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## Relativism and Two Kinds of Branching Time

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**Abstract:** This essay examines the case for relativism about future contingents in light of a distinction between two ways of interpreting the ‘branching time’ framework. Focussing on MacFarlane (2014), we break the argument for relativism down into two steps. The first step is an argument for something MacFarlane calls the *Non-Determination Thesis*, which is essentially the view that there is no unique actual future. The second step is an argument from the Non-Determination Thesis to relativism. I first argue that first step of this argument fails. But despite that result, the second step is still of interest, since many philosophers have maintained something like the Non-Determination Thesis on alternative grounds. I then argue that whether the second step of the argument succeeds depends on how the Non-Determination Thesis is motivated, and how the ‘branching time’ framework is interpreted in light of that motivation. If the branches in an intended branching time model are ersatz possible worlds, then the argument for relativism might go through; but if, instead, the branches are concrete parts of a ‘branching multiverse’, then the argument for relativism turns out to make implausible assumptions about the nature of personal identity over time. That argument can thus be rejected by rejecting those assumptions. One upshot of this is that the case for relativism about future contingents is much weaker than has been appreciated; a broader lesson is that philosophers who invoke the branching time framework need to pay close attention to different ways of interpreting it.

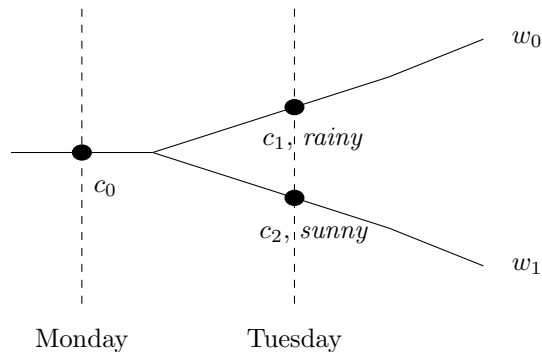


Figure 1: Jake's predicament

## 1 Introduction

Let us suppose that there are two possible worlds,  $w_0$  and  $w_1$ , that are alike with respect to the past, the present, and the laws of nature, but which are unlike with respect to some aspect of the future. (So we are supposing that causal determinism is false.) Perhaps in  $w_0$  it rains tomorrow in Berkeley, while in  $w_1$  it is sunny tomorrow in Berkeley, so that the situation can be depicted as in Figure 1. Suppose it is Monday and we are located at context  $c_0$ . And suppose that Jake is also located at  $c_0$  and that he says, *Tomorrow Berkeley will be sunny*. What is the status of Jake's assertion: is it true, false, or neither true nor false? The standard linear picture of time says: *it depends*. Jake's assertion takes place in two worlds,  $w_0$  and  $w_1$ , exactly one of which is actual. If  $w_0$  is actual, Jake's assertion is false; if instead  $w_1$  is actual, Jake's assertion is true. But a well-known alternative view—deriving perhaps from Aristotle—says that Jake's assertion at  $c_0$  is neither true nor false. On this view, there is no fact of the matter as to which of these branches,  $w_0$  and  $w_1$ , is the unique actual future, and so the question of whether it will rain tomorrow in Berkeley is objectively unsettled.

John MacFarlane has recently defended a third alternative, one which has certain affinities with each of the foregoing views (MacFarlane 2003, 2008, 2014). On MacFarlane's *relativist* view, we can say that Jake's assertion is neither true nor false *when assessed from  $c_0$* , false *when assessed from  $c_1$* , and true *when assessed from  $c_2$* . Sentential truth, in other words, is relative not just to a *context of use*, but also to a *context of assessment*. In his most recent presentation of the case for relativism about future contingents, MacFarlane proceeds in two steps (MacFarlane 2014, Ch. 9). He first argues for something he calls the *Non-Determination Thesis*, a version of the view that there is no unique actual future. He then argues that, given the Non-Determination Thesis, relativism offers the best treatment of certain facts concerning the assertion and retraction of future contingents. The present essay is organized as a critical assessment of MacFarlane's two-step argument, and the upshot of that assessment is that the

case for relativism is much weaker than has been appreciated. In order to motivate their view, the relativist must make one or other speculative metaphysical assumption, assumptions their contextualist opponent might well deny on independent grounds. But I have an interest beyond relativism, an ulterior motive in pursuing this project: I want to highlight a distinction between two ways of interpreting the ‘branching time’ framework, and argue for its significance when theorizing about the semantics of future operators.

