the same individual had different properties in situations that belong to different worlds: e.g. Ed Miliband has black hair in one situation, blond hair in another and we are considering a larger situation of which both of the former are parts. Propositions expressing the facts about the smaller situations appear not to be persistent. Here our analysis works well; the particular referred to by the propositions does indeed have an additional existential situation in the larger situation. Thus propositions don't have to persist; the larger situation fails the restrictive clause in the definition we give of restricted persistence. The particular restriction succeeds for this counterexample.

[20] This issue recurs in Chapter 7, pp. 221-222

But what about the first kind of modal example we gave? In that example, Ed Miliband won the leadership election in *s,* David Miliband won it in *s'* and *s* = s + s'.* The proposition that Ed won is true in *s,* the proposition that David won is true in *s'* but they can't both be true in *s** as they contradict. So at least one is not persistent. It seems the particular restriction will not help here, for there are different particulars involved so no particular has additional existential situations in *s*.* But that's not quite true. Granted, Ed and David are different particulars, but what about the leadership election? This must refer to an individual election, for there would be no contradiction if Ed won the 2010 election and David won some future election. So the election referred to by both propositions is the same election, the 2010 election. This election is an event; it is a particular. This particular is multiply located in *s*,* and there is an existential situation for it in *s** that is not in *s* (and an existential situation in *s** that is not in s'). Hence propositions that pick out the 2010 election will fail the particular restriction between *s* and *s** (and *s'* and s*). Thus the particular restriction *does* get this example right. The particular restriction correctly analyses both modal counterexamples.

We shall now consider the general cases of failure of persistence to see how the particular restriction fares for them.

Propositions which quantify universally are not persistent. The proposition that all kittens are black can be true in some situation *s* but not in *s** of which *s* is a part. Other quantifiers like 'fewer than three' and 'most', superlatives and the definite article are all capable of producing similar non-persistent propositions. We can offer a diagnosis for this: the reason such propositions don't have to be persistent is the fact that the larger situation

contains entities which are relevant to the truth of the proposition which are not in the smaller situation. So, in the kitten example there is a particular (a non-black kitten) which appears in *s** but not in *s.* Barwise and Perry's example has a similar diagnosis; 'I am the cook' is true in *s* where there is only one cook of the cake but false in *s** where there is more than one cook of the whole dinner. Similar considerations apply in all the examples; what causes the problem is that *additional* entities falling under the description given in the proposition are contained in the larger situation. These are the entities which make false the proposition that is true in the smaller situation.

How does this diagnosis correlate with the other specific cases we considered above? The general cases are slightly different from the modal and time-travel cases, where we have one particular multiply located in the larger situation. But the modal and time-travel cases might be seen as special cases of the general phenomenon when the referent of a proposition is given by a proper name. Proper names usually only pick out an entity once in any given situation, as usually situations only contain one of any particular. But in the examples of modal cases and multiple spatial location although it is one and the same entity that is being picked out by the proper name, it is picked out twice over (or more than twice over). We can thus think of the cases analogous to change as unusual applications of a general principle that rules out automatic persistence for the general cases.

This is the diagnosis of the problem cases. It captures them all. Let's look, then, at the restriction we placed on persistence and see if it accurately encapsulates the diagnosis. Recall the restriction:

Particular restriction: if *p* is true in *s* and $s \leq s^*$ then *p* is true in *s*,* unless *s** contains more than one existential situation for a particular that *p* picks out.

As it stands, the restriction doesn't easily apply. But if we tweak it to remove the presumption that some particular is multiply located we get the following:

Particular restriction: if *p* is true in *s* and $s \leq s^*$ then *p* is true in *s*,* unless *s** contains more existential situations for particulars that *p* picks out than *s.*[21]

This applies just as well as the previous version to cases of multiple location and also applies to the general cases. Consider the kitten example: in the larger situation there is an existential situation for a particular that *p* picks out that is not in *s*; namely the existential situation for the non-black kitten. Likewise, there is an additional existential situation for a cook in Barwise and Perry's example. In each counterexample case there is an additional existential situation for some particular the proposition picks out; this is why they are not persistent.

So it seems the persistence condition, once tweaked, captures all the counterexample cases. It would be nice to conclude, therefore, that we have found the right restriction of persistence. However, there is a problem with the condition as it stands, and we need to account for it.

[21] Compare this with the previous chapter, where we said that a proposition about an entity which is not in a situation is neither true nor false in that situation. This equates to an entity having no existential situations in a situation.

The particular restriction in its current form is too restrictive. It doesn't allow persistence sometimes when it really should. Consider existential quantification: 'there is a Queen of England'. This proposition should persist from a situation with one Queen to one containing more than one Queen of England. It would be a disadvantage of our restriction if it didn't allow us to infer this. But a situation containing another Queen would have another existential situation for a Queen, one which doesn't occur in the smaller situation. So it fails the restriction. More precisely, the proposition 'there is a Queen of England' doesn't have to persist from a situation *s* in which only Queen Elizabeth I exists to a situation *s** in which Elizabeth I and her sister Queen Mary I exist. This is a problem as we want such a proposition to satisfy our condition for restricted persistence.

So we need to revise the particular condition further. What is the relevant difference between the genuine counterexamples and cases like the existential quantification above? In the latter it is irrelevant to the truth of the proposition that there are additional existential situations for particulars that the proposition concerns. No particular in *s* has to be* picked out by the proposition that there is a Queen of England. Either Elizabeth I or Mary I would do equally well.[22] In the case of a genuine counterexample, the particulars in *s* have to be* picked out by the relevant proposition; each and every existential situation for a particular that the proposition picks out is relevant. So it seems the character of the 'picking out' of the proposition is important.

Though we specified above that we are not providing a theory of propositional reference, we can at least distinguish between two types. The first is when a proposition *must* pick out a certain particular or particulars, and the second is when a proposition

[22] The same is true of propositions containing qualifiers like 'at least a dozen' which generate similar worries.

doesn't have to pick out a certain particular or particulars. Adding this into our restriction we get the following:

> *Particular restriction*: if *p* is true in *s* and $s \leq s^*$ then *p* is true in *s*,* unless *s** contains more existential situations for particulars that *p* must pick out than *s.*

The 'must' in this condition means that the Queen of England case doesn't fail the particular restriction, for even if there is more than one Queen of England in *s** then neither Queen *must* be picked out by *p.*

We have therefore arrived at a restriction condition for persistence that gets the counterexample cases right and doesn't rule out persistence in cases of existential quantification and the like. Once it has been revised, this condition is satisfying, as it captures the variety of problem cases in a unified way.

In concluding this section on restricted persistence, it is worth mentioning the esoteric group of propositions which formed a group of counterexamples to universal persistence. These esoteric propositions contain indexical reference to the situation in which they are evaluated. These are strange sorts of propositions which are probably used only by linguists, semanticists and philosophers. But it would stand our analysis of restricted persistence in good stead if the particular restriction ruled out persistence for these cases. To take a test case, one such proposition is the proposition *p*: 'this situation is a minimal situation that a cat is on a mat'. In a minimal situation that a cat is on a mat *p* is true (call one such situation *s*). In a larger situation *s*,* containing *s* and some additional material, *p* is

not true.[23] Would restricted persistence mischaracterise *p* as true? Given that *s* is a part of *s*,* the only way for it not to be true is if there is an existential situation for some particular that *p* must refer to which is in *s** but not in *s.* Let's see if this is so.

The particulars referred to by the proposition under consideration are the cat and the mat, but also the situation itself. For situations are particulars, and in this precise case *p* indexically picks out the situation of evaluation (along with any relevant cats and mats). When we apply the particular restriction for persistence, we look to see if there are any existential situations for particulars that the proposition must refer to in the larger situation which are not in the smaller. The cats and mats are the same. But what of the situation? An existential situation for a situation is quite simply the situation itself.[24] So because *p* picks out the situation of evaluation, and the situation of evaluation has changed, there is an existential situation for *that* particular that is in *s** but not *s.* For it is *s* itself* that is the particular, and *s** itself that is the existential situation. And *s** is part of itself but not of *s.*[25] Hence there is a particular that *p* must pick out that has an existential situation in *s** and not *s.* So we do not need to say that *p* is true in *s** because of restricted persistence.[26]

This reasoning can be extended to all the esoteric propositions we have mentioned. They all indexically refer to the situation of evaluation, and hence by recalling that situations are particulars we can deal with them appropriately.

[23] For ease, suppose *s** doesn't contain any more existential situations for cats or mats than *s.*

[24] Situations cannot change, and have strict identity criteria. So one and only one situation could be an existential situation for any situation: itself.

[25] This is definitional; all situations are parts of themselves and if *s* is a proper part of *s** then *s** cannot be a part of *s.*

[26] We cannot determine it is false in *s*,* of course, as restricted persistence is a sufficient but not necessary condition for the truth of *p* in a situation. And the proposition may be neither true nor false (though it is in fact false).

This concludes our discussion of restricted persistence. It is a crucial concept for the thesis. The idea that propositions do not universally persist is strengthened by finding a principle under which all the counterexamples can be brought together.

Partial truth

Having shown that persistence is not universal, and having proposed that a notion of restricted persistence avoids the problem cases, it is worth pausing a moment to examine the gap between universal and restricted persistence. If we do not allow universal persistence, we cannot always say that a proposition true in some part of a situation is true in the whole situation. We can only say that it is if the condition of restricted persistence is satisfied. But there seems to be a difference between the following two cases: i) a proposition *p* is not true in a situation *s** but is true in some group of sub-situations of *s**, and ii) *p* is not true in *s** or any sub-situation of *s*.* The former case is an example of a situation that fails the restrictive clause of persistence, whereas the latter is a case where *p* is just not true. Noting this difference, we can define a notion of *partial truth*: a proposition *p* is partially true in *s** if there is a situation *s* such that $s \leq s^*$ and *p* is true in *s.*[27] Thus, in examples we considered of the failure of universal persistence, although the relevant propositions weren't *true* in the larger situations they were *partially* true. This is going to become important in the account we give of the metaphysical import of the situationalist view of change in the second part of Chapter 7.

[27] In fact, for every proposition *p* that is partially true in *s*, s** will have as a part a minimal situation that *p.* This isn't relevant to the definition, though.

It's worth pointing out a couple of interesting consequences that follow from this notion of partial truth, given certain other assumptions. These consequences are: (a) If there is a situation which contains all possible situations (= the sum of all possible worlds), then all non-contradictory propositions are (at least) partially true in the totality; and (b) If there is a situation which is the actual world, then any actually true propositions are (at least) partially true in this situation. An actually true proposition is thought of here as a proposition that is true in at least one actual situation.

The situationalist solution: restricted persistence in cases of change

So, we have an independently motivated restriction on persistence and also a notion of partial truth. Now let's turn our attention back to the problem of change and see what restricted persistence shows. We begin by looking at the problem as phrased in situational terms, before translating this into the terms of Problems 1-3 of our first chapter.

Recall the propositions:

(1) The poker is hot

(2) The poker is cold

The proposition in (1) is true at *t* and the proposition in (2) is true at *t'*. We are looking for an eternalist, endurantist picture with non-relational properties, so the problem is that *t* and *t'* are equal parts of reality and the propositions expressed lead to contradiction. (1) is true in

s, (2) is true in *s'*, and *s* and *s'* are both parts of some *s** (e.g. the actual world). The question we want to answer is: is (1) true in *s**?

The first thing to remember is that restricted persistence isn't going to tell us that (1) *isn't* true in *s*.* But what it can do is tell us that (1) *doesn't have to be* true in *s*,* i.e. our framework doesn't entail that it is true in *s*.* Let's see how. Restricted persistence applies to all propositions, so it applies to (1). According to restricted persistence, (1), which is true in a part of *s*,* is true in *s* unless s* contains more existential situations for some particular that p must pick out than s.* But *s** does indeed do this; it contains an existential situation for the poker that will be found in *s'* but not *s.* Thus (1) isn't persistent from *s* to *s** so we don't have to maintain that it's true in *s*. Mutatis mutandis* the same is true for (2). So neither (1) nor (2) need be true in *s** by our principle of persistence. The particular restriction on persistence applies to cases of change.

But it is certainly the case that (1) and (2) are *partially true* in *s*.* For *s** contains *s* and *s'* as parts, and in *s,* (1) is true, and in *s',* (2) is true. The example given by (1) and (2) is representative. In general, when an enduring particular changes the propositions that describe the changing of that particular will not be able to be inferred in a situation that contains the change. They will be partially true in such a situation. When an enduring particular changes, it generates additional existential situations for itself. This means that propositions about the particular in some situation *s* will not persist into a larger situation *s** if *s** contains a change for the particular that *s* does not. Change scuppers propositional persistence.

This should make it clear how the situationalist will solve Problem 3, which was the problem from non-contradiction at the level of propositions. The propositions expressed by

(1) and (2), like all propositions, must be evaluated with respect to a situation. And propositions can vary in truth-value depending on the situation with respect to which they are evaluated. So far, nothing very controversial has been said. Here's the controversial bit: there are situations with respect to which (1) is true, and situations with respect to which (2) is true, but there are no situations with respect to which both are true, despite the fact that there are (actual) situations that contain a sub-situation in which (1) is true and a sub-situation in which (2) is true. The denial of universal persistence allows us to maintain such a position.

As we have explained it here, the situationalist solution is akin to temporalism about propositions. A temporalist about propositions believes propositions can be true at some times and false at others. The situationalist believes propositions can be true in some situations and not true in others *even when those situations are parts of each other*. But the situationalist has a larger framework which contains this assertion. It is patently true of some propositions they are true in some situations but not in others, and the important move for solving the problem of change is not defending the claim that propositions can vary in truth-value across situations, but that the propositions involved in a case of change do in fact vary in truth-value even across situations related in certain ways.

The other two problems of change we discussed in our first chapter were Problem 1, a problem from non-contradiction, and Problem 2, a problem from the indiscernibility of identicals. Demonstrating how the situationalist solves these two problems will be slightly more complicated than the solution to Problem 3.

Solving Problems 1 and 2

Problem 1 is also a problem from non-contradiction. It operates at the level of objects and properties. The law of non-contradiction at this level is that no one object can have and lack a property. Qualitative difference means having and then lacking a property, which means something has and lacks a property, which entails numerical difference. As an example, consider the changing poker. It is qualitatively different at different times: it is first hot and then cold. Hot and cold are incompatible, so if something is cold it is not hot. The poker therefore is both hot and not hot at different times: it has and lacks a property.

We want to allow that the poker has the property hot and that the same poker has the property cold. We want to allow that hot and cold are strictly incompatible so that they cannot be had at the same time. We also want to allow that the poker has both properties equally. These conditions are imposed by our second chapter, where we argued that they were necessary for *real* change. So how can we allow these things and not end up with a violation of non-contradiction?

Let *s* be a situation in which the proposition that the poker is hot is true. In *s,* the poker is hot. Let *s'* be a situation in which the position that the poker is cold is true. In *s',* the poker is cold. The poker in *s* is the same poker as the poker in *s'*; the cold poker and hot poker are numerically identical. Let *s** be a situation that has both *s* and *s'* as parts. In this situation, because of restricted persistence, the propositions that the poker is hot and that the poker is cold do not have to be true. Suppose they are not true. Then the poker in *s** is not hot and is not cold. The poker in *s** has neither property. So in *s** there is no violation of non-contradiction; the poker doesn't have and lack a property.

In *s* and *s',* too, there is no violation. For in *s* the poker is not cold, and so doesn't lack the property *hot*. In *s'* the poker is not hot, and so needn't lack the property *cold*. There is no situation in which the poker is *both* hot and cold, though there are situations in which the poker is hot and situations in which the poker is cold. There is therefore no situation in which the poker both has and lacks the property *hot* (or *cold*). The situationalist will hold that to violate non-contradiction an object must have and lack a property in a situation. The modal and time-travel analogues make this clear; objects can vary across situations but it is only when an object has and lacks a property *within* a situation that non-contradiction is violated.

This might seems strange: we have said that the poker is hot in *s* and that one and the same poker is not hot in *s'.* Surely then, we might think, one and the same poker has and lacks a property? But this is exactly what the situationalist solution amounts to: whether or not the poker has a property is relative to a situation. The poker does, in *different* situations, have and lack a property, but it does not, in any *one* situation, have and lack a property. Restricted persistence permits us to deny that there is any such situation in which the poker is both hot and not hot. Without such a situation, non-contradiction is not violated and Problem 1 is solved.

This solution might sound similar to one that is already available. The Hofweber and Rychter challenge to the problem of change was that it incorrectly assumes an atemporal reading of non-contradiction. I argued that this amounted to an adverbialist solution to the problem of change. Situationalism is making a similar move. It argues that non-contradiction is to be understood *within* situations and, further, that the problem is solved because the instantiation of the property *hot* by the poker is relevantly different from instantiation of

the property *cold* by the same poker.[28] As with Problem 3, situationalism has given us a broader framework within which to place this account of non-contradiction at the level of objects and properties (or, if you prefer, the account of different ways objects have properties).

Problem 2 is a problem from the indiscernibility of identicals. The indiscernibility of identicals asserts that if x and y are identical they share all properties. Numerical identity entails qualitative identity. The problem can be briefly put: the poker before the change (*a*) is identical to the poker after the change (*b*) so they share all properties. But *a* is hot, and *b* is cold. Nothing can be both hot and cold, so the poker before the change doesn't seem to share all properties with the poker after the change.

The situationalist solution to this version of the problem is similar to the solution to Problem 1. The poker in *s* is indeed identical to the poker in *s'* and the poker in *s*.* But what is true of the poker is different in these different situations. The poker has different properties in different situations. This would be true even if persistence were universal; in a minimal situation that the poker is hot, it is not the case that the poker is made of metal. For the minimal situation only contains the poker, the property *hot* and their connection. So the indiscernibility of identical cannot be asserting that if x and y are identical then they share all properties *even evaluated with respect to different situations*. It must be asserting the more moderate claim that if x and y are identical then they share all properties *when evaluated with respect to the same situation*. Or, in other words, x and y must have the same properties in any situation.

[28] Thus the non-instantiation of the property *hot* by the poker, which is entailed by the poker's instantiation of the property *cold*, is relevantly different from the poker's instantiation of *hot*. See the second part of Chapter 7 for further discussion.

This is what the indiscernibility of identicals means in situational terms. And it is not violated by the change case. Suppose *a* = *b*, so *a* and *b* have all the same properties in every situation. In *s a* is hot, but so is *b*. In *s' b* is cold, and so is *a*. In *s** it is not the case that *a* is hot or that *b* is cold. And, likewise, it is not the case that *b* is hot or that *a* is cold. There is qualitative identity between *a* and *b*.

By distinguishing what is true in different situations, we are able to demonstrate that *a* and *b*, the poker before the change and the poker after the change, do indeed abide by the indiscernibility of identical. The problem comes if we allow universal persistence, as then what is true of *a* in *s** seems different from what is true of *b* in *s*.* Of course, we deny universal persistence and this is what underlies the solution.

So, we have seen how, precisely, the three problems of Chapter 1 are solved by situationalism. The solutions involve slightly different ways of deploying the same underlying claim: persistence across situations is not universal.

Conclusions

In this chapter we have presented the meat of the situationalist solution to the problem of change. The solution is the following: propositions don't have to persist across situations. We fleshed it out by finding a condition that constrains persistence, so that propositions persist *unless* the situations, particulars and propositions are in a certain special relationship. Nevertheless, the key to the solution is the claim that what is true in some situation doesn't have to be true in situations of which it is a part. This solution

upholds the real inconsistency between the propositions and hence what we called in Chapter 2 *real* change.

In presenting the situationalist solution as we have, there are a number of things left unsaid. Primarily, we have not discussed what situationalism would mean for reality if it were true. This is a task for the second part of our final chapter, where we show what the situationalist account of change does for our metaphysics. Before we get there, though, we shall demonstrate in the next two chapters that the situationalist position not only solves the problem of change but can also solve other puzzles that arise from persistence.

Chapter 5

Situationalism and the Ship of Theseus

The case of the Ship of Theseus is a puzzle about diachronic identity, and it has a venerable history.[1] Imagine there is a ship arriving in Athens harbour; this is Theseus' ship, returning from Crete and the defeat of the Minotaur. Call this ship Victory. The Athenians, overjoyed at the safe return of Theseus and the young people of Athens, decide to put Victory on display in a museum. As the months and years go by, parts of the ship lose their lustre and are worn down. These worn planks are replaced by new ones when necessary by the curator of the museum. After 20 years, all of the planks of Victory have been replaced. Call the ship that is in the museum after 20 years Restoration. Is Restoration Victory? The natural answer is that it is; ships can survive the gradual replacement of parts.

Now imagine that, instead of displaying Victory when it arrives back in Athens, the Athenians take it apart and leave it in a warehouse. After 20 years, someone suggests they put the ship back together for a commemorative celebration of Theseus' return. So, they put the planks back together and display the ship on the Acropolis for their party. Call the ship on the Acropolis Reconstruction. Is Reconstruction Victory? Again, the natural answer is that it is; ships can survive being taken apart and put back together.

But here comes the puzzle. Suppose that the Athenians do decide to display the ship in the museum. And suppose, further, that the curator stores all the gradually replaced planks in a warehouse. On the 20th anniversary of Theseus' return, these planks are put back together on the Acropolis. Where is Victory? Is it in the museum? Or is it on the Acropolis?

[1] Plutarch first mentions it in his *Life of Theseus* and Hobbes refined the example in *De Corpore* II: 11.

Or neither? Or both? In other words, which, if either, of the following is true: Restoration = Victory; Reconstruction = Victory?

The structure of this chapter is the following: we shall start by explaining the underlying problem and then outline it in terms of situations. Having done so, we shall introduce the situationalist solution. This solution will be challenged, and we shall respond to these challenged by examining identity *within* and *across* situation. We shall close by considering a residual issue about the necessity of identity.

The theses in conflict in the puzzle

The above informal presentation of the Ship of Theseus case gives us a puzzle because it brings into tension a number of plausible theses that we want to hold together. In what follows we shall describe these, which will help to make the case more precise.

(i) *There are ships.* Victory seems to be a thing. It seems to be a ship, to be exact. Restoration and Reconstruction also seem to be ships. They are all made up of smaller parts: planks and molecules and quarks etc. We hold that there are such composite objects. This, of course, is an assumption (though it relies on solid intuitions). We could solve the problem by denying that there are ships. Perhaps we could deny the existence of composites more generally. But this seems too high a price to pay.[2]

[2] As an example, see van Inwagen (1990) for the view that the only composites are organisms (which would solve this case).

(ii) *Ships can change their parts and remain numerically identical.* The Ship of Theseus case relies on the intuition that a ship can have a plank replaced and remain the same ship. This intuition is repeated until we have a ship which shares no parts with the original. This is how we derive the initially plausible claim that Restoration = Victory. And, in the absence of Reconstruction, it seems a very plausible claim. More widely, we take it that objects can survive (at least some) diachronic changes in parts. It is possible to deny this thesis and maintain that things only persist if they have exactly the same parts. But this move also seems to come with too high a price.[3]

(iii) *Ships can have spatio-temporal gaps in their existence*. We have an intuition that a ship can be taken apart and put back together again, and that once it has been put back together again it is the very same ship. The ship doesn't exist when there is a pile of planks in the warehouse, but it does exist before the taking apart and after the putting back together. So there is a temporal gap in the ship's existence. There may be a spatial gap too, depending on where it's deconstructed and reassembled. Victory undergoes just such a process, with Reconstruction the end result. And, in the absence of Restoration, we are perfectly happy to identify Reconstruction with Victory. Things, and in particular ships, can survive (at least some) spatio-temporal gaps. Again, we could deny this and hold that spatio-temporal continuity is necessary for identity. But this is an implausible claim.

(iv) *Two ships can't be in the same place at the same time.* The principle behind this thesis is that objects can't coincide: two material objects can't occupy exactly the

[3] This is mereological essentialism; see Chisholm (1976) for such a view.

same space at a time and be distinct. In the particular case of the ships, it says that there cannot be two ships sailing back into port from Crete with Theseus at the stern. Victory cannot be two ships in the same place. When we see Victory in the quay we are not looking at two *distinct* ships, one Restoration and the other Reconstruction. To deny this is strongly counterintuitive.[4]

(v) *Ships endure.* Ships, like other objects, are wholly present when they exist. The thing we see when we see Victory on the horizon is the very same thing as the thing we see when it arrives in port; these are not merely things related by being parts of the same whole. When something is before us, all of it is before us. Even fourdimensionalists ought to admit that perdurance isn't the intuitive notion of persistence, for otherwise the Ship of Theseus puzzle wouldn't seem puzzling. Of course, denial of this thesis is a popular move. But it is a move with a cost.[5]

We now come to some theses that can be loosely grouped together as relating to identity:

(vi) *Indiscernibility of identicals.* We have discussed this principle in previous chapters. It states that, for all x and y: if x = y then any property x has y will have too (and *vice versa*). In propositional terms, any proposition true of x will be true of y.

(vii) *Identity is intrinsic*. Whether or not Victory is Restoration depends on nothing other

[4] Despite this, many do reject the thesis. Examples include Fine (2003) and Forbes (1987). In the Ship of Theseus case, two material objects not only coincide but also have all the same parts and are the same sorts of thing, which makes the coincidence all the more unpalatable.

[5] Sider (2001) takes the fourdimensionalist response to coincidence puzzles as a significant argument in its favour (see his fifth chapter).

than the thing(s) involved. Likewise with Victory and Reconstruction. So Victory's identity to Restoration cannot depend on what we do with the replaced planks, and Victory's identity to Reconstruction cannot depend on what we do about replacing planks. Identity is independent of everything external to the thing(s) in question.

(viii) *Transitivity of identity*. If x = y and y = z then x = z. In particular, if Restoration is Victory and Victory is Reconstruction then Restoration is Reconstruction. If 'being identical to z' is a property, then this follows from the indiscernibility of identicals as given in (vi).[6] Even if 'being identical to z' is not a property, transitivity seems exceedingly plausible for the identity relation.

The trouble with these eight theses is that jointly they give us a paradox. The sort of things in the Ship of Theseus case really do exist (from (i)). Because of (iv) and (v), Victory is one enduring thing. Thesis (ii) pushes us to identify Victory with Restoration. And we want to say that Victory is Reconstruction because of (iii). Victory's identity with one of the ships cannot depend on the existence of the other (from (vii)), yet if Victory is Restoration and Victory is Reconstruction then (via (viii)) Restoration is Reconstruction. But Restoration and Reconstruction have different properties, so by the contrapositive of (vi) they are not identical. Contradiction.

[6] Strictly, we also need the reflexivity of identity (c.f. Williamson (1998)). Without the reflexivity of identity we cannot derive the symmetry of identity: the indiscernibility of identity tells us that [[x=y] → [y=y]] but if we don't know that x=x we can't therefore conclude that y=x. Without the symmetry of identity we come across the following problem in deriving transitivity: the indiscernibility of identity tells us that [[x=y] → [[x=z] → [y=z]]. But it doesn't tell us that [[[x=y] ∧ [y=z]] → [x=z]], for we don't know that [y=x]. In effect, without reflexivity (and hence symmetry) the indiscernibility of identity demonstrates that if x is identical to something then so is y, but not that if x is identical to y and y is identical to something that x is identical to that thing. The reflexivity of identity is hardly controversial, however.

There is a final thesis we should mention, which does not contribute to the paradox but constrains solutions to it:

(ix) *Identity is unproblematic*. Everything is identical to itself and nothing is identical to anything else. This relation is easy to understand. Identity is not a matter which, in itself, generates problems. Problems, therefore, must not be solved by complicating identity.[7] They are problems with something else.

We shall not delve into the alternative solutions to the problem: these are well-documented and discussed.[8] Instead, we shall present a solution based on the situational account. But before we do so, we shall first describe the puzzle in terms of situations.

The Ship of Theseus case in terms of situations

In order to see what the resources of the situational account can offer us, we need to recast the case of the Ship of Theseus in terms of situations. Working with the informal presentation above, we can name the following situations:

s_1: The situation containing: a recently-docked ship in port

[7] This thought can be found in Lewis (1986) and Hawthorne (2003), for example.
[8] The Stanford Encyclopedia entry by Wasserman (2009) is a good starting point.

s_2: The situation containing: a recently-docked ship in port and the removal of this ship to a museum where the planks are gradually replaced until, after 20 years, none of the original planks remain.

s_3: The situation containing: a recently-docked ship in port and the history of the original planks of this ship, being gradually moved to a warehouse until they are reformed into a ship on the Acropolis after 20 years.

s_4: The situation containing: a ship in a museum and a ship on the Acropolis, 20 years after Theseus returned home.

s_5: The situation containing: a recently-docked ship in port, the removal of this ship to a museum where the planks are gradually replaced, and the history of the original planks.

We can clarify the relationship between these situations in the following way ($\geq$ means 'has as a part'):

$s_5 \geq s_1$, s_2, s_3 and s_4

$s_2 \geq s_1$

$s_3 \geq s_1$

These are all the non-reflexive parthood relations there are between the situations we have described. Specifically, s_2 and s_3 are not part of one another, and nor are they part of s_4, and s_1 is not a part of s_4. The situations we have given describe what happens in parts of the world. The problematic situation is s_5, which contains all the others. Let's see how the problem arises by looking at some of the propositions true in situations s_1 – s_4 (all but the first of these are derived from the theses above):

In s_1: Victory = Victory

In s_2: Victory = Restoration

In s_3: Victory = Reconstruction

In s_4: Restoration ≠ Reconstruction

So far, so good. But the trouble is that s_1, s_2, s_3 and s_4 are all part of s_5. So it seems we should say:

In s_5: Victory = Victory

Victory = Restoration

Victory = Reconstruction

Restoration ≠ Reconstruction

But via the transitivity of identity, from Victory = Restoration and Victory = Reconstruction we should add:

Restoration = Reconstruction

This directly contradicts the fourth equality in s_5. So s_5 is inconsistent.

The situationalist solution

Luckily, there is a way to avoid the inconsistency of s_5. In assessing which propositions are true in s_5 we simply imported the propositions which were true in parts of s_5. We implicitly relied on the idea that whatever is true in a part of a situation is true in the whole situation. But we have already rejected such a general principle: this was key to the situational solution to the problem of change. It was also independently supported by other examples, such as statements involving universal quantification (e.g. 'all students did well'). We have denied the *universal persistence* of propositions across situations.

But we did not deny that propositions *can* persist across situations, and we introduced a restricted account of the persistence of propositions that indicates when propositions in a larger situation are true given their truth in a part of that situation. Restricted persistence states:

> *Particular restriction*: if *p* is true in *s* and $s \leq s^*$ then *p* is true in *s*,* unless *s** contains more existential situations for particulars that *p* must pick out than *s.*[9]

[9] An existential situation for some particular is a situation containing only that particular and its properties and relations.

What happens when we apply restricted persistence to the relationship between s_5 and its parts? Well, consider the proposition that Victory = Restoration. This is true in s_2. As s_2 is part of s_5, Victory = Restoration will be true in s_5 if restricted persistence is satisfied. Is it satisfied? No. For s_5 contains an existential situation for a particular that the proposition picks out that is not in s_2; namely the existential situations for Victory in s_3. The proposition therefore fails the condition and it cannot be inferred from the truth of Victory = Restoration in s_2 and the fact that s_2 is part of s_5 that Victory = Restoration in s_5.

Mutatis mutandis, the same is true for the proposition that Victory = Reconstruction which is true in s_3. Hence, we are not required to assert these identities in s_5 and so no contradiction can be derived. The situation s_4 makes it apparent that Restoration ≠ Reconstruction, and it also makes it clear that s_2 and s_3 contain different existential situations for Victory.

So we know that restricted persistence doesn't require us to hold that Victory = Restoration and Victory = Reconstruction in s_5. What should we say about the status of these propositions in s_5? Consistent with our approach when discussing the problem of change, we shall take these propositions to be neither true nor false in s_5.[10]

There is, I feel, something intuitively satisfying about this solution. It allows the identities to obtain in circumscribed situations, but not in larger situation of which both are a part. This parallels the way the Ship of Theseus case is usually introduced: first establish an intuition that Victory is Restoration, then establish a separate intuition that Victory is Reconstruction before unleashing the puzzle by combining the two.

[10] Formally, we are not required to do this. The propositions could be false or even true in s_5, for all that the situation theory says. But, for reasons that will become clear below, the best option for us is to posit that such propositions are neither true nor false.

There are, however, significant objections to resolving the Ship of Theseus case in this way. Even if we take for granted the situational account offered in the last chapter (and in particular restricted persistence) opponents of the solution can make several criticisms, which we shall describe and discuss in the coming sections.

Criticisms of the situationalist solution

The central worry with the situationalist solution, I think, comes from looking at the three theses relating to identity. Let's look at these in turn.

Thesis (vi) is the indiscernibility of identicals. One might argue the following:

> Victory and Restoration are supposed to be identical in s_2. According to the indiscernibility of identicals, therefore, anything true of Victory should be true of Restoration. Victory is identical to Reconstruction in s_3. So Restoration should be identical to Reconstruction in s_3. But it isn't, hence Victory and Restoration are discernible and not identical.

This reasoning can be rephrased using property-talk. Victory has the property *being-identical-to-Reconstruction-in-s_3.* Restoration does not have this property. The contrapositive of the indiscernibility of identicals states that if x and y have different properties then it is not the case that x=y. In s_2, then, Victory has a property that Restoration doesn't, and so

they can't be identical in s_2. It seems, therefore, that the indiscernibility of identicals is violated by our solution.

Thesis (vii) states that identity is intrinsic. It claims that whether x = y doesn't depend on anything other than x and y. But our proposed solution to the Ship of Theseus case seems to make identity extrinsic. If Victory = Restoration in s_2 but not in s_5 and s_2 is a part of s_5, it looks like something else in s_5 must be preventing their identity. Any intrinsic relation between Victory and Restoration cannot differ from s_2 to s_5 as all of Restoration is in s_2. It must be something in s_5 which is *not* in s_2 which prevents their identity.[11] And it seems, on the face of it, that something *does* prevent the identity in s_5. It is because of the existence of Reconstruction in s_5 that Victory is not identical to Restoration there. So the solution we have offered appears to conflict with the claim that identity is intrinsic.

Thesis (viii) is the transitivity of identity. We should be able to see why this raises difficulties for our solution. Victory = Restoration in s_2 and Victory = Reconstruction in s_3. Neither of these holds in s_5 so we avoid the problem *within* a situation. But transitivity might work across situations as well as within them. If this is so, then our solution isn't a solution at all, as we still end up with the unpalatable identity Restoration = Reconstruction. We might give the following as a *prima facie* plausible principle: if x = y in *s* and y = z in *s'* then x = z in *s* + *s'*.[12] If a principle of this form seems plausible then our solution doesn't avoid the transitivity worry after all.

[11] This, of course, relies on the idea that, in the scenario described, *something* must prevent the identity of Restoration and Victory in s_5.
[12] See footnote 16 later for a discussion of this.

So the three theses relating to identity each pose a challenge to our solution. In order to answer these challenges, we need to be more explicit about what we are claiming about identity. In particular, we need to examine the concept of identity *within* a situation and the concept of identity *across* situations.

Identity *within* and *across* situations

Let's begin with identity within a situation. An example of such an identity is $a = b$ in *s.* What is it for this to be the case? It is for a certain relation to hold between *a* and *b* in *s,* the relation of identity. This relation is reflexive, symmetric, and transitive: it is an equivalence relation. Furthermore, it obeys the indiscernibility of identicals and is the relation everything bears to itself and no other thing. In short, the identity of *a* and *b* in *s* is the obtaining of the traditional identity relation between *a* and *b* in *s.*[13] Whatever the common or garden notion of identity is, that is the concept we are using for identity in a situation.

And what of the identity of entities *across* situations? An example would be when *a* is in *s* and *b* is in *s'* and $a = b$. A natural first thought is that if $a = b$ then *a* bears to *b* the self-same equivalence relation from the previous paragraph. But there is a problem with this. It requires a relation to hold between entities in different situations. This is a departure from the situational theory we have proposed. In our conceptual scheme, relations hold either *in* situations or, for the relation of parthood, *between situations*. To say that two things in different situations are related is against the grain of our framework. All relations and

[13] See Noonan (2009) for a more full description of this relation.

properties are had in situations or by situations. The identity relation expressed by *a* = *b*, therefore, should hold in some particular situation if *a* and *b* are not situations.

An example will show why this is necessary. Consider Blackbeard the pirate, who is raiding a ship in some situation *s*. He buries looted treasure in some other situation *s'*.[14] It's the same person in *s* and *s'*: Blackbeard in *s* = Blackbeard in *s'*. But he has different properties in *s* and *s'*, and so if we are simply considering the individual in *s* and the individual in *s'* they fail the contrapositive of the indiscernibility of identicals. If we consider the case asituationally, it seems Blackbeard in *s* ≠ Blackbeard in *s'*. We've been here before; this is the same problem as the problem of change. We reject solutions that have an unequal ontology or divide Blackbeard into parts or complicate properties. So we don't have these escape routes. Our solution was that *what is the case* is relative to situations; propositions are always evaluated with respect to a situation. But if we allow the identity relation to hold between thing(s) in *different* situations then to which situation do we look to determine what is the case? The things in those different situations, if they are identical, ought to obey the indiscernibility of identicals in those different situations. As the Blackbeard example shows, however, they do not, as what is the case varies across the different situations.