After describing the formal framework in which we will be operating (Section 2), I argue that the first part of MacFarlane’s argument for relativism—his argument for the Non-Determination Thesis—fails (Section 3). But this result doesn’t completely scupper the case for relativism, for MacFarlane’s is not the only argument in favor of the Non-Determination Thesis; many philosophers have accepted the idea that that there is no unique actual future on alternative grounds (Section 4). So the second part of MacFarlane’s argument for relativism—the step from the Non-Determination Thesis to relativism—is still of interest. But does the second part of his argument succeed? Does relativism follow from the Non-Determination Thesis?

My answer to this question is: it depends. It depends on what the alternative grounds for motivating the Non-Determination Thesis are, and how the ‘branching time’ framework is interpreted in light of that motivation. For example, some defenders of the Growing Block Theory adopt the branching time framework and interpret the branches in that framework as something like (ersatz) possible worlds (e.g. Briggs and Forbes 2012); on this interpretation MacFarlane’s argument for relativism might well go through. But a number of other theorists adopt the branching time framework and interpret it in an ‘eternalist’ way: they replace the ‘block universe’ with a ‘branching multiverse’, and thus take the branches in an intended branching time model to be concrete parts of the actual world (e.g. Belnap *et al.* 2001, Saunders and Wallace 2008). When the branching time framework is interpreted in this way, MacFarlane’s argument runs into trouble from a somewhat unexpected source. For on this interpretation, the argument turns out to presuppose a particular—and not particularly plausible—conception of *personal identity* over time. It can thus be resisted by adopting an alternative—and arguably more plausible—conception of personal identity (Sections 5–6). One upshot of all this is that the case for relativism about future contingents is much weaker than has been appreciated; a broader lesson is that philosophers who invoke the branching time framework need to pay close attention to different ways of interpreting it (Section 7).

## 2 The formal framework

We begin by putting in place some background assumptions about the semantic framework in which we will work. We assume a formal language containing: atomic sentences  $p, q, r$ , etc.; negation and conjunction; a modal operator,  $\Box$ , expressing ‘historical necessity’; and a temporal operator,  $\mathcal{T}$ , used to translate *tomorrow at this time*. The competing proposals we will consider are all defined

with respect to the same class of models, which we define as follows:

**Definition 1.** A *branching model* is a tuple  $\mathcal{M} = (W, T, U, D, <, I)$ , where:

- (1)  $W$  is a non-empty set whose elements are called *worlds*,
- (2)  $T$  is a non-empty set whose elements are called *times*,
- (3)  $U$  is a non-empty set whose elements are called *individuals*,
- (4)  $D$  is a function mapping elements of  $W \times T$  into the power-set of  $U$ ; if  $x \in D(w, t)$ , then  $x$  is said to *exist at  $t$  and  $w$* ,
- (5)  $<$  is a strict total order on  $T$  such that each time  $t \in T$  has an immediate successor,<sup>1</sup>
- (6) and  $I$  is a function from atomic sentences and elements of  $W \times T$  into  $\{1, 0\}$ .

Although our language is propositional, we include a domain of individuals in our models for reasons that will soon emerge.<sup>2</sup>

For each time  $t$ , we define a binary accessibility relation  $\approx_t$  on the set of worlds as follows:

**Definition 2.** For any model  $\mathcal{M} = (W, T, U, D, <, I)$ , any  $t \in T$ , and any  $w, w' \in W$ ,  $w'$  is *accessible* from  $w$  at  $t$ ,  $w \approx_t w'$ , iff for all times  $t' \leq t$  and all atomic sentences  $p$ ,  $I(p)(w, t') = I(p)(w', t')$ .