These considerations suggest a better understanding of identity across situations. An entity *a* in *s* is identical to *b* in *s'* if *a* = *b* in the situation composed of *s* and *s'.* This gives us a situation for evaluating the truth of the identity, and is a view of identity across situations that makes it conceptually derivative to the notion of identity within a situation and the combination of two situations (a part of our situation theory). Identity across situations is reducible to identity in a situation and the relation of parthood between situations. As a

[14] We can think of *s* and *s'* as different times, different possible situations at the same time or even different places at the same time (for a time-travelling Blackbeard).

slogan: all identity across situations is identity within a situation. This is what it means to identify entities in different situations: that such an identification holds in the combined situation. In the Blackbeard case, we can say that the individual in *s* and *s'* is identical because in *s**, which is *s* + *s'*, Blackbeard = Blackbeard. The problem from the indiscernibility of identicals is avoided because the identity relation holds between thing(s) in the *same* situation, and hence what is the case will not vary.

One result of this account can be drawn out when we consider situations that are parts of one another. If a situation *s* is part of another situation *s'* then the combination of those situations will be *s'.* Therefore, if *s'* ≥ *s,* an entity in *s* will be identical with an entity in *s'* if they are identical in *s'.*[15]

Here comes the important bit. What properties does the relation 'identity across situations' have according to this view? It is trivially reflexive: [x in *s* = x in *s*] because [*s* + *s*] is *s* and in *s* [x = x]. It is also symmetric: if [x in *s* = y in *s'*] then [y in *s'* = x in *s*] because [[*s* + *s'*] = [*s'* + *s*]], and in this combined situation [x = y] holds. But it is *non-transitive*. From [x in *s* = y in *s'*] and [y in *s'* = z in *s''*] it doesn't necessarily follow that [x in *s* = z in *s''*]. The situation in which [x in *s* = z in *s''*] is evaluated is [*s* + *s''*], and the fact that x = y in [*s* + *s'*] and y = z in [*s'* + *s''*] doesn't make it the case that x = z in [*s* + *s''*]. Of course, it may be the case that x = z in that situation. But it could also be the case that x isn't identical to z in that situation. What governs the possibility of the inference is the principle mentioned above of restricted persistence. The identity propositions are not always persistent, hence the relation is non-transitive.[16]

[15] As all situations are part of themselves, the question whether *a* in *s* = *b* in *s* can be reformulated as whether *a* = *b* in *s.*

[16] We should consider a particular case raised on p. 151. We said that it would raise a problem from transitivity if the following principle were true: if x = y in *s* and y = z in *s',* x = z in *s* + *s'*. This is a rephrasing of: if [x in *s* = y in

This will have significant consequences. We have left untouched the identity relation within a situation: this is our usual notion of identity and is transitive. But identity between things in different situations is *not* transitive. Armed with this understanding of identity, let's return to the criticisms from the theses about identity.

The situationalist solution and the criticisms from the nature of identity

The indiscernibility of identicals worry was that if Victory is Restoration in s_2 then something would be true of Victory that is not true of Restoration, e.g. that it is identical to Reconstruction in s_3. There are three possible replies to this. In the first place we could claim that Restoration does have the property *being-identical-to-Reconstruction-in-s_3* and hence that it is not discernible from Victory. Secondly, we could claim that neither Victory nor Restoration has this property. Thirdly, we could claim that their difference with respect to this property doesn't entail that they not identical.

The third approach seems untenable. If Victory and Restoration really do differ in their properties, how can they be one and the same thing? Perhaps we could restrict the indiscernibility of identicals somehow, so that it only applies to a subset of properties that do not contain reference to a situation. But restricting the principle is fraught with difficulties, and the unrestricted version of the principle remains extremely plausible.[17] We shouldn't, therefore, admit that Victory and Restoration differ with respect to this property.

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s] and [y in *s'* = z in *s'*] then [x in *s* + *s'* = z in *s* + *s'*]. From the first two statements we can conclude that that [y in *s* = y in *s'*], because [y = y] in *s* + *s'*. But from this we can't move to the last statement unless the conditions of restricted persistence are met, and hence x = y in *s* + *s'*. So this principle is not plausible, on our view, and is a more specific case of the general non-transitivity of identity across situations.

[17] One argument against restricting the principle is that we can construct an unrestricted version of the principle, and we need reason not to accept the unrestricted version. Sider *op. cit.*: 166-167 argues that restricting Leibniz's Law (the indiscernibility of identicals) means we are not talking about identity.

This leaves us with the first two options. The obvious question facing the first approach is how Restoration could have the property *being-identical-to-Reconstruction-in-s_3* when it clearly isn't identical to Reconstruction in s_3 and so doesn't have this property in s_3, or indeed in s_4 or s_5. Gallois, in the temporal version of this reply, asserts the following principle:

(x)(*t*)(*t'*)(ϕ)[at *t*: at *t'*: ϕx ↔∃y (at *t*: x=y & at *t'*: ϕy)][18]

The corresponding principle for situations would be:

(x)(*s*)(*s'*)(ϕ)[in *s*: in *s'*: ϕx ↔∃y (in *s*: x=y & in *s'*: ϕy)]

In other words, in a situation *s* something has a property in a situation *s'* if there's something that is that thing in *s* and has the property in *s'*. Sider's problem with Gallois' principle is cashing out 'in *t*: in *t'*: *p*' in such a way that the first qualifier is not redundant without rejecting the B-theory.[19] There might be some work we could do here to show that situations fare better than times against Sider's criticisms, and so our principle fares better than Gallois'. But we have a more particular worry with the Gallois-style reply. By admitting that in s_2 Restoration has the property *being-identical-to-Reconstruction-in-s_3* we allow that there is some information in s_2 about what's going on in s_3.[20] But situations are specifically supposed to be limited in the information they contain. If we allow that anything true of an

[18] Gallois (1998).
[19] Sider *op. cit.*: 168 and (2004): 677-679.
[20] The property *being-identical-to-Reconstruction-in-s_3* is a complex property that is the property of having the following property in s_3: *being-identical-to-Reconstruction.*

entity is true of it in any situation in which it occurs, albeit in a suitably qualified way, then situations aren't restricted parts of the world in the sense we have taken them to be. Suppose it is true in some large situation that the cricket side scored well in the early part of the innings but badly in the latter stages. It shouldn't be true in the smaller situation containing only the early part of the innings that the team scored badly towards the end. It shouldn't be true of Restoration in s_2 that it has the property *being-identical-to-Reconstruction-in-s_3*.

We can clarify this objection by looking again at cross-situational identity. When we ask if two entities from different situations are identical, what we are asking is whether they are identical in the combined situation. So in ascribing the property of *being-identical-to-Reconstruction-in-s_3* to an entity in a situation we are introducing a combined situation for evaluation. Restoration could not have this property *in* s_2. If we were to admit that Restoration in s_2 is identical to Reconstruction in s_3 then we are claiming that they are identical in [s_2 + s_3]. As [s_2 + s_3] is s_5, and Restoration ≠ Reconstruction in s_5, this is a false claim anyway. But even if it were true, it would not be true in s_2. We should therefore not claim that, in s_2, Victory and Restoration are both identical to Reconstruction in s_3.

The final option we have to avoid a violation of the indiscernibility of identicals is to claim that neither Victory nor Restoration has the property we are considering. We have seen why Restoration doesn't have it, but for similar reasons we can maintain that Victory shouldn't have this property in s_2 either. If Victory has the property in s_2, there's information in s_2 about things happening in s_3. So in s_2 Victory doesn't have the property *being-identical-to-Reconstruction-in-s_3.* Victory may (and does) have this in other situations, but doesn't

have it in s_2.[21] If neither Restoration nor Victory has the property, then they don't fall foul of the indiscernibility of identicals. So, it seems that Victory = Restoration can be true in s_2, Victory = Reconstruction true in s_3, and no problems arise from indiscernibility.

So much for the worry that Victory and Restoration are discernible with respect to Reconstruction. But there remains a more insidious problem from the indiscernibility of identicals which doesn't involve Reconstruction. While it is true in s_2 that Victory = Restoration, this is not true in s_5. Hence Restoration does not have the property of being identical to Victory in s_5. But this is a property that Victory should have, as Victory in s_2 = Victory in s_5. So it seems after all that Restoration and Victory are discernible in s_2 and hence are not identical there: one but not the other is identical to Victory in s_5. Our theory of identity across situations seems to reinforce the problem, as Victory in s_2 and Victory in s_5 satisfy the condition for being identical, whereas Restoration in s_2 and Victory in s_5 do not.

What's gone wrong? It's certainly true that Restoration doesn't have the property *being-identical-to-Victory-in-s_5* in any situation. And it's also true that Victory in s_2 = Victory in s_5. But for Victory and Restoration to be discernible *in* s_2 Victory needs to have, *in* s_2, the property of being identical to Victory in s_5. For the reasons given above this is unpalatable. If Victory has, in s_2, the property of being identical to something outside of s_2 then the information in s_2 is not limited by the contents of s_2. While Victory in s_2 is identical to Victory in s_5 the reason this is so is because they are identical in s_5. By introducing the entity which is Victory in s_5 we shift the situation in which we evaluate the truth of the identity claims. Thus we shouldn't be surprised to find Victory and Restoration discernible in this new situation

[21] It is worth emphasising the fact that Victory doesn't have the property *being-identical-to-Reconstruction-in-s_3* in s_2. It is true that Victory in s_2 is identical to Reconstruction in s_3, because they are identical in the combined situation $s_2 + s_3$ (= s_5). But this truth holds in s_5, not in s_2. In s_2, therefore, Victory doesn't have the property described. The next paragraphs deal with a similar worry.

(s_5). However, they can still remain indiscernible in s_2. What our cross-situational notion of identity tells us is that we need to use the combined situation to make such identity claims. It is not the case, therefore, *in the small situation* s_2 that Victory in that situation is identical to something else in some other, larger situation.[22]

As much as this seems to deal with the issue, it still feels odd. There appears something strange about Victory being identical with Restoration in s_2 and Victory being identical with Reconstruction in s_3 and Restoration and Reconstruction not being identical in any situation. Similarly, it seems strange that Victory in s_2 can be identical to Restoration in s_2 but that in other situations they differ. This unease arises from a further property that identity is supposed to have: necessity.

The (current) standard view is that identity is necessary. What is usually meant by this is that is if $a = b$ anywhere, $a = b$ everywhere. This is not the sense of necessity we introduced in Chapter 3, which states that a proposition is necessary iff it is never false. For the moment, though, we'll grant the usual usage (we'll return to the issue in the section on the necessity of identity). In situational terms, the claim is that identity is invariant across situations. Our position departs from this view. According to our position, it is possible for an identity to hold in one situation but not in another. Identity is *not* invariant across situations, not even across situations in the same world. For the moment, we will postpone discussion of whether or not identity is necessary for later in the chapter. What we shall show is that, like the indiscernibility of identicals objection, the objections based on the thesis that

[22] So Victory exists in s_5 and is identical to Victory in s_2 and Victory in s_3 there. But what other properties does Victory have? This is a difficult question, as it appears that propositions about Victory fail restricted persistence into s_5, so very little will be true of Victory. The issue is dealt with in Chapter 7, where we explain the metaphysical consequences of situationalism.

identity is intrinsic and on the transitivity of identity are bound up with this sense of the necessity of identity.

There is a tension between our solution and the alleged intrinsic nature of identity. As we said above, Victory = Restoration in s_2 but not in s_5, so something must have changed between s_2 and s_5. Given that s_2 is part of s_5, what seems to have changed is something external to Victory and Restoration. But this appearance is deceptive; the thing that is different between s_2 and s_5 is *Victory*. As our restricted persistence shows, there are existential situations for Victory in s_5 that are not in s_2. Victory is qualitatively different in s_2 and s_5. One of those qualitative differences is that the relation of identity holds between it and Restoration in the former situation, but not in the latter. So, on our view identity *is* intrinsic, in the sense that the relation depends solely on the entity. But the entity itself can differ between situations, and so the intrinsic relation can too.

This is obviously unsatisfactory if one believes that identity is necessary. If identity is necessary, the relation either always holds or never holds. The relation cannot hold in some situations but not others. So an entity cannot differ between two situations with respect to this relation. But we can reject the necessity of identity and still maintain that identity is intrinsic.

One obscuring factor is that the necessity of identity entails that identity is intrinsic. For if identity is necessary then the truth-value of a proposition expressing an identity will be fixed across situations. This means that whether or not the identity holds is independent of the rest of the situation: it is independent of all external factors. However, although the necessity of identity entails that identity is intrinsic, the converse is not the case. Identity

being intrinsic doesn't say anything about whether it is necessary. The criticism of our solution from the fact that identity is intrinsic is therefore misguided.

We have claimed that identity across situations is non-transitive. This provides the dynamic by which our solution works. But denying cross-situational transitivity is controversial. It might be claimed that identity relations *are* transitive, or perhaps even *must be* transitive. If our solution is to work we cannot accept this, though we allow that the relation of identity within a situation is indeed transitive. It is worth pointing out that the transitivity of identity is also connected to the necessity of identity. For if identity is necessary, an identity relation which holds in any situation holds in all situations. If *a* = *b* in *s* then *a* = *b* in *any* situation. This would collapse the distinction we have drawn between transitivity within a situation and non-transitivity between situations: we could pick any situation and this would contain all identity relations. In virtue of the fact that there is transitivity within a situation, and the fact that all situations contain all identities, we could then infer x = z from any x = y and y = z true in any situation. The necessity of identity, therefore, would fatally undermine the difference between identity within and across situations because the situation of evaluation would be irrelevant to the truth of the identity statement.

As well as the connection between the necessity and transitivity of identity across situations, it is also worth noting the connection between the contingency of identity and non-transitivity across situations. Suppose identity is contingent, so that *a* = *b* in *s* but not in *s'*. Suppose, also, that *b* = *c* in *s'*. So *a* = *b* in *s*, *b* = *c* in *s'*, but it's not the case that *a* = *c* in *s'*. Suppose, for a *reductio*, that identity across situations is transitive. We can then infer from *a*

= *b* in *s* and *b* = *c* in *s'* that *a* = *c* in *s'.* So by transitivity *a* = *c* in *s'*, and by assumption it isn't the case that *a* = *c* in *s'*: we end up with a contradiction. The trouble is caused by the pairing of unrestricted transitivity of identity across situations with contingent identity. So it seems the best bed-fellows are either contingency and non-transitivity or necessity and transitivity.

It appears that all three of our objections based on the theses for identity are tied up with one more basic claim: identity is necessary. We shall therefore turn to this crucial claim.

The necessity of identity

In the sense mentioned above, we take identity to be contingent. Most take it to be necessary. Kripke famously argued for the necessity of identity, so we will have to tackle his argument.[23] It begins with a substitutability principle from the indiscernibility of identicals: (x)(y)(F)[[x=y] → [Fx → Fy]]. This states that, if x is identical to y then they will share all properties. Now an example of the substitutability principle might be: (x)(y)[[x=y] → [□[x=x] → □[x=y]], where the property used is the property of being necessarily identical to x. Kripke claims that, 'surely', everything is necessarily self-identical, i.e. (x)□[x=x]. As (x)□[x=x] is therefore true, we can assert the consequent that succeeds it in the formula above. We end up with (x)(y)[[x=y] → □[x=y]]. Therefore, if x is y then necessarily x is y. In more informal terms, the argument states that identical things share all properties and that everything is necessarily self-identical, so if *a* is identical to *b* it shares the property *b* has of being necessarily identical to *b*.

[23] Kripke (1971). Ruth Barcan-Marcus proposed a similar argument under her maiden name: Barcan (1947). The connection between these is a matter of contention.

If our solution is to work, we need to respond to this argument. Lowe (1982) and others raise the question whether there is a difference between 'being necessarily self-identical' and '*a* being necessarily identical to *a*' and, if so, whether the argument equivocates on this. Although I am not unsympathetic to this view, I wish to press in a slightly different area. There are two different replies I will offer to Kripke's argument. The first draws on our distinctive interpretation of necessity, covered in Chapter 3, and shows that on our view identity is indeed necessary after all. The second proposes that, even if we do not accept the interpretation offered in Chapter 3, Kripke's argument does not establish a stronger version of the necessity that would conflict with the situationalist solution to the Ship of Theseus puzzle.

Kripke's conclusion to his argument is that if $a = b$ then necessarily $a = b$. The definition of validity (i.e. necessity) we gave in our outline of situation semantics in Chapter 3 was the following: a proposition is valid iff it is not false in any situation. If we were using possible worlds as the basis of our semantics we might desire that all propositions are given truth-values in a given context of evaluation; worlds are supposed to be big things that determine a lot. But situations can be restricted in their purview and thus some propositions are neither true nor false in certain situations. For instance, the proposition that Puddy the cat is tabby is neither true nor false in the situation which corresponds to the Battle of Britain. Our claim is a further one: even propositions which are *necessarily* true and about Puddy are not true in the situation corresponding to the Battle of Britain. To reiterate: we have a notion of necessity as a negative condition; a proposition is necessary if there is no situation in which it is false.

Given this understanding of necessity, Kripke's conclusion is not damaging to the situationalist solution. If the necessity of a proposition just means that there is no situation in which the proposition is false, then identity is necessary on our picture. In the Ship of Theseus case, Restoration is identical to Victory in s_2. In s_5 the proposition that Restoration = Victory fails restricted persistence and is neither true nor false. More generally, the proposition that Restoration = Victory is true in s_2, in some situations which are part of s_2 and in extensions of s_2 but where restricted persistence is satisfied. The proposition lacks a truth-value in situations which have s_2 as a part but which fail restricted persistence and in situations which do not overlap with s_2.[24] There are no situations in which the proposition is false. Similar reasoning applies to the identification of Reconstruction and Victory in s_3. If necessity is understood in this way, we can therefore uphold the necessity of identity without jeopardising our solution.

This is our first reply to Kripke: he is quite right, but interpreting his conclusion by our lights does not give us a problem. Identity *is* necessary, given our definition of necessity. Before going on to the second reply, however, we should pause to clear up a possible confusion that would undermine what we have said. We stated that if an identity is true in some situation it is never false in any situation. Take the identity of Restoration and Victory: as we have said above, this is true in s_2 and neither true nor false in s_5. But it might seem like it should be *false* in s_5, because Victory and Restoration both exist in s_5 and have different properties there. It is to assuage this worry that we shall briefly postpone the second reply to Kripke.

[24] By overlap here we mean having a part in common. If a situation does not have a part in common with s_2 then Restoration doesn't exist in that situation as all of Restoration's career is in s_2. Thus, in such situations propositions involving Restoration will be neither true nor false.

The fact that Victory and Restoration have different properties in s_5 might encourage us to think that they are distinct because of the contrapositive of the indiscernibility of identicals. We might take the contrapositive of the indiscernibility of identicals to be the distinctness of discernibles: the claim that two things are distinct if there is some property they do not share. But this overlooks the situationalist framework within which we are working. According to the situation semantics we are adopting, a proposition can be either true, false *or neither true nor false* in a situation. This third possible status for a proposition in a situation is highly relevant. The indiscernibility of identicals states: $\forall x \forall y \forall F\ [x=y \rightarrow [Fx \rightarrow Fy]]$. In other words, if 'x = y' is true then y shares all x's properties. The distinctness of discernibles states: $\forall x \forall y \forall F\ [[Fx \wedge \neg Fy] \rightarrow x \neq y]$. Or, in English, if y doesn't share all x's properties then 'x = y' is false. But this is *not* the contrapositive of the indiscernibility of identicals given that 'x = y' can be neither true nor false. The actual contrapositive of the indiscernibility of identicals is the following: $\forall x \forall y \forall F\ [[Fx \wedge \neg Fy] \rightarrow \neg [x=y]]$: if y doesn't share all x's properties then 'x = y' is not true. The difference between 'x ≠ y' and '$\neg$[x=y]' is precisely what the situationalist picture asserts. The latter can be true in a situation while the former is not. This will happen when the identity is neither true nor false. So the *real* contrapositive of the indiscernibility of identicals merely states that an identity cannot be *true* if there is difference in properties, not that the identity is *false*. And this, of course, is consistent with our claim that 'Restoration = Victory' is neither true nor false in s_5.

So we have given reason to think that, interpreted as we stipulate, identity *is* necessary, and Kripke's argument is unthreatening. But this might feel a bit like a dodge: there are other senses of necessity which our view of identity *doesn't* satisfy. In these

senses, identity is *contingent* according to the situationalist. If Kripke's argument establishes the necessity of identity in one of these stronger senses then we will still be in trouble. Therefore, in our second reply, we shall show that the argument doesn't work for these stronger senses of necessity.

The strongest sense of necessity is the one mentioned in the previous sections; necessity as simply truth in all situations. According to this interpretation a proposition *p* is necessary if it is true in every *s*. Under this interpretation the argument fails to establish its conclusion. One of the assumptions of the argument is that everything is necessarily self-identical. As Kripke himself notes, in a world or situation in which some object *a* does not exist, it is unclear whether '*a* = *a*' is true, false or neither true nor false. In line with what we have suggested elsewhere, I take it that '*a* = *a*' is not true in a situation in which *a* doesn't exist.[25] This is a problem for the claim that *a* = *a* is necessarily true, on the interpretation we are considering. So, the claim (x)□[x=x] is false if □ is interpreted as unrestricted. It claims that every thing is identical to itself in every situation, which is incorrect given that not every thing exists in every situation.

Kripke, however, seeks to avoid this difficulty by offering us a different interpretation of necessity. He urges us to "interpret necessity here weakly. We can count statements as necessary if whenever the objects mentioned therein exist, the statement would be true."[26] So Kripke offers us a third alternative interpretation of (x)□[x=x] according to which the necessity is restricted to situations where the entities taking the place of the variable exist. We should see if this 'weak' notion of necessity (which is not as weak as our notion of

[25] I take it that '*a* = *a*' is neither true nor false in such a situation. The argument fails just as much if it is false there, however.
[26] Kripke *op. cit.*: 137.

necessity) gets Kripke's argument through and whether the 'weak' conclusion conflicts with our solution.[27]

Kripke's assumption, on the 'weak' view of necessity, is that every entity is identical to itself whenever it exists. The property, therefore, that is used in the application of indiscernibility of identicals is the property of being identical to x whenever x exists. By assumption, x has this property and hence, through the indiscernibility of identicals, y must as well. This leads us to the conclusion that, if x = y, then x = y whenever x exists. Because the argument works no matter what x and y are, we end up with a symmetrical claim that, if x = y, then whenever x or y exists they are identical.

This conclusion still undermines our position. For we hold that some entities can be identical in some situations but not identical in other situations *in which they both exist*. The Ship of Theseus example is a case in point, for Restoration and Victory are identical in s_2 but are not identical in s_5, despite the fact that they both exist in s_5. This is what raised the worry above about the contrapositive of the indiscernibility of identicals. So it seems Kripke's 1971 revision gives us a problematic argument. In order to provide a satisfactory response, we need to explain where Kripke's argument (interpreting □ in this way) goes wrong.

Kripke's modal argument for the necessity of identity fails because it doesn't distinguish between identity *within* and *across* situations. We have distinguished these two at a fundamental level; the latter relation is a complex relation which holds when the former relation holds in a certain situation, namely the situation that is the combination of the two

[27] In the third lecture of *Naming and Necessity* Kripke mentions, in passing, our interpretation of necessity. Again discussing the possibility that the entities involved do not exist in some worlds, he says that we can either hold that identity statements are true, false or neither true nor false. He then continues, "if we take the last option [which is indeed our chosen option], is 'Hesperus = Phosphorus' necessary because it is never false, or should we require that a necessary truth be *true* in all possible worlds?" (Kripke (1980): 110). Unfortunately the very next sentence is "I am leaving such problems outside my considerations altogether", so we don't know how he would have responded to our approach here.

situations in which the relevant entities exist. There is an ambiguity about which of these relations of identity Kripke is using in his argument. If we should understand Kripke as talking of identity within a situation, he is then talking about a particular situation (say *s*). The substitutability principle grounded in indiscernibility of identicals is perfectly acceptable (as is transitivity). But the second antecedent then states that it is necessary that x = x within *s*, i.e. that in every situation in which x exists it is identical to x in *s*. We have argued above that this is not true: suppose there is some situation *s'* which does not overlap at all with *s* but in which x exists. There should be no information in *s'* about what is the case in *s*: they do not overlap. So although x = x in *s'*, it is not true in *s'* that x = x *in s*. Once Kripke substitutes □ [x=x] for Fx, the antecedent of the second conditional is false. The argument therefore doesn't work.[28]

Perhaps we should interpret Kripke as using identity across situations for '='. In such a case □ [x=x] will be true. However, if we should understand him as referring to identity across situations the substitutability principle derived from the indiscernibility of identicals becomes controversial. It states that, if an entity in one situation is identical to an entity in another they share all the same properties unrestrictedly. But this is what we deny. Identity across situations allows for the qualitative difference of that entity *in different situations*. Consider the case of change. A poker is hot in some situation *s* and cold in *s'.* We hold that the situations are incompatible and that the poker is neither cold in s nor hot in *s'.*

Working through the Ship of Theseus example may make it clearer what our response to the argument is. Taking identity within a situation first, we allow the principle (x)(y)(F)[[x=y] → [Fx → Fy]]. An instance of this principle is (x)(y)[[x=y] → [□[x=x] → □[x=y]]].

[28] Maybe the Kripkean will suggest that '=' be interpreted as *within every situation in which the relata exist*. This avoids our issue. But it raises another one: x = y will then not be true for any pair of relata that are contingently identical, and *this* antecedent will be false in the cases we consider.

Within the situation s_2, we select Victory for the variable x and Restoration for the variable y. Hence we have: in s_2: [[Victory = Restoration] → [□[Victory = Victory] → □[Victory = Restoration]]]. But it is *false* that □[Victory = Victory], as Victory is not, in every situation in which Victory exists, self-identical within s_2. There are some situations where this is neither true nor false, because s_2 is not a part of them. In s_3, for example, the following proposition is neither true nor false, 'in s_2: Victory = Victory'. Hence, where '=' is understood as identity within a particular situation (in this case s_2) the argument is invalid.

Taking '=' to refer to cross-situational identity, however, the principle (x)(y)(F)[[x=y] → [Fx → Fy]] states that, if x is in one situation and y is in another and they are identical, they will share all the same properties. This we flatly deny. One and the same thing can have different properties in different situations: this is what we understand to be happening in cases of change. By denying it, we dissolve the argument. If we didn't deny it, we would have the following problem: substitute Victory in s_2 for x and Victory in s_5 for y, and take F to be the property of being identical to Restoration. If we allowed the principle, then we ought to conclude that Victory in s_5 = Restoration. The argument is valid but unsound.

Kripke's argument fails with the univocal reading of '=' as identity within a situation. It makes a false assumption with a univocal reading of '=' as identity across situations. So however the argument is interpreted, it does not succeed against our position.

We have offered two replies to Kripke's modal argument. The first is that it is quite right, and not damaging, if necessity is interpreted in our preferred manner. It is indeed the case that if x = y then it is never false that x = y. If necessity is interpreted in a stronger way, the argument fails. Thus we can uphold the 'contingency' of identity corresponding to the

stronger sense of necessity. The second reply was that, on a stronger reading of necessity, Kripke's argument doesn't work. Whether we take him to be speaking univocally of identity within a situation or across situations, the argument is not acceptable. Our situationalist solution to the Ship of Theseus problem therefore doesn't fall foul of Kripke's argument.

Conclusions

We have proposed a solution to the Ship of Theseus puzzle using situations and restricted persistence. Our solution has led us to deny the transitivity of identity across situations so, in closing, we should consider thesis (ix): the simplicity of identity. This was the broader thesis that problems cases such as the Ship of Theseus should not be solved by making identity complicated but by finding problems elsewhere. It might seem that we have complicated identity by distinguishing between identity within and across situations. But the latter is reducible to the former, together with our situation theory. We have only one basic notion of identity, and we talk of identity across situations as a construct of that basic notion and our view of relations between situations.

Our diagnosis of the problem is not that identity is problematic. We uphold thesis (ix). Granted, we hold a position on the nature of identity that sees it as only necessary in the sense that identities are *never false*. We take identity to be contingent in the sense that an identity can hold in one situation but fail to hold in another (even if the relevant entities exist in that situation). We also consider identity to be non-transitive across situations because of the different situations of evaluation of the statements concerned. But the root of the puzzle that the Ship of Theseus case elucidates is the relations between situations.

What is true in some situation needn't be true in situations of which it is a part. This even extends to statements of identity. This puzzle comes from the same route as the puzzle over change. In proposing the above solution to the Ship of Theseus case, therefore, I propose it as part of a wider solution to problems with persistence. The Ship of Theseus case is a species of a more general difficulty, and can be solved using the same methods.

The situationalist solution to the Ship of Theseus puzzle contributes to the argument for the theory of situations we propose. In the next chapter I shall continue this approach and present the picture as a unified response to problems persistence.

Chapter 6

Situationalism and other persistence puzzles

In the previous chapter we have shown how our framework provides a solution to the Ship of Theseus puzzle. In this chapter I want to demonstrate that the framework has the resources to deal with the other puzzles about material constitution in a similar way. This will, unfortunately, involve some repetition, as the key insight is the same between the solutions. But I hope that the process will be enlightening despite its repetitive nature. We shall begin by looking at the less elaborate cases before moving on to the more complex.

Symmetric fission

Consider an amoeba which is on a Petri dish in a lab. Call this amoeba Mummy. Suppose that, at *t,* the right side of Mummy is destroyed leaving only the left side. What remains is a functioning amoeba, which we shall call Daughter.[1] It seems like Mummy = Daughter. Now suppose that the *left* side of Mummy was destroyed at *t* rather than the right. We have an amoeba we shall call Son. If this were to happen, then it seems Mummy = Son. But now imagine that Mummy reproduces at *t* by dividing itself exactly and perfectly symmetrically into two parts.[2] The result is two amoebae, one from the left side of Mummy and one from the right: Daughter and Son. What do we say now about the identity of Mummy with Daughter and Son?

[1]In order for this to be so, biologically, the amoeba may have had to begin the process of reproducing before the partial destruction.

[2]Maybe no real-life amoeba has ever had such a 'perfect' fission. But it is at least possible for it to take place.

There are four options, each of which appears unpalatable: i) Mummy is identical to both Daughter and Son. But Daughter and Son aren't identical, so how could Mummy be identical to both of them? ii) Mummy is identical to Daughter and not Son. But why? Son and Daughter are qualitatively identical and have a qualitatively identical history with respect to Mummy. iii) Mummy is identical to Son and not Daughter. This has the same problems as (ii). iv) Mummy is identical to neither Daughter nor Son. But Mummy would be identical to each of them if the other didn't exist, so how can being successful in reproducing make Mummy cease to exist?

The difficulty here is that there are reasons why each of the four options appears unacceptable. It is hard to know which is the right option. To solve this puzzle using situation theory, we need to first recast the description in terms of situations. The following are three situations:

s_1: The history of Mummy before *t* and of the amoeba from the left side of Mummy after *t*

s_2: The history of Mummy before *t* and of the amoeba from the right side of Mummy after *t*

s_3: The history of Mummy before *t* and of the amoebae from both sides of Mummy after *t*

The situation s_3 has both s_1 and s_2 as parts, but s_1 and s_2 are not parts of each other. Our solution is to accept the following identities in the following situations:

s_1: Mummy = Daughter

s_2: Mummy = Son

s_3: neither

We are entitled to deny that neither Mummy = Daughter nor Mummy = Son in s_3 because of our principle of restricted persistence, which governs when propositions true in a part of a situation must be true in the whole situation. Restricted persistence is violated by the propositions expressing the identities Mummy = Daughter and Mummy = Son because there are existential situations for Mummy that exist in s_3 but not in s_2 or s_1 respectively. Furthermore, in the previous chapter we argued that identity is only transitive *within* situations; in order for Mummy = Daughter and Mummy = Son to entail that Daughter = Son the first two identities need to hold within one situation. As there is no situation in which Mummy = Daughter and Mummy = Son are both true, there is no situation in which transitivity requires that Daughter = Son.

In effect, our solution is to take option (iv) above with respect to s_3 and options (ii) and (iii) with respect to s_1 and s_2. By chopping the world up into situations, we are able to offer a fine-grained answer to the puzzle. Furthermore, in s_3 the propositions expressing the identities are not *false* but are neither true nor false. This fits with the view we have taken of the truth of propositions in situations related by parthood. By distinguishing between different situations and giving these situations an appropriate structure we can say what we want to say without contradiction.

Symmetric fusion

A symmetric fusion case is a symmetric fission case in reverse. Imagine two amoebae, called Mum and Dad, which are in a Petri dish in a lab. A new scientific process is being tested whereby two amoebae are fused to make a single amoeba. This exactly parallels the reproduction process, but runs in the other direction. Mum and Dad undergo this procedure at *t* and afterwards there is a single amoeba present which we can call Baby (the left side of which came from Mum and the right side from Dad). Our question is then what identity relations hold in this case. Intuitively, it is obvious that Mum and Dad are not identical. But there is pressure to accept the identities Mum = Baby and Dad = Baby, and so a seeming threat from transitivity. It should be clear by now what our approach will be. In the first place we describe the following situations:

s_4: The history of Mum before *t* and of Baby after t

s_5: The history of Dad before *t* and of Baby after t

s_6: The history of both Mum and Dad before *t* and of Baby after t

Once again, s_6 has as parts s_4 and s_5, but s_4 and s_5 are not parts of each other. Our solution accepts that Mum = Baby in s_4 and Dad = Baby in s_5 but holds that neither of these are true in s_6. Hence there is no situation in which the transitivity of identity requires us to maintain the absurd identity Mum = Dad and yet we can uphold the identity of Baby with each of Mum and Dad in the appropriately restricted situations.

Asymmetric fission and fusion

In the two preceding examples we have had symmetry between the two candidates for identity with a single amoeba: the candidates for identity had exactly the same claims to being the single amoeba. But there are also examples we can furnish where this symmetry isn't present. One asymmetry might just be that one candidate amoeba has slightly more in common with the single amoeba, say 51% of material. If we have more complicated entities, the asymmetry could be of different kinds.

For example, suppose that a teleportation device is created that can transport individuals across the world by scanning the particles that make up an individual and arranging qualitatively identical particles in the same way at a destination. Elizabeth steps into the machine in London and someone (call her Beth) steps out of the machine in Sydney looking exactly like Elizabeth, having all of Elizabeth's memories and character traits and believing that she is Elizabeth. There is good reason to think that Beth is Elizabeth. Imagine, though, that the original particles that enter the machine are still arranged in broadly the same way afterwards: i.e. arranged person-wise. This person, who we shall call Liz, however, has no memory of before she stepped into the machine and has a totally different character. Furthermore, Liz vehemently denies that she is Elizabeth. This is an example of asymmetric fission, because there are reasons for both Beth and Liz to be considered Elizabeth but these reasons are different.

Another example of asymmetric fission is the Ship of Theseus case itself.[3] There we have two things seemingly resulting from one thing and both having good but different

[3] Sider (2001): 145 sees it this way.

grounds for identity with the originator. Our solution to the Ship of Theseus case equally well applies to the Elizabeth/Beth/Liz case.

Asymmetric fusion is also possible. Two entities can have different but competing claims to identity with an entity that exists after their fusion. If we reverse the time in the Elizabeth/Beth/Liz case we end up with exactly such an example. The solutions remain the same; within circumscribed situations the relevant identities hold but they do not hold in the larger situation containing both candidates. The identity of the candidates therefore cannot be derived from transitivity and we avoid absurdity.

Different kinds of thing

Another puzzling case is that of Lumpl and Goliath. Lumpl is a lump of clay and Goliath is a statue of Goliath. A sculptor puts together Lumpl, the lump, at t_1 before moulding it into the shape of a statue at t_2. The statue, Goliath, then exists. After a while, though, the sculptor decides that he would be better off making the clay into cups and saucers (as these are selling well). He therefore squashes the statue down at t_3 and then splits it up at t_4.

Lumpl seems to exist from t_1, the time the clay was brought together. Goliath seems to exist from t_2, the time it was shaped as a statue. Lumpl survives the squashing at t_3 but Goliath doesn't: at t_3 Lumpl exists and Goliath does not. Lumpl ceases to exist at t_4, when the clay is divided. But at t_2 Lumpl and Goliath seem to be the same thing. They occupy the same area and have exactly the same parts, so unless we allow coincident objects they must be identical. When you touch the statue, it seems you are touching only one thing, not two

things. This is the intuitive position, but for most theorists this presents a problem: does Lumpl = Goliath or not? We are able to give a nuanced answer, referring to the following situations:

s_7: The history of the clay from t_1 to t_2

s_8: The history of the clay from t_2 to t_3

s_9: The history of the clay from t_3 to t_4

s_{10}: The history of the clay from t_1 to t_4

It should be obvious that s_{10} has the other situations as parts but they do not overlap. In s_7 and s_9 Goliath does not exist, although Lumpl does. In these situations it is not the case that Lumpl = Goliath: it is neither true nor false that Lumpl = Goliath. In s_8, however, Goliath does exist and is identical to Lumpl. In s_{10} it is neither true nor false that Lumpl = Goliath, for familiar reasons. Once again, we can uphold the intuitive position on the questions of identity, including intuitive confusion on whether or not the identity holds in s_{10} (because the proposition reporting it is neither true nor false there).

Different kinds of thing 2

A variant of the Lumpl and Goliath case is worth attention of its own. Suppose the histories of Lumpl and Goliath are exactly coincident. For example, imagine that the sculptor makes two halves of the statue separately and then joins them at *t.* At *t'* the statue is annihilated by being smashed into many pieces. There will be no difference in careers of

Lumpl and Goliath. But there are still, it seems, differences between the two. Lumpl could survive being reshaped. Goliath could survive the loss of an ear. Lumpl and Goliath seem to have different modal properties. So we are pushed to accept their identity by their coincidence and the fact that they share parts. But we are pushed to deny their identity because of the different possibilities that hold for them.

This case is particularly interesting because the temporal parts theorist isn't able to use their usual tactics to distinguish Lumpl and Goliath. In many of the puzzle cases of material constitution the appeal to temporal parts solves the problem. But here Lumpl and Goliath have all the same temporal parts. They differ in what we might call modal parts (in their relations of trans-world identity). So the fourdimensionalist seems constrained to identify Lumpl and Goliath and explain away their apparent difference in modal properties. An ontology of temporal parts does not, on its own, solve this puzzle case.

Our theory *does* solve this case, however. Recall that situations need not only contain parts of one world. Situations can cut across worlds. Now consider the following situations:

s_{11}: The actual history of the clay from *t* to *t'*

s_{12}: The history of the clay from *t* to *t'* in which it is reshaped

s_{13}: The history of the clay from *t* to *t'* in which it loses an ear

Both s_{12} and s_{13} are non-actual situations, though they will share significant parts with the actual situation s_{11}. In s_{11} Lumpl = Goliath. In s_{12} and s_{13} this is not the case. In these situations it will be neither true nor false that Lumpl = Goliath, as there are situations that are parts of s_{12} and s_{13} where Lumpl = Goliath (the situations describing the period before

the destruction of Goliath and Lumpl respectively) and situations where it isn't true that Lumpl = Goliath (as one or other of them no longer exists).[4]

So in the actual world we can say that Lumpl = Goliath. But we can also say that, *if Lumpl were reshaped*, it wouldn't be the case that Lumpl = Goliath. And, *if Goliath lost an ear*, it wouldn't be the case that Goliath = Lumpl. The italicised phrases make non-actual situations relevant for evaluating the truth of the identity. Because we have modal flexibility in our view of identity we can explain the identity of Lumpl and Goliath in the actual situation s_{11} without denying that there are different situations in which they are not identical.

One plausible way to think about modal properties is that to have a modal property is to have cross-situational identity to entities in non-actual situations which have certain properties, i.e. it is true that x has the property of being able to survive some change *c* iff there is some possible situation in which y survives *c* and x is identical across situations to y. Lumpl in s_{11} has this cross-situational identity to Lumpl in s_{12} and hence could survive reshaping. Goliath in s_{11} does not. Similarly, Goliath in s_{11}, but not Lumpl in s_{11}, is identical to Goliath in s_{13} and hence could survive the loss of an ear.

This might seem to be a violation of the indiscernibility of identicals in s_{11}, but as we said in our previous chapter the situation relevant for evaluating the identity of Lumpl in s_{11} and Lumpl in s_{12} is not s_{11} but $s_{11} + s_{12}$. In this situation it isn't identical to Goliath and so needn't be indiscernible from Goliath. Lumpl and Goliath having different cross-situational identities does not make them discernible *in* s_{11}. So this cross-situational identity and the

[4] Thus the identities will be partially true in s_{12} and s_{13} but fail restricted persistence into these situations from the parts.

variation in modal properties doesn't detract from the fact that, in s_{11}, Lumpl and Goliath are identical.

Undetached and detached parts

There is a puzzle for identity that arises when we consider parts of an entity that are continuous with it. We shall use the example of Tibbles the cat.[5] Tibbles is a normal, happy cat. We can refer to different parts of her, for example by saying, 'Tibbles' whiskers'. Let's refer to all of Tibbles bar her tail with the name Tib. Tib is a part of Tibbles but is not identical to Tibbles; Tib and Tibbles have different properties (e.g. Tibbles has a tail but Tib doesn't). Imagine, though, that at some time *t* Tibbles undergoes a painless and accidental loss of her tail. Her tail is no longer attached to her; it is no longer a part of her. At this point, after *t,* Tibbles and Tib completely coincide. Tibbles does not have any bits that Tib doesn't have. So it might seem that they are identical. But how can they be identical after *t* if they were not identical before *t*? How can two things become one thing?

The central problem here is that Tib seems identical with Tibbles sometimes but not always. Of course, this is something we can capture within the situationalist position. We begin, as usual, by describing some situations:

s_{14}: The history of Tib and of Tibbles before *t*

s_{15}: The history of Tib and of Tibbles after *t*

s_{16}: The history of Tib and of Tibbles before and after *t*

[5] Wiggins (1967) attributes this example to Geach. Another popular version uses Dion and Theon, where Theon is Dion minus a foot.

As before, s_{16} has both s_{14} and s_{15} as parts and s_{14} and s_{15} do not overlap. The challenge of this example is that the identity Tibbles = Tib seems true in s_{15} but not in either s_{14} or s_{16}.

Our picture can accommodate these intuitions. In s_{15} it is true that Tibbles = Tib. In s_{16} it is neither true nor false that Tibbles = Tib because the proposition expressing this fails restricted persistence: there are additional existential situations for Tibbles in s_{16} that are not in s_{15}. In s_{14} it is clearly not the case that Tibbles = Tib; as we have noted above Tibbles and Tib fail the indiscernibility of identicals in s_{14}. So we are able to assert that Tibbles = Tib is true in only s_{15}, not s_{14} or s_{16}.

Although we have shown how the situationalist can generate the truth of Tibbles = Tib in only one of the above situations, we ought to pause for a digression on the exact status of the proposition expressing this identity in s_{14}. As we have said, it is clearly not true. In fact, it seems false. But this would be problematic given what we have said in the previous chapter about the necessity of identity. We said there that identity *is* necessary in the sense that if x = y in some situation *s* then there is no situation in which x = y is *false* (though there may well be situations in which it lacks a truth-value). The situation s_{14} and the identity Tibbles = Tib seem a counterexample to this claim.

To maintain the necessity of identity in the sense described, we need a reason to think that Tibbles = Tib is not false in s_{14} but rather neither true nor false. But Tibbles and Tib seem to be distinct in s_{14}: after all they have different properties! This suggests that Tibbles ≠ Tib and hence that Tibbles = Tib is false.

To provide us with grounds to deny such a claim, consider a further situation which is part of s_{14}:

s_{17}: the history of Tib before t

This situation is the history of the tail-less part of Tibbles before the loss of her tail. We are considering s_{17} by itself, not merely as a part of s_{14}. What is true in s_{17} is independent of its relation to s_{14}. Considered in itself, s_{17} resembles s_{15}. In both there is a tail-less group of organic matter. In s_{15} this is a cat, called Tibbles. I contend that the organic matter in s_{17} is also a cat, and is also Tibbles.[6] Thus Tibbles = Tib in s_{17}; we have found a part of s_{14} where it is true that Tibbles = Tib.

Of course, this identity is not true in s_{14}. It fails restricted persistence as s_{14} contains existential situations for Tibbles that are not in s_{17}; namely situations in which Tibbles has a tail. However, Tibbles = Tib *is* partially true in s_{14}. Now, this doesn't establish that Tibbles = Tib is not false in s_{14}, because there are propositions which are partially true in a situation which are also false in that situation (universal quantification is a case in point). But it might give us pause for thought, and make us ask why, exactly, we want the identity to be false in s_{14}.

We noted above that Tibbles and Tib having different properties motivates the falsity of Tibbles = Tib in s_{14}. This, however, relies on the incorrect interpretation of the contrapositive of the indiscernibility of identicals, as discussed in the previous chapter. To repeat what we have said there: the actual contrapositive of the indiscernibility of identicals is the following: $\forall x \forall y \forall F$ [[Fx $\wedge$ $\neg$Fy] $\rightarrow$ $\neg$[x=y]]. If y doesn't share all x's properties then 'x = y' is not true. So the contrapositive of the indiscernibility of identicals states that an identity

[6] I find this intuitive. But if it is not found intuitive consider the situation that is a part of s_{15} which exactly demarks the organic matter that is Tibbles in s_{15}. This seems analogous to the situation s_{17} in all relevant respects (in fact, if Tibbles's tailless part has not changed, they will be identical), and I take it that the organic matter is Tibbles in that situation. It then seems hard to deny that the organic matter is Tibbles in s_{17}.

cannot be *true* if there is difference in properties, not that the identity is *false*. And this, of course, is consistent with our claim that 'Tibbles = Tib' is neither true nor false in s_{14}.

There might seem something unsatisfying about this; how can it fail to be false in a situation that two things are identical if they have different properties in that situation? Perhaps this will seem less unsatisfying when we consider that such cases only arise when two things are *capable* of being identical, i.e. are identical in some possible situations. If this is still unsatisfying, this may count as a cost of the theory. But for our purposes, at any rate, we hold that a principle stating the distinctness of discernibles does not follow from the indiscernibility of identicals, and so would require an argument.

Thus we hold that the identity of Tib and Tibbles is not false in s_{14}, it merely lacks a truth-value. As we have said above, it also lacks a truth-value in s_{16}. It is true in s_{15}. The case of Tibbles and Tib therefore does not threaten the necessity of identity, and yet we can vindicate the intuition that it is true after *t* but not when considering times before *t.*

Paradoxes of increase and decrease

The paradox of increase takes the following form: suppose an entity undergoes growth by gaining a part; it has *n* parts at *t* and *n*+1 parts at *t*'. We want to allow that this is possible, and hence that the entity with *n* parts is identical to the entity with *n*+1 parts. On the other hand, we want to say that entities are composed of their parts. But there is a worry with these two assertions. In a case of growth the entity at *t* and the entity at *t'* have different parts; they are composed of different things. If things are composed by their parts then there seems to be two different things; if x and y are composed of different parts then

this seems to imply that x and y are distinct entities.[7] In our example, the sum of *n* parts that composes the entity at *t* still exists at *t'*: it is just attached to another thing. How can it be, then, that the entity itself at *t'* is no longer identical to the sum of *n* parts, but rather is identical to the larger sum of parts: *n*+1?

We can rephrase the problem. Let's assume that two objects cannot completely coincide. Therefore the entity before *t* must be identical to the sum of *n* parts; otherwise there would be two coinciding objects: the entity and the sum. But at *t'* the entity is not identical to the sum of *n* parts, as it has gained a part. After *t'*, the entity is identical to the sum of *n*+1 parts. The sum of *n* parts exists at *t'* but it isn't identical to the entity anymore. How is this possible?

The paradox of decrease is exactly the same problem run in reverse: an entity loses a part but stays the same thing. We have, in fact, already discussed an example of this type. Much as the Ship of Theseus case is a version of asymmetric fission, the Tibbles and Tib case is a version of the paradox of decrease. So our answer to the paradox of decrease has already been given above. It can be easily adapted for increase. But, for the sake of completeness, we shall spell out our reply to the paradox of increase.

We accept the possibility that things can be identical in only some situations. Let's consider a concrete example: a village which is originally made up of 25 buildings and in which a new house is completed at *t.* Look at the following situations:

s_{18}: The village up to *t*

s_{19}: The village after *t*

[7] This implication is obvious if composition is identity, but it might also be true even if composition is not identity.

s_{20}: The village before and after *t* (i.e. $s_{18} + s_{19}$)

s_{21}: The pre-existing 25 buildings after *t*

In s_{18} the village is identical to the collection of buildings which compose it at that time.[8] But in s_{19} the village is not identical to this collection as it has gained a building. It is, instead, identical to the collection that includes the extra house. The situation s_{20}, which might seem problematic, is safe because restricted persistence fails and so the identities can be neither true nor false in the composite situation. The village itself is identical across times, as it is self-identical in s_{20}.

There is a worry that the 25 buildings which composed the village before *t* are distinct from it after *t* and hence that in s_{19} it is *false* that the village = the sum of 25 buildings. This would undermine necessity of identity (in the sense already elaborated). However, the village still seems to exist in s_{21}, and the sum of 25 buildings *is* identical to the village there. Furthermore, s_{21} is a part of s_{19}. This motivates the thought that the identity is neither true nor false in s_{19}. If we understand the distinctness of discernibles correctly, it is consistent with this claim.

Thus situationalism provides a parallel solution to the paradox of increase as it does for the paradox of decrease, which we tackled under the banner of detached and undetached parts.

[8] We are assuming that a village is a collection of buildings. Perhaps we should also include people, parish boundaries etc. but for the sake of simplicity we'll stick with the assumption.

The problem of the many

A final puzzle of material constitution to consider is of a slightly different form and will bear a more extended discussion. The problem of the many is a problem about complex material objects falling under a sortal. The usual example given, following Unger,[9] is that of a cloud. The scenario is the following: you look up and there is a single cloud in the sky. From a distance, this much is obvious. However, if we get up close it becomes difficult to say where the cloud ends and the clear sky begins. The cloud is made up of droplets of water. But which droplets make it up? There are a number of equally plausible candidates. As the candidates are equally plausible it seems that either they are all clouds, and hence there are many clouds in the sky, or none of them are clouds, in which case there is no cloud in the sky. But what we know is that there is *one* cloud in the sky and neither option allows us this.

To set this out more formally, we can use the following argument:[10]

(i) There is one and only one cloud in the sky

(ii) Clouds are collections of droplets of water

(iii) There is no collection of droplets of water in the sky that is the best candidate for being a cloud

(iv) If there is no collection of water droplets in the sky that is the best candidate for being a cloud then there is not one and only one collection of water droplets in the sky that is a cloud

(v) There is one and only one collection of droplets of water in the sky that is a cloud

[9] Unger (1980).

[10] This owes some debt to Weatherson (2009).

(from (i) and (ii))

(vi) There is not one and only one collection of droplets of water in the sky that is a cloud (from (iii) and (iv))

We have a contradiction. As with the previous puzzle cases, a plethora of solutions have been offered to this argument. For example, we can deny each of (i) to (iv) (and some of these assumptions are vulnerable for more than one reason). But the central tension is between the obvious fact that there is a single cloud in the sky and the pressure to treat the different collections equitably, and hence avoid brutishness. Let's see if our framework can resolve this tension.

The general tactic we have employed above is to pick some small situation in which the relevant propositions are true, vindicating the intuition that these propositions get things right. We then look at the larger situation in which the truth of these propositions might seem to conflict, and show how such a conflict does not arise. This is because what is true in parts of a situation need not be true in the whole of it. So, to employ this tactic we need to look for the right situations.

There is a single cloud in the sky; this is premise (i) and is assumed for the *reductio*. The problem of the many arises because there are many collections of water droplets that are equally well placed to claim to be that cloud. Call the single cloud in the sky Fluffy. Each collection of droplets is well placed enough that, if there were no other candidates, that collection would constitute Fluffy. So let's begin by looking at situations that contain no more than the candidate collections of water droplets. For each collection that is plausibly a cloud we have a situation corresponding to just those water droplets. If we have collections

$C_1 - C_n$ then we have situations $s_1 - s_n$. There will be overlap between the droplets contained in various situations and some situations will be parts of others. In each situation, a cloud exists. And in each situation, this cloud is Fluffy. In order to get clear on the problem of the many, we need to look closer at these situations.

The situations $s_1 - s_n$ will be one of three types. The majority of situations will be ones which have both a proper part in which Fluffy exists and an extension in which Fluffy exists. In other words, the collection of water droplets corresponding to the situation *has* a proper part which is a candidate to be Fluffy and *is* a proper part of a candidate to be Fluffy. The other two types of situation in the range are those where this is not the case: i.e. the smallest and largest situations which contain candidates for being Fluffy.

Having made these distinctions, I claim that the problem of the many, for the situationalist, is in fact four inter-related problems. We shall deal with them in turn.

The first problem arises when we look at the first type of situation within the $s_1 - s_n$ range. I hold that for every s_m, Fluffy is identical to C_m in s_m. In the situation containing a particular collection of water droplets that is a candidate for being Fluffy, Fluffy = that collection in that situation. This might seem problematic because for some s_x in which Fluffy = C_x there is another collection of particles which is a proper part of C_x which exists in s_x and which is identical to Fluffy in the relevant sub-situation. But when we try and work out why this is a problem it turns out it is just the problem of Tibbles the cat: a paradox of decrease. Remember that in some situation before Tibbles loses her tail there is a proper part of Tibbles (Tib) which exists in the situation and is identical to Tibbles in a sub-situation. But we solved this problem by asserting that Tibbles = Tib is neither true nor false in the larger

situation. Likewise, the identity of Fluffy with some proper part of C_x is neither true nor false in s_x. This problem reduces to the problem of undetached parts (= the paradox of decrease).

The second problem is very similar. It also concerns the first type of situation. We might think it problematic that Fluffy = C_x in s_x when s_x is a part of a larger situation s_y in which Fluffy = C_y and $C_x \neq C_y$. But this is simply a paradox of increase; the village which has a building added is strictly analogous to this scenario. And the same solution applies here: Fluffy = C_x is neither true nor false in the situation s_y. These are both is consistent with the appropriate reading of the distinctness of discernibles.

The third problem is of a slightly different flavour. It concerns the two types of extreme situation from the range $s_1 - s_n$. It is reasonable to ask *which* are the situations that are the smallest containing Fluffy, or *which* are the collections that are the largest to be identical with Fluffy. Identifying these situations seems extremely difficult. The smallest situations containing Fluffy will be ones where the removal of one water droplet would mean that that particular cloud didn't exist. The largest collections are those for which increasing the size of the situation wouldn't change the composition of Fluffy. But these cut-off points seem vague. It is unclear when Fluffy ceases to exist, and it is unclear when an extension of a situation doesn't change Fluffy's composition. Which collections are too small to be Fluffy? And which water droplets are too disconnected to ever be part of Fluffy?

These are difficult questions, and I won't attempt to answer them here. But what I do want to point out is that the third problem is a form of the Sorites paradox.[11] The challenge to determine at which point the removal of a water droplet removes the cloud (or at least *that* cloud) is a classical form of the paradox. The challenge to determine at which point the addition of a water droplet doesn't alter the composition of the cloud is a more abnormal

[11] In particular, it satisfies the definition of a Sorites paradox found in Barnes (1982).

form of the Sorites paradox. But both challenges are Sorites paradoxes none the less.[12] It would be ideal if the situationalist approach was able to explain away Sorites paradoxes, and perhaps this is something to look further into elsewhere. But it is generally accepted that the problem of the many is distinct from Sorites paradoxes. Indeed, they are distinct on our view too (for the Sorites paradoxes only make up part of the problem of the many). But if one of the interrelated problems that constitute the problem of the many is a Sorites paradox, we can avail ourselves of solutions to the latter to solve this aspect of the problem of the many.

So far, we have reduced three problems generated by the problem of the many to problems that can be dealt with separably. The fourth and final aspect of the problem of the many that we shall now consider is the distinctive element, and it will require a situationalist solution. In paradoxes of increase and decrease and in the Sorites paradoxes there are, in a given situation, best candidates for being identity with Fluffy. The former sorts of problem arise from the existence of candidates that are proper parts of each other and the latter from determining when different situations give genuine and distinct candidates. But our last problem is that there may, in fact, be no *best* candidate for Fluffy in a situation. This, I feel, gets to the crux of the problem of the many.

Consider the largest situations in our range $s_1 - s_n$.[13] These are situations of a particular type. Each contains a collection of water droplets which is identical to Fluffy, and every proper part of each fails to contain this collection, and there is no extension of any in which these collections are proper parts of some collection that is identical to Fluffy. The fourth problem arises when there is more than one situation with these properties: i.e.

[12] It is worth being explicit on the reason the second challenge is a Sorites paradox. Take some collection of water droplets that is a cloud. It seems we can add one nearby water droplet to the collection and still have the cloud. But if we keep doing this, we end up with a collection of water droplets that is so dispersed and disconnected that it is clearly not the cloud.

[13] We have to ignore the Sorites worry in order to do so: it is not obvious which situations are in the range.

there is more than one largest candidate for Fluffy. These candidates will overlap but not be identical.[14] For every largest candidate there will be some droplets it shares with other largest candidates and at least one droplet it doesn't share with each other largest candidate. Let's label some such candidate collections C_a and C_b (their corresponding situations will be s_a and s_b).

Here is the problem: imagine a situation which has both s_a and s_b as parts. This could, for example, be the situation containing all of $s_1 - s_n$. Call this situation *S.* The proposition that Fluffy = C_a is true in s_a and the proposition that Fluffy = C_b is true in s_b. So what is true in *S*? Neither C_a nor C_b are parts of one another (unlike the cases of undetached parts), so why should we deny that they are identical to Fluffy in *S*? If Fluffy = C_a and Fluffy = C_b are both true in *S,* then by transitivity $C_a = C_b$ in *S.* But the collections C_a and C_b are clearly not identical in *S* as they are different collections of water droplets. So the collections seem to be both identical and distinct. This is a problem.

It arises because we allowed that C_a and C_b are both identical to Fluffy in *S.* Thankfully, in *S* the collections *aren't* identical to Fluffy. The proposition that Fluffy = C_a fails restricted persistence when moving from s_a to *S* because *S* contains existential situations for Fluffy that aren't in s_a. The situation s_b is precisely such a situation. This means that the identity of the collection of water droplets C_a with Fluffy the cloud is indeterminate in *S*: it is neither true nor false. The same can be said for C_b. *Mutatis mutandis*, this is the case for every largest candidate collection of water droplets. In fact, as every candidate is either one of the largest or a proper part of one of the largest, for *every* collection of water droplets in *S* it is neither true nor false that it is identical to Fluffy.

[14] Strictly, it is not required that they overlap. They will, in fact, overlap in this case of a cloud.

This is the fourth problem that makes up the problem of the many. It is distinctive, and it leads the situationalist to an odd conclusion. Fluffy exists in *S* and is composed of water droplets, but there is no collection of water droplets of which it is true that it is identical to Fluffy. We have left the identity of Fluffy with any of these collections in *S* indeterminate. This might seem strange. In *S* it is true that Fluffy is composed of water droplets but it is not true that Fluffy is composed of any particular collection of water droplets. If this seems strange, though, I believe that the strangeness comes from the example rather than the solution. We have, I think, an intuitive sense that Fluffy's boundary is uncertain. I take it that the indeterminate nature of which collection of water droplets composes Fluffy is what underlies this sense.

So, we have analysed the problem of the many in situational terms as four discrete problems. The first two problems are paradoxes of increase and decrease and the third problem is a Sorites paradox. The fourth problem is distinctive, but is easily solved within the situational framework of restricted persistence. Of these four problems, we have left one – the Sorites paradox – unsolved. Obviously a full solution to the problem of the many requires a solution to the Sorites paradox. But there are a number of different options from which to choose. By reducing the problem of the many to three other problems and one distinctive one, and by solving the irreducible problem, it seems reasonable to claim that the situationalist has solved the problem of the many.[15] Thus I believe that the situationalist deals well with the problem of the many, and that this is another point in her favour.

[15] In fact, of course, we have previously used situationalism to solve the first two problems to which the problem of the many reduces.

Conclusions

In this chapter we have been briefly outlining the ways in which our solution to the problem of change and the Ship of Theseus can be extended to other puzzles over persistence. We have undoubtedly left some stones unturned in our presentation here, which is necessarily cursory. But hopefully we have shown that there is significant potential for the approach we advocate to be generalised to these cases. In building an argument for the metaphysical position that underlies our solutions, this sort of accretion demonstrates the power of our picture and makes it more attractive. Sider, in his *Four-dimensionalism*, suggests that the perdurance account provides 'the best unified theory of the paradoxes of coincidence'. I contend, in contrast, that the situationalist has the best joined-up solutions to these paradoxes, as situationalism solves all of these paradoxes whereas there are at least two paradoxes that the perdurantist needs further work to solve.[16]

I take it, therefore, that the cumulative case presented above will provide significant support for the view of reality that provides these solutions.

[16] Namely the problem of the many and the Lumpl/Goliath case where they coincide for all their existence. The end of the previous section might suggest that the situationalist still has work to do on the Sorites paradox before she can claim to have solved *all* the problems. But this is really a dispute over whether reduction counts as a solution, and either way situationalism is better placed than fourdimensionalism.

Chapter 7- Some consequences of situationalism

In the previous chapters we have explored situationalism. We have seen that it can solve the problem of change while maintaining a robust notion of incompatibility. It can also solve other puzzles over persistence in virtue of the fact that propositions do not always persist across situations. The usefulness of the situationalist theory in this context should lend it support. But we have so far been concerned with what the theory can *do*, not what it says about the world. In this concluding chapter, therefore, we want to ask: what does situationalism *mean*? What consequences does it have?

Some of situationalism's consequences have already come out in our discussion, in a somewhat piecemeal way.[1] Here we want to take a more broad and comprehensive approach. This falls into two parts. In the first we ask what situationalism says about time and times. In the second we ask what consequences situationalism has for the nature of reality more widely.

Part 1- Situationalism and time

In this section I aim to expand on the consequences of the situational view for time. In particular, I want to look at how situations can be used to talk about time. In doing so, we will also be able to reiterate the B-theoretic nature of situationalism, for situationalism rests easily with special relativity while A-theories do not. This is a significant advantage, as our

[1] E.g. the fact that propositions can vary in truth-value and that identities true in some situations don't have to be true in every situation.

best physical theories take time to be relativistic. We begin by introducing a central concept for what follows within a pre-theoretic understanding of space and time. The concept is that of a temporal situation. We shall then show that this concept survives translation into relativity, and in fact thrives in it. We then characterise the concept in purely situation-theoretic terms, which demonstrates that temporal situations are a natural class of situations. Finally, we draw this together to show what it means for the nature of times and of time.

Time and situations: the concept of temporal situations

There is a pre-theoretic idea that the world carves neatly into space and time. This coheres with Newtonian mechanics. There are therefore taken to be *times*, which determine what is the case at every place. Times are slices of the total history of the world along the temporal axis. The events within the temporal slice will all be simultaneous; the slice will be the largest collection of simultaneous events. As simultaneity is reflexive, transitive and symmetric, this collection will be exhaustive: all simultaneous events will be included in the slice.[2] The collection of events that is a slice will be simultaneous with itself and related to all other slices by either being before them or after them. This relation of before and after can either be taken as primitive or else explained further (for example by reference to an entropy gradient).

[2] Strictly speaking this characterisation only works for *instantaneous* events, or *instantaneous parts* of events. Temporally extended events will belong to more than one time-slice of the world history and might not therefore uphold transitivity. In what follows, we understand by 'event' an instantaneous event or an instantaneous part of an event (this correlates with the use of 'event' in relativistic theory).

Now this slice, as we have been informally referring to it, will be a situation. And it will be a situation of a particular type: we shall call these sorts of situation *temporal situations*. They are the situations that correspond to totalities of the way the world is at times. Temporal situations will be maximal in some sense; they will be the largest collections of simultaneous events.[3] There is nothing happening at that time which isn't included in the situation. Temporal situations are special sorts of situation.

We have thus far implicitly been talking about the actual world. But there will be merely possible temporal situations too. This complicates the notion slightly: a temporal situation which is maximal in the relevant sense in the actual world may be only part of a larger situation in some other world (and hence not a temporal situation there). More generally, given we allow situations to be trans-world entities there are some situations whose status as temporal situations depends on the world they are in. Furthermore, space itself might be different in different worlds, so what *places* there are will vary. Given that we are proposing an ontology that gives primacy to situations over worlds, if temporality is to be a natural property of situations it ought not to be world-restricted. But if temporality is not world-restricted then how can one and the same situation be a temporal situation in one world and not in another?

This is a tricky problem, and it has a parallel in the relations between possible worlds.[4] Consider two possible worlds, A and B, where B contains everything in A and some additional material. For example, B is the actual world and A is the actual world with one

[3] Of course, the collection of all actual temporal situations will be maximal in a fuller sense: it will be the actual world. And the collection of all possible temporal situations will be maximal in the fullest sense: it will be the collection of all possible situations.

[4] The parallel is particularly strong for the modal realist. But it can be constructed as a theoretical issue even for an ersatzer if we use two non-actual worlds.

spatial point deleted.[5] Suppose we name the subsection of B without that spatial point B'. Oughtn't we to identify A with B'? After all, they seem qualitatively identical. But we might also want to say that B' is not a world, as it is wholly contained in another world to which it is not identical. If we grant these two plausible claims B' (=A) seems to be a world in one world (itself) but not in another. Being a world is a concept that seems to have maximality built into it, but on the other hand we also want to allow the possibility that worlds can be proper parts of larger worlds.

Our reply to such worries is to contend that situations include the distance relations which the particulars bear to one another in them. So, if the spacetime of some temporal situation *s* is embedded in some larger spacetime in an extension of *s*, *s* will still be maximal in the sense that it is the largest situation that preserves the distance relations that hold in it. The notion of temporality is therefore not world-restricted, but it is restricted by the distance relations that hold in some situation. We mention this issue again in footnote 17, but at the least, even without distance relations, the notion of temporal situations works for *actual* situations. Actual temporal situations will be those situations containing only actual events in which all events are simultaneous, and which do not lack any actual event simultaneous with any of them.

In introducing the notion of a temporal situation we have been using a pre-theoretic notion of space and time. This corresponds to Newtonian mechanics. But we know that Newtonian mechanics is false; relativity requires that we reimagine the notions of space and

[5] If we don't believe the actual world has spatial points, then we can rephrase this in terms of one less primitive distance relation, or one less of whatever it is that underlies space.

time. So in the next section we shall reinterpret the notion of a temporal situation in relativistic terms.

Temporal situations under relativity

Our description of temporal situations within relativistic mechanics will not be drawn out. We will not, for example, give a sketch of the theory of special relativity. We do, however, need to give a little theory to show the framework into which temporal situations need to fit.[6]

What Special Relativity (SR) shows us is that there is no absolute simultaneity and no absolute temporal duration. Whether two events are simultaneous or not depends on the observer. We can introduce the term '*reference-frame*' for the point of view of an observer on some objects and their properties.[7] Simultaneity is therefore relative to a reference-frame. Thus simultaneity is not an objective feature of the world, for "[t]he objective features of the world must be represented by invariant quantities."[8] Duration, the temporal distance between two events, is also dependent on reference-frame and hence not an objective feature of the world either.[9] However, SR does not say that *any* relations of simultaneity, earlier than and later than are relative. There are some event-points (points of spacetime) which *cannot* be simultaneous. Temporal order is determined for event-points

[6] Field theory is the usual setting for relativistic mechanics, and this could be problematic for us as it seems to do away with changeable objects. This is an issue we shall be setting aside.

[7] A reference-frame gives a system of co-ordinates. *Inertial* reference-frames are a key concept in relativistic mechanics; inertial frames are those which are not accelerating. SR tells us that all inertial reference-frames are equal.

[8] Maudlin (2011): 32.

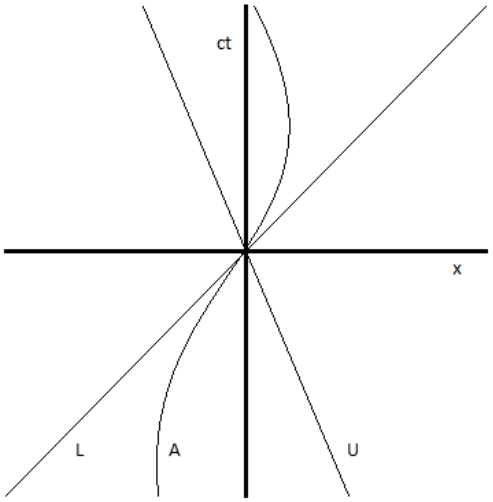
[9] The difference in simultaneity and temporal duration between two frames is quantifiable. It is measured by the equation $t = Dv/c^2$. t is the time interval in frame 2 between the two events which are simultaneous in frame 1, D is the distance between the events in frame 2 and v is the speed with which frame 2 moves with respect to frame 1.

between which travel is possible. If you can get from A to B then A is earlier than B. It is impossible, however, for anything to travel faster than the speed of light: any reference-frame containing super-luminal travel is physically impossible. There are thus event-points between which travel is impossible; these event-points are those which can be simultaneous according to a possible reference-frame. Event-points between which sub-luminal travel is possible are *time-like separated.* Those between which travel is physically impossible are *space-like separated*. Those between which travel at the speed of light is possible are *light-like separated*.

What has this got to do with temporal situations? Well, our Newtonian idea of a temporal situation was one which said for every place what was happening at a time. Or, equivalently, temporal situations are collections of all simultaneous events. Under Newtonian mechanics there is an objective fact about which events are simultaneous. But under SR there is not; whether or not two events are simultaneous depends on the reference-frame. Furthermore, relativity tells us that different references frames divide the 4-dimensional spacetime differently into space and time. So the characterisation of temporal situations we have given doesn't work in relativistic mechanics. But we can rehabilitate the notion. To do so it will be helpful to use *Minkowski spacetime diagrams*, so we shall briefly introduce these first.

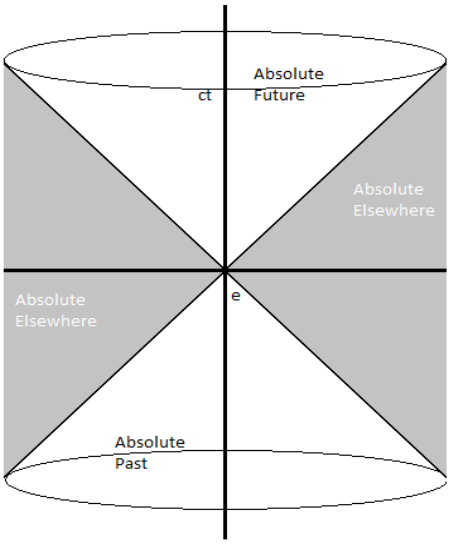
Minkowski spacetime diagrams (also just called Minkowski diagrams) are ways of displaying the relations between event-points of a spacetime which obeys SR. At least one, often two, of the spatial dimensions is suppressed so that it resembles a graph. We can choose the temporal axis to be the vertical, and it is conventional to adopt units for time in

which *c* is 1 in order to simplify the resulting depictions (though this is solely a matter of choice of units). We thus label the vertical axis *ct*. Given this, light will trace a 45° angle between the two axes. An object travelling without accelerating traces a straight line on the diagram. An object undergoing an acceleration traces a curved line on the diagram. The tracing of a path by an object is known as that object's *worldline.* The worldlines for a beam of light (L), an object travelling with uniform velocity (U) and an object travelling with accelerated velocity (A) through a common point are shown on the diagram below:



These diagrams can give us visual analogues for the different possible separations between event-points. We have seen that a beam of light will travel at 45° (because the temporal axis is *ct*). If we depict all possible directions that light could pass through an event-point *e* we end up with that point's *light cone*. These are the event-points that are light-like separated from *e*. On our 2 dimensional representations, this will simply be two lines at 45° passing through the point. If we allow a 3 dimensional representation, this will appear as a conical shape expanding out either side of the point (hence the name).

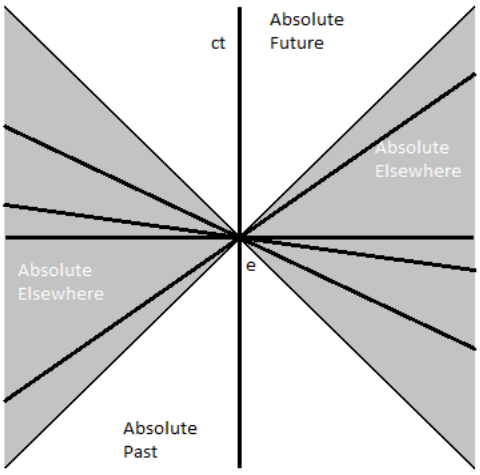
There are regions of spacetime on *e*'s light cone, regions within the cone and regions outside it. The regions within it are those that are time-like separated from *e*. They and the regions on the light cone are the places that are possibly causally connected with that point. Those in the backwards light cone are the event-points that could have caused an event at *e* and those in the forward light cone are the event-points that could be caused by an event at *e*. Outside the light cone, no causal interaction is possible. It is in this area that different reference-frames will consider different event-points simultaneous with *e*. The titles of these areas are given in the following quasi-3D diagram:



We can use such a diagram to make clear the above claim that any two events which are possibly causally connected will have a determined order. No matter what our reference-frame (i.e. how we divide spacetime into spatial and temporal axes), the shape of the light cone is invariant. For any two events which are possibly causally connected, therefore, one will be in the Absolute Future of the other and the latter will be in the Absolute Past of the former. Location within, on or outside the light cone is independent of reference-frame.

Now that we have introduced Minkowski diagrams, we can use them to get a handle on what temporal situations should look like under SR. Recall that a worldline traces the path of an entity across a time-like direction (or a light-like direction if it travels at *c*). We want the converse of this; something that traces a three-dimensional path across the space-like directions. On a Minkowski diagram it should go through the focal event-point *e* and extend in all directions into the absolute elsewhere of *e*. On a 2D Minkowski diagram this will be represented by a line. On a 3D Minkowski diagram this will be represented as a plane. Such a plane is called a *hyperplane of the present*.[10]

Of course, just as there is more than one worldline going through an event-point, there is more than one hyperplane of the present going through *e*:



[10] What we have said does not preclude curved hypersurfaces, which will be akin to the worldlines of accelerating objects. Such curved hypersurfaces would describe a region of space for an accelerating object. However, we shall be considering hypersurfaces correlated to inertial reference-frames, and hence these hypersurfaces will be flat.

Each of these lines represents a possible way of carving up spacetime. The hyperplanes on a 2D diagram are alternatives to the spatial axis, alternatives which arise from different reference-frames. Each hyperplane will be the collection of all event-points simultaneous with *e* in a certain reference-frame.

However, not just any hyperplane passing through *e* is admissible. For any line which is at an angle of greater than or equal to 45° to the spatial axis would be describing a space that is possibly causally connected. There would then be two points on the line which were not in one another's absolute elsewhere. Such a line describes two event-points that cannot be legitimately regarded as simultaneous, and it describes an impossible division of spacetime into space and time. There is no physically possible reference-frame that corresponds to such a hyperplane. So we have a restriction on what planes are possible hyperplanes of the present.

We have said that each hyperplane will include all event-points simultaneous with *e* according to a certain frame. That reference-frame will provide a division of spacetime into space and time, and the hyperplane will say for such a division what is happening at every point of space when *e* occurs. Thus, in SR, hyperplanes are doing the work of slices of the world history in Newtonian mechanics. In relativistic mechanics, then, we should be looking at hyperplanes to furnish us with a concept of temporal situations. Hyperplanes are collections of event-points that will correlate with temporal situations.[11] There will be a situation that describes what is happening at each of the event-points on any hyperplane. This situation will contain all events that are simultaneous *according to a particular*

[11] The nature of this correlation is something we shall discuss below, under the section entitled 'What this means for time and times'.

reference-frame and will say for every point of space, *according to the way that reference-frame divides space and time*, what is the case there. Thus the notion of a temporal situation that we derived from a pre-theoretic understanding of time can be rehabilitated to include relativity to a reference-frame.

What relativity tells us, in fact, is that every point in spacetime is contained in a number of temporal situations. Newtonian mechanics mistakenly assumes that each spacetime point is a member of one and only one temporal situation. By revising our idea of simultaneity so that it takes account of reference-frames we can keep the core of the concept of a temporal situation. The resulting conception fits with special relativity. This very flexibility of the concept of a temporal situation allows us to make a clear break between situationalism and A-theoretic views of time. This distinction is worth a brief digression.

Interlude underlining the B-theoretic credentials of situationalism

Although I hope that the situationalist theory I present has seemed plausibly B-theoretic up to this point, the temporal situation material we've been discussing gives us a neat way of emphasising the difference between situationalism and the A-theory of time. The A-theory is committed to the idea that there is something metaphysically special about the present time. One natural way to extend this is to give the metaphysical specialness some ontological content. Thus we might be presentists, who think that only presently existing things exist.[12] But however we choose to elaborate on the metaphysical specialness of 'now', the A-theory need a particular slice of the spacetime manifold to correspond to 'now'. Some part of spacetime is privileged.

[12] Or we might be growing block theorists (e.g. C. D. Broad) who take it that only past and present things exist.

The part of spacetime that is privileged will be a time: in SR it will presumably have to be a hyperplane of the present. What's going on at that hyperplane will be described by a particular temporal situation. Here the distinction between situationalism and the A-theory becomes apparent. The A-theorist must say that one temporal situation is somehow special. One temporal situation more naturally carves nature at its joints so that *that* temporal situation corresponds to the actual present time. It is the things that exist in *that* temporal situation that exist (if we are presentists). This notion of a privileged temporal situation is the source of a major argument against the A-theory, as it is extremely difficult to see how to generate such privilege within SR. Situationalism, by contrast, is committed to no such position. All the possible temporal situations for some point of spacetime are ontologically and metaphysically on a par. None is special. What is true is different in these different situations, but there is no priority between the claims of any temporal situation. Situationalism therefore coheres well with SR.

So, we have seen that temporal situations give us a way to characterise the difference between situationalism and an A-theory position. But we have so far relied on the language and tools of relativity to pick out the situations which are temporal: they are the ones corresponding to hyperplanes of the present. What we shall do next is remove this scaffolding. We intend to show that temporal situations are a natural class of situations within situation theory, regardless of the precise claims of special relativity. To do so, we will come up with a characterisation of temporal situations that is independent of our physical theories. This characterisation should take a form that means that, if we were to accept SR, it would fall out that temporal situations are correlated with hyperplanes.

Temporal situations in situation theory

In this part of the chapter, we intend to analyse what it is for a situation to be a temporal situation using the tools of situation theory. This analysis will then explain what the connection is between temporal situations in SR and hyperplanes of the present. This would show that there are natural distinctions within situation theory that lend themselves to describing time.

The notion of maximality is key to temporal situations. As we have said, they determine what is the case at every place (given a certain carving of 4-dimensional spacetime into space and time). It is this idea of maximality that we shall draw on when finding a situation-theoretic account of temporal situations. The notion of maximality is not simply that of sheer number of true propositions: there are some complex propositions (e.g. those employing universal quantification) which are true in smaller situations and false in larger ones. So we shall use atomic propositions, and assert that temporal situations, broadly, are those that have the largest number of true atomic propositions.

Two features of temporal situations spring to mind. Firstly, the atomic propositions which are true in them are all *independent* of each other; they do not depend on each other for their truth.[13] Secondly, no atomic propositions seem *merely partially* true in them, i.e. atomic propositions which are true in a part of temporal situation seem to be true in the whole temporal situation. By contrast, trans-temporal situations are ones which contain parts which do rely on each other and will have atomic propositions merely partially true in them.

[13] Except for some that are necessarily connected: e.g. the proposition 'Fred is a bachelor' is not independent of the proposition 'Fred is male'. See pp. 95-96 for our definitions of logical equivalence and logical consequence.

We might be encouraged to claim that temporal situations are the largest ones with have one or both of these features.[14] But although this might seem to neatly characterise temporal situations, it is not *quite* accurate. We allow the metaphysical possibility of time-travelling enduring particulars. A temporal situation which contains such a time-traveller will not display these two features. There will atomic propositions that counterfactually depend on one another in such a temporal situation, for if we alter the propositions about the younger version of the time-traveller we will alter propositions about the older version. There will also be atomic propositions that are merely partially true, namely those propositions describing properties that the time-traveller has at one spatial location but not the other. So our first thoughts aren't quite right.

The metaphysical possibility of time-travel (and its arguable physical possibility)[15] makes it more difficult to find necessary and sufficient conditions for a situation to be a temporal situation. But we can still find such conditions, though they don't look as elegant. The definition will rely on a couple of notions. In the first place, we have the logically possible extensions of a situation *s.* These are simply the logically possible situations of which *s* is a part. Secondly, we will be using the idea that propositions can be neither true nor false in situations containing parts in which they are true and parts in which they are false. The third idea is that any trans-temporal situation will contain at least one atomic proposition which is neither true nor false for this very reason.[16] With this case in mind, therefore, we offer the following definition:

[14] Obviously if these features have the same extension then either would do equally well. If they come apart we'd need to pick one, or stipulate that situations need to display both.

[15] See Arntzenius and Maudlin (2010) for discussion of the physical possibility of time-travel.

[16] This claim falls out the individuation of situations. Suppose time passes but nothing changes. Then the temporal situation describing the first time will be qualitatively identical to the temporal situation describing the second time. But, for situations, qualitative identity entails numerical identity, hence the temporal situations will be identical. A situation therefore cannot be trans-temporal without including some change. We

Temporal situation

A situation *s* is a temporal situation iff i) there is no possible extension *s'* of *s* in which all atomic propositions true in *s* are true in *s'* ii) *s* has no proper part in which (i) is the case.

In other words, a temporal situation is a *smallest* situation to which nothing can be added without losing the truth of some atomic proposition. The balance this definition achieves is between the maximality indicated by (i) and the minimality indicated by (ii). A temporal situation is maximal in the sense that no larger set of propositions including all its true atomic propositions is consistent but minimal in the sense that it is the smallest situation of which this is true.[17] It's worth pointing out precisely how this deals with the time-travel case.

In a case of time-travel, an enduring object is multiply spatially located. We want the temporal situation, therefore, to contain the entire enduring object in all its spatial locations. Both the older and younger object (according to its personal times) should be included in

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might also be encouraged to think that time cannot pass without change, though this relies on a controversial connection between temporal situations and times (see the next section).

[17] We should digress at this point to head off a couple of potential objections. We mentioned above that any situation *s* includes the distance relations which the particulars in *s* bear to one another. This removes two worries. The first is that there is a logically possible situation which contains everything in a temporal situation *s* plus some discrete situation far in the absolute past or future of *s*. This situation might be causally disconnected from anything going on in *s* (the absolute past and future of an event-point are only *possibly* causally connected to it). It seems that a temporal situation will then fail condition (i). Our stipulation of distance relations, however, rules this out as a counterexample, as the disconnected situation will be in the same *place* as something in *s*, and hence generate incompatible distance relations. Some atomic propositions will then lose truth-value.

The second worry is the one touched on above in the discussion of temporal situations in Newtonian mechanics: *s*'s spacetime might be embedded in some larger spacetime in an extension of *s*, and hence all the atomic propositions true in *s* will be true in this extension of *s*. The temporal situation *s* will then fail condition (i). But if distance relations are included in *s* then not all the propositions true in *s* will be true in an extension of *s* with a larger spacetime: the atomic propositions about distance relations will no longer be true.

If it seems implausible that situations include distance relations then we can achieve much the same result if we use physically possible extensions rather than logically possible extensions of *s* and include spacetime structure as a constraint of what is physically possible.

the temporal situation. This is intuitive: we want the temporal situation to contain everything that's happening at that time. We have an intuitive idea of which situation should be the temporal situation. Let's see if it uniquely satisfies the definition we've given.

The first condition states that there is no extension of the situation in which all the atomic propositions true in it are true. This is satisfied by our temporal situation in the same way that it is by all other temporal situations: any extension will include something which renders a proposition merely partially true. The second condition might seem more troublesome, for there are parts of the temporal situation whose extensions do indeed lose some truths for atomic propositions, namely the situations containing everything but the older time-traveller and everything but the younger time-traveller. Take the situation which is intuitively the temporal situation. This situation has a part, which contains everything but the older time-traveller. The latter situation has an extension in which some atomic propositions true in it (e.g. about the properties of the younger time-traveller) are merely partially true. So it might seem that we do not deal with the time-travel case after all.

However, the key to resolving this issue is the recognition that it is not *necessary* that the object time-travel and hence be multiply located. So the part of the temporal situation that contains everything except for one of the instances of the object will have extensions in which some further propositions are true without some atomic proposition losing truth-value. For there will be extensions in which the second instance of the object doesn't occur. There will be extensions, for example, in which some other particular exists and has some properties. The situation which is such an extension will be one in which all the propositions true in the part are true in the whole, and in which there are additional propositions true.

The temporal situation is the only one in which *all* extensions require some loss of truth-value.

Thus we have found a definition for temporal situations using only situation-theoretic terms. The temporal situations we have defined will map neatly onto the hyperplanes of the present. For each temporal situation there will be one hyperplane of the present, and this will be the hyperplane containing all the event-points where the particulars in the temporal situation exist and have the properties the temporal situation ascribes them. This vindicates the idea that situations can fruitfully describe time, and encourages us to draw some conclusions. In the final section of this part of the chapter, this is exactly what we shall do.

What this says about times and time

So, we have the notion of a temporal situation and we have a definition of this notion using situation-theoretic machinery. There are still a number of questions we have not discussed that pertain to temporal situations. One of the most interesting is the relation between temporal situations and times. Our choice of language already anticipates some sort of connection. Our best route to answering this question begins, however, with a detour to consider the relationship between times and hyperplanes of the present.

Hyperplanes of the present are collections of event-points. So far we have simply said that event-points are points of spacetime. But collections of event-points can also be considered as places where things can happen. Or, more precisely, we can think of an event-

point as the smallest possible location of a physically possible situation.[18] One plausible thought is that times are to be identified with hyperplanes of the present. For a given reference-frame, the hyperplanes of the present will be stacked on top of one another, like times. They cover all of spacetime, and are definitively ordered by a B-series relation of earlier-than or later-than. Furthermore, they have the same modal flexibility: different things could have happened at some time and different things could have happened in some hyperplane (because hyperplanes are collections of event-points; they are collections of locations of physically possible situations). It seems reasonable to identify hyperplanes of the present with times.[19] This identity implies, therefore, that the relationship between temporal situations and times is simply the relationship between temporal situations and hyperplanes.

So, what is the relationship between temporal situations and hyperplanes of the present? We have taken it for granted above that there is some connection between temporal situations and hyperplanes of the present. In fact, we suggested that temporal situations are those that describe what is happening in regions of spacetime that are hyperplanes. But here we should work without this assumption, and simply consider how some natural class of situations is related to a natural class of regions of spacetime. A first idea might be that they, too, are identical; temporal situations just are the hyperplanes of the present. But this can't be right. In the first place, they are different sorts of thing. A temporal situation is a situation, whereas a hyperplane of the present is a collection of

[18] The location of a situation is understood here as the place where the constituents of a situation make true the propositions which are true in that situation and make false the propositions which are false in that situation.

[19] Cian Dorr has suggested in conversation a couple of reasons we might be cautious about such an identification. In the first place, we might think that every time must be either before or after every other time. But it seems to me that this is exactly what relativity has shown to be false. Secondly, we might want space-like curved hypersurfaces to count as times as well as hyperplanes of the present. I agree, and so allow such hypersurfaces to count as times, although I work with hyperplanes for the sake of simplicity.

event-points. Secondly, situations have such stringent identity conditions that they could not be other than they are. Hyperplanes of the present, by contrast, are individuated by the event-points of spacetime that they contain. These event-points are the locations of physically possible situations: different things can happen at them. The modal profiles of hyperplanes and temporal situations are different. More than one temporal situation will correspond to each hyperplane. Will each temporal situation correspond to exactly one hyperplane? This also might not be so: if the same temporal situation can occur at more than one time (perhaps in different worlds) then this situation will not be correlated with a single hyperplane.[20]

However, the *actual* temporal situations for a given reference-frame will be what is *actually* happening in the hyperplanes for that frame. And given a reference-frame and a point, there will be a unique actual temporal situation which will be what actually happens at the unique hyperplane of the present that the reference-frame and point determine. So hyperplanes can be identified by actual temporal situations, if not with them. In the final paragraphs of this part of the chapter I wish to be a bit more speculative; can we reduce hyperplanes to situations in some way, and is *time* susceptible to the same treatment?

We have talked of hyperplanes as collections of event-points, which indeed they are. These event-points are understood as the smallest location for some situation. A collection of event-points, therefore, will be a collection of smallest places that contain the constituents of situations, related so as to make true and false all the propositions that are true and false in the situations. Now, we might be happy with an irreducible notion of 'place'. But we might prefer to try and reduce location to some more basic ingredients. One

[20] If time can pass without change, then even one actual temporal situation can correspond to more than one hyperplane. For reasons given in footnote **[??]** above we reject this possibility.

controversial way of doing this would be to identify places by the things that can happen at them. An event-point is then simply the events that can happen there. In our situational terms, an event-point is the collection of situations that can be located there.[21] A hyperplane, therefore, which is a collection of event-points, will be a collection of situations that could obtain in that region. More generally, regions of spacetime will be identified with collections of possible situations that could occur at them.

If we accept this controversial move, what would it tell us? In order for regions of spacetime to be distinguishable, there would need to be different collections of possible situations corresponding to them. What is possibly the case would need to be different in different places for this position to be tenable; otherwise all regions of spacetime would become identical. We can, perhaps, soothe the idea that this imputes bizarre modal properties to regions of spacetime by identifying only some sub-group of the situations possible in a region to be identical to it. The contender I have in mind is the collection of situations which are physically possible for some region of spacetime, given the previously occurring situations. Hence there is some conditional element that governs the grouping of situations into spacetime regions: a region of spacetime is identical to a collection of situations that are physically possible for it given the previous history of the world.[22] If the forgoing is correct, situations, and temporal situations in particular, are not only a tool for understanding time; they are times.

The final point to consider is what the relationship is between times and time. If it is simply a mereological one – if time is the mereological fusion of all times – then time will be

[21] This collection might itself be a situation: spatio-temporal locations would then be special sorts of situation. I'm unconvinced that this further step is either necessary or helpful, however.

[22] Sometimes 'physical possibility' is used to mean exactly this: what is possible given the previous states of the world. Up to now, however, we have used it in a time-independent sense, so that what is physically possible doesn't depends on what's happened (i.e. it is physically possible that the history of the world is different).

all the physically possible ways things could be, and all the possible relations between these ways. If time is a type of which times are tokens, then time is a type of situation (presumably the type 'temporal'). But whatever one's view of the relation between times and time, with the above view of times we can provide a correlate concept of time.

The speculations above may go too far. But showing that, with situations or their constituents as our primitives, we can give an account of spacetime and relativity is, in itself, a demonstration of the power of situation theory in understanding time.

Part 2- Situationalism and reality

In the coming sections, we shall investigate some of the broader consequences of situationalism for the nature of reality. We shall begin by contrasting it with two similar theories: adverbialism and the SOFism of Haslanger (2003). After this, we shall investigate situationalism more deeply, and draw on Fine (2005) to flesh out its commitments.

Situationalism and adverbialism

As we noted back in Chapter 4 when discussing the situationalist's precise solution to Problem 1, situationalism bears a resemblance to adverbialism. The resemblance is in the fact that both adverbialism and situationalism qualify the instantiation of properties by objects. The 'having' of properties is relative to times. The different varieties of adverbialism parse this qualification differently, but each of them contends that the relation between a property and the object having it is in some sense irreducibly temporal. In a sentence of the

form ‘A is *F* at *t*’, adverbialism attaches the temporal reference to the copula. Some of the locutions that are used to convey this somewhat obscure notion are: ‘A is *t*ly F’, ‘A is-at-*t* F’, ‘A is *F* in a *t* way’. Adverbialism was an overlooked alternative in Lewis’ first taxonomy of the possible solutions to the problem of change.

Situationalism isn’t adverbialism. It doesn’t hold that the instantiation relation is irreducibly temporal. But what is does say is that whether an object has a property or not depends on the situation we are talking about. The having of properties is situation-relative. In a situation, an object has a property *simpliciter*. But objects only have properties relative to situations. The adverbialist treats the relation between properties and objects as involving, somehow, the time at which the object has the property. The situationalist claims that the relations between properties and objects involve situations as the parts of reality in which the relations hold. The adverbialist is often criticised for not giving space for an object to *just have* a property, or to have a property *simpliciter*. On the situationalist view, this fundamental relation is maintained, albeit within situations. What is ruled out is an object having a property not within a situation, what we might call asituational instantiation.

The fact that objects have properties only in situations parallels the fact that propositions only have truth-values in situations. On the situationalist picture, there is no more to be said than which objects have which properties and relations in which situations.[23] Likewise, there is no more to be said than that propositions have certain truth-values in certain situations. All instantiation is instantiation in a situation.

[23] This would complete the ‘book of the world’, if we are to use such an analogy.

Situationalism and SOFism

In her survey of persistence over time, Sally Haslanger (2005) introduces a term 'SOFism', which is an abbreviation of 'state-of-'fairs-ism'. This term is a description of a theory that has strong parallels with situationalism (and adverbialism), and it is presented as an extension of Forbes (1987). It relies on token and types of states of affairs and an Austinian notion of the truth of propositions as the correspondence of a token state of affairs with a type of state of affairs. The best way of describing the position is in Haslanger's own words. She summarises it as follows:

> "[T]he SOFist account of change seems to be this: There are enduring things which are wholly present in token states of affairs obtaining at different times (endurantism); in states of affairs such as the candle's being straight and the candle's being bent, the properties *being straight* and *being bent* are qualities of the candle (not relations to times); and these properties are incompatible. There is no contradiction because the two states of affairs types involving incompatible properties (*the candle's being bent* and *the candle's being straight*) don't have tokens at the same time."[24]

What a proposition does is assert that a token state of affairs is of a certain type, and nothing more. All propositions, therefore, only assert this relation between token and type. Haslanger's SOFist account is interesting, and was a starting point for my development of situationalism. There are a number of connections between SOFism and situationalism. It is

[24] Haslanger (2003): 345-6.

worth point out, though, that Haslanger offers only a sketch of SOFism, so it is not entirely clear what the degree of overlap will be.

Despite this caveat, we can note some key differences. Haslanger is keen to point out that SOFism includes an eternalist view of propositions, though a temporalist view of statements. Statements change in truth-value over time, but propositions do not: the proposition that some state of affairs is a certain type is a fixed matter.[25] The direction we took the Austinian insight, however, was more dramatic. We held that propositions can be true in some situations (≈ Haslanger's states of affairs) but not in others. Propositions therefore can and do vary in truth-value over time according to situationalism (and, of course, vary along other vectors too).

A second important difference follows on from this. According to SOFism, a proposition is simply true or false. Thus a pair of propositions expressing a change in an object are both true. The contradiction is avoided, as Haslanger effectively says above, because the truth of the propositions is not incompatible. The states of affairs *types* are incompatible, as they cannot both obtain at a time, but the *tokens* are not incompatible; they both obtain. The propositions are likewise not incompatible. It is *always* true that some token state of affairs is of a certain type. For the situationalist, by contrast, the propositions expressing a change *are* incompatible. They cannot both be true in any situation. They are, in fact, neither true nor false in situations which contain parts in which they are both true. So, for example, the situation which is the actual world will not give truth-values to propositions which jointly describe an actual change.

[25] Haslanger is concerned to emphasise this to respond to Lewis (2002), which criticises her (1989) on that basis. The status of proposition and statements is the other way round on our view.

SOFism also has a two-fold predication structure. The first level of this is the predication of some object that it has some property. This is what occurs in a type of state of affairs, and is, in Haslanger's words, "as close as one gets in the SOFist picture to 'just having' or *having simpliciter*."[26] The second is the obtaining of this type in virtue of the obtaining of a token state of affairs. It is this second predication which is temporally relativised. The obtaining of the token state of affairs occurs at times. The complication of instantiation is a primary source of objection to adverbialism and to SOFism. Situationalism, by contrast, has only one level of predication. It is the first of the SOFist's: an object ('just') having a property. Situationalism therefore is not vulnerable to objections based on *just having*.

A further interesting contrast emerges when we ask what SOFism precisely says about the way the world is in a case of change. We shall need to develop SOFism somewhat to bring this out. SOFism holds that there are tokens of incompatible types which obtain at different times: this much is clear. So in a case of a poker changing in temperature, we have instantiation of the state of affairs type *the poker's being hot* at one time and the instantiation of *the poker's being cold* at another. It might seem natural to infer therefore that the poker itself is hot at one time and cold at the other. If we allow this inference it becomes unclear how this position is supposed to deal with the problem of change. The distinctive part of SOFism is the fact that the token states of affairs are not incompatible while the types are. If the SOFist allows that the poker itself bears the properties hot and cold then how does she avoid the problems outlined in Chapter 1?

[26] Haslanger *op. cit.*: 346. SOFism is therefore committed to the existence of types of states of affairs, which are presumably abstract objects. Situationalism doesn't have this commitment.

Of course, this might be blocked in various ways (e.g. by claiming that states of affairs are ontological primitives). But I take it that the most plausible way of accounting for the failure of the inference according to SOFism is that "*what is the case* depends on the time under consideration"[27]. So 'what is the case' varies in a metaphysically significant way depending on the time we are considering. If this is to be more than simply banal, and if it is to avoid the inferences suggested above, it seems to suggest that time enters in an important way into the description of the world. One way this could be the case would be if we were A-theorists. But SOFism is supposed to be B-theoretic, so needs to explain why 'what is the case' is temporally loaded. Situationalism has an explanation for this: the relation between the world and its parts is complicated (and hence there is not universal persistence). SOFism still owes us an account of *why*, exactly, what is the case is different from time to time. If times are metaphysically on a par, what is the nature of this difference?

Situationalism, though, does have some consequences that SOFism does not. Because it allows that propositions can lack truth-value in extensions of situations in which they do have truth-values we are committed to the denial of universal persistence. What is true in some portion of the world is not true in all of it. This is a more significant assertion than it first appears. The parts of the world disagree in a fundamental and irreconcilable way. The world as a whole, therefore, isn't the simple sum of its parts. This leads us into the substantive metaphysical claims of situationalism.

[27] *Ibid.*: 342-3. The italics are hers.

The underlying picture: what does it *mean*?

Now we come directly to the metaphysical consequences of situationalism. First let's remind ourselves of the terrain in which we locate out theory. Situationalism is a theory of B-theory eternalist endurance. All times are metaphysically and ontologically on a par, and objects are fully present whenever they exist. The other theories of persistence have ontological and metaphysical commitments.[28] What are the situationalist's?

Situationalism holds that propositions can be true in part of a situation and not in the whole of that situation. Furthermore, two contradictory propositions can both be partially true in a situation. This can occur when restricted persistence fails. Change cases are such cases. So, a consequence of the solution we are proposing is that when things change the propositions which characterise them before and after a change are neither true nor false in situations which contain the change.

It is worth mentioning the sheer number of propositions and situations that are affected by the restriction to persistence. Consider a proposition *p* about an object O and a situation *s* in which it is true. Ours is a theory of endurance, so objects are fully present whenever they exist. Thus, if an object persists and changes in a situation, that situation will contain more than one existential situation for that object. And because of this, propositions that pick out that object will not automatically persist into such a situation.[29] So *p* will not automatically persist into any *s'* in which O persists and changes. If O *doesn't* change in *s', p*

[28] The presentist has a restricted ontology, the perdurantist takes objects to have temporal parts, the relational properties theorist considers properties to be relative to times and the adverbialist tinkers with instantiation.

[29] Recall that persistence here relates to the truth of a proposition in an extension of a situation in which it is true, rather than continued existence over time

will persist; there is no additional existential situation.[30] But as soon a situation is one in which O changes, all propositions about O will not automatically persist into it. On a practical level, given that objects change a great deal, this means that propositions about persisting objects rarely satisfy restricted persistence.

The particular restriction is a condition whereby whenever a particular changes at all any situation containing its previous and later states is one into which propositions about the particular don't have to be persistent. This might seem too strict, but it is a consequence of the view.[31] It is not quite as unpalatable as it seems. If a particular (usually an object) *changes* it is not going to be the same afterwards. So we ought not to assume that things that were true of it before will be true of it afterwards. Of course, they may be true. But they might not be. It shouldn't be the place of a formal theory of the relations of situations to determine whether these things are true or not. We need to investigate the situation itself and see what its contents are. Unless we are willing to make our restriction one that specifies the contents of situations into which propositions are persistent (and hence make it vacuous, see pp. 121-122), this is something we have to accept. But it doesn't seem as bad as it first appeared. All it is saying is that we can't assume that the same things are true after a change as they were before: this seems reasonable enough.

The propositions, of course, are still true in the smaller situations in which there is not a relevant change. The smaller situations are not affected by the restricted persistence. Restricted persistence governs inferences from the truth of proposition in situations to the truth of propositions in extensions of those situations. The relation between situations and

[30] Unless, of course, there is some other particular that *p* picks out that does have an additional existential situation in *s**.

[31] We touched on this issue above in Chapter 4, pp. 121-124.

their extensions is what is really revolutionary in the situationalist solution: it is what undergirds the project.

For situationalism, what is true in smaller parts of reality is more important than what is true in larger parts of reality. Situations are more primitive than worlds; this is a central tenet of situation theory. The situationalist claims that the primitive nature of situations also means they are more important than worlds. But we can see this as a specific case of a more general principle: smaller situations are more fundamental than larger ones. Take a proposition *p.* This proposition is true in any minimal situation that *p.* It is also true in any situation that has a minimal situation that *p* as a part that passes the condition of restricted persistence. It may also be true in a situation that fails the condition. It is at least partially true in any situation that has as a part a minimal situation that *p.* But *p* is always true in a situation in virtue of being true in a minimal situation that *p.* There is no situation in which *p* is true that doesn't have a minimal situation that *p* as a part: this follows deductively. Minimal situations are the bedrock of truth, and hence the bedrock of the metaphysics.

Depending on the proposition, of course, minimal situations can vary a great deal in size. But the underlying point remains the same; it is the smaller chunks of reality that are important and the larger chunks of reality rely upon them. In fact, the larger a situation gets the more likely it is that some proposition that was previously true will become only partially true.[32]

[32] We might think that the larger a situation gets the more truth it contains. To an extent this is true; adding an additional entity into a situation will make further propositions true in that situation. But adding additional temporal or modal parts to a situation may well result in a loss of truth. This underpins the notion of maximality that we earlier applied to temporal situations.

This metaphysical position suggests that reality is in parts in a radical and dramatic way. Propositions are never true *simpliciter*; they are always true relative to a situation.[33] And truth in a situation depends on truth in a minimal situation. Propositions are only true relative to a situation because *what is the case* is also a relative notion. There is a sense in which what is the case obviously depends on the situation we are talking about. In different parts of reality different things are the case. But, like the SOFist above, the situationalist is making a more contentious claim. The claim is not just that there is variation across different situations, but that the minimal situations are basic and that *some of these situations contradict*. The radical element of the solution is that reality fundamentally contradicts.

There are actual situations in which some proposition *p* is true and actual situations where some proposition *q* is true where *q* is the negation of *p.* There are thus some actual situations in which *p* is false. Actuality (or, if you prefer, the actual world) contains minimal situations for propositions that contradict. The contradictory propositions are not *true* in the actual world, as they fail restricted persistence. But the actual world contains situations in which they are true. Remember that the picture we are presenting is *B-theoretic*, so all temporal situations are metaphysically on a par. The actual situations in which *p* is true and the actual situations in which *q* are true are equally primitive. It seems we have two (or more) primitives of our theory that assert contradictory things about the nature of reality. This cannot be explained away by their assimilation into a larger situation in which they do

[33] One way to phrase this is to say that truth is relative (or: all truths are relative). This terminology, though, is apt to connote things we do not intend, so we shall avoid it.

not contradict; larger situations are less primitive and so explanatorily secondary to smaller situations.[34]

The same issue can be recast in terms of objects and properties rather than propositions. If some proposition asserts that an object O has the property *F* and this proposition is true in some situation *s* then it clearly follows that O has *F* in *s.* If some proposition asserts that O does *not* have *F* and this proposition is true in *s'* then it also clearly follows that O doesn't have *F* in *s'.* However, if *s* and *s'* are both actual, what are we to say about O in the actual world? Is it *F* or not? The point seems to be that, in the actual world, it is *neither F nor not F.* There are *parts* of the world where it is *F,* and *parts* of the world where it is not *F.* But in the world taken as a whole, it is neither *F* nor not *F.*

What are we to say, then? The underlying theory asserts both that minimal situations are basic and that these minimal situations can be in direct contradiction to one another. This doesn't look good. 'The book of the world' is a metaphor for a complete description of reality. Situationalism seems to leave this book in tatters. A complete description of reality appears to be impossible; the description will be full of contradictions. At the level of objects and properties this might seem scandalous. Shouldn't an object which exists in the actual world either have or lack a property there? How could it possibly do neither? Situationalism asserts that it *can* do neither. Perhaps this is a scandal. It is, however, what the theory contends.

This, I take it, is the most important metaphysical consequence of situationalism. The fourdimensionalist makes a significant division of objects into parts, the relational properties theorist makes a significant division of properties into parts and the situationalist

[34] And, in fact, this is why they do not contradict in the larger situation; the larger situation is one in which the objects do not have the properties.

makes a significant division of the world into parts. This consequence can be given an extra flavour by correlating it with a position Kit Fine has presented, so it is to this that we now turn.

Situationalism and fragmentalism

Fine, in his (2005), introduces some new ways of being a realist about tense. He does so at least partly in response to McTaggart's famous argument for the unreality of time. These positions are realist in the sense that they contend that reality is aspectual; the perspectival nature of the statements we make about reality is in fact a feature of reality itself. One of the non-standard ways to maintain this is fragmentalism, which is the rejection of the following premise:

> *Coherence:* Reality is not irreducibly incoherent, i.e. its composition by incompatible facts must be explained by its composition by compatible facts.[35]

Fragmentalism claims that it is "in the character of reality that certain contradictory aspects of it cannot be explained away."[36] Reality simply contains parts that do not cohere.

Fine's taxonomy of realism vs. anti-realism cross-cuts distinctions between A-theories and B-theories of time. This might be surprising; we might expect that A-theories are realist and B-theories anti-realist. But if we have a definition of an A-theory as one that takes there to be a metaphysical significance to which time is the present, i.e. that not all

[35] Fine (2005)*:* 273.
[36] *Ibid.*: 280-1.

times are metaphysically on a par, it is clear that fragmentalism (and the relativism Fine also describes) is not an A-theory. It does not require one time to be privileged.

Situationalism can be seen as a type of fragmentalism that takes situations to be the parts of reality and asserts of them that they do not always cohere. It gives content to the denial of Coherence by maintaining the primacy of situations over their extensions. The world, or, in Fine's terms, the über-reality, does not stand behind situations; it is not in virtue of über-reality that we have parts of it. Instead, situations are simply the base level, and priority is with smaller situations. Certain other situations can be composed of smaller situations, but are not primitive. What is the case in the resulting, larger, situations is governed by the restrictions we have discussed.

Fine's fragmentalism gives us another way of framing the theory we have presented. Real change requires incompatibility, and for situationalism this incompatibility leads to contradictions between parts of reality. These parts are primitive. There is no part, however, in which a contradiction is true. The contradictions are between but not within situations. These situations correspond to fragments of reality as conceived by Fine.

Conclusions

In our conclusion to this chapter, we shall also be providing a conclusion to the whole thesis. It will therefore be somewhat extended. Quickly retracing our steps, we have in short been presenting a novel account of persistence. In Chapters 1 and 2 we argued that change does give rise to problems, and that the current solutions seem deficient. Chapter 3 explained the theory underlying situations and gave some shape to their nature. Chapters 4,

5 and 6 were applications of situation theory to the problems of change, the Ship of Theseus puzzle and the other paradoxes of coincidence respectively. The central dynamic in these solutions was the fact that something can be true in a situation but not in extensions of that same situation. Propositions *do* persist when there are no extra existential situations for particulars that the proposition must refer to, but might not persist if this condition fails. By carving the world into situations and looking at what is true in them we are able to hold on to the intuitions we have in the persistence puzzles cases. By giving a more complicated account of truth in a situation and what is the case when situations are parts of each other, we avoid getting into contradictions.

I have not directly presented a case for situationalism being the best theory of persistence. It does, however, have a number of virtues. It provides a unified account of the persistence puzzles. It holds onto a notion that change requires *genuine* incompatibility. It uses resources that are accepted (by some) for other reasons in semantics and information theory. It is consistent with relativity, and in fact meshes with it well. It is informative about times and time if we allow some speculative assumptions. It is B-theoretic, eternalist and endurantist, which will make it appeal to some. It is a wide theory; the temporal is treated in the same way as the spatial and the modal.[37] These virtues, I believe, warrant considering it a viable alternative in the somewhat crowded market place for theories of persistence.

Although it has these advantages, situationalism does have consequences some will perceive as costs. A few of these emerged in earlier chapters: the denial of the strong forms of the necessity of identity; the denial of the bivalence of propositions in a world; temporalism about propositions; and a refinement of the contrapositive of the

[37] Though perhaps there will be some differences between the modal and spatial/temporal cases. One such difference might be that there are distinguished *actual* situations that are metaphysically or ontologically privileged, whereas all *spatial* and *temporal* situations are on a par.

indiscernibility of identicals. All of them, though, are derived from the more fundamental metaphysical consequences described in the latter part of this chapter. It might be possible to come up with a situational theory that does not have these commitments, but the theory of situationalism I am proposing is a metaphysical position that has the character elaborated above. These consequences will be, to some, unbearable, but we do not have space to try to show how they can be borne. The best defence of the metaphysics is that it arises naturally from the central contention with which we began Chapter 3; reality should be primarily thought of in terms of its parts rather than as a whole. This concept is what underpins the use of situations in any theoretical discipline. Here we have followed through on one way of fleshing out the central contention. It comes up against an attraction we have to the notion that reality is of a piece; that reality coheres. Perhaps, though, what change and the other persistence puzzles tell us is that this is an inappropriate attraction.[38]

Situationalism is the view that the metaphysical primitives are parts of reality. These parts are not inherently compatible. At the level of objects and properties, this amounts to the claim that what is fundamental is an object having a property, and that the properties an object has in different parts of reality don't have to cohere. But the object has each property *equally*; the parts of reality are equal. We make no ontological or metaphysical distinction between primitive situations. Their incompatibility is the price of the theory.

In closing, it is worth emphasising what was mentioned back in the Introduction. I do not offer this thesis as a knock-down argument for situationalism. In order to evaluate its relative merit, we should have to get out the scales and weigh its costs and benefits, as well as those of all the other candidate theories of persistence. Perhaps this is a worthwhile task,

[38] The modal and time-travel cases can also be seen as undermining the attraction.

and perhaps situationalism will come out well from such a comparative project. But it is a task and a project for another day.

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