Thus,  $w \approx_t w'$  just in case  $w$  and  $w'$  are exactly alike up to (and including)  $t$ . In terms of a branching diagram,  $w \approx_t w'$  just in case  $w$  and  $w'$  coincide up to  $t$ ; they may diverge thereafter. Note that this definition implies that  $\approx_t$  is an equivalence relation on  $W$ , and that if  $w \approx_t w'$  and  $t' < t$ , then  $w \approx_{t'} w'$  (there is no backwards branching).

All the theories we will discuss share the same recursive semantics; all make use of the same definition of *truth at a model and a point of evaluation*. A point of evaluation is a triple consisting of a context, a world, and a time. Precisely what contexts are turns out to be an important issue, but for the moment we need only assume that each context  $c$  determines a time  $t_c$ , the time of the context.

**Definition 3.** Let  $\llbracket \phi \rrbracket^{\mathcal{M}, c, w, t}$  be the truth value of a formula  $\phi$  relative to a model  $\mathcal{M}$  and a point of evaluation  $(c, w, t)$ . Then we have:

$$\llbracket p \rrbracket^{\mathcal{M}, c, w, t} = 1 \text{ iff } I(p, w, t) = 1, \text{ where } p \text{ is any atomic sentence}$$

<sup>1</sup>So for each time  $t \in T$ , there is a  $t' \in T$  such that  $t < t'$  and there is no  $t'' \in T$  such that  $t < t''$  and  $t'' < t'$ .

<sup>2</sup>The model theory assumes that domains may vary across times and branches. But our discussion could instead be carried out assuming that domains are fixed across times and branches; in that case, we might take  $D(w, t)$  to be the set of things in  $U$  that are concrete at  $t$  in  $w$ . See Williamson (2013) for extensive discussion of these issues.

$$\begin{aligned}
\llbracket \neg\phi \rrbracket^{\mathcal{M},c,w,t} = 1 &\text{ iff } \llbracket \phi \rrbracket^{\mathcal{M},c,w,t} = 0 \\
\llbracket \phi \wedge \psi \rrbracket^{\mathcal{M},c,w,t} = 1 &\text{ iff } \llbracket \phi \rrbracket^{\mathcal{M},c,w,t} = \llbracket \psi \rrbracket^{\mathcal{M},c,w,t} = 1 \\
\llbracket \Box\phi \rrbracket^{\mathcal{M},c,w,t} = 1 &\text{ iff for all worlds } w' \in W, \text{ if } w \approx_t w', \text{ then } \llbracket \phi \rrbracket^{\mathcal{M},c,w',t} = 1 \\
\llbracket \mathcal{T}\phi \rrbracket^{\mathcal{M},c,w,t} = 1 &\text{ iff } \llbracket \phi \rrbracket^{\mathcal{M},c,w,t_c+24} = 1, \text{ where } t_c + 24 \text{ is a time exactly 24} \\
&\text{ hours after } t_c^3
\end{aligned}$$

I shall generally suppress reference to models in what follows; in any given application, we may assume an intended model.

The principal question that now arises is how to move from the technical notion of truth at a point of evaluation to some notion of truth that makes contact with the behavior of language users. The rival theories to be considered below offer rival answers to this ‘postsemantic’ question. The standard answer to this question in the philosophy of language is that one defines a notion of *truth at a context* in terms of the notion of truth at a point of evaluation as follows (Lewis 1980, Kaplan 1989):

#### KAPLANIAN TRUTH AT A CONTEXT

A sentence  $\phi$  is *true at a context*  $c$  iff  $\llbracket \phi \rrbracket^{c,w_c,t_c} = 1$ , where  $w_c$  is the world of context  $c$  and  $t_c$  is the time of context  $c$ .

The standard idea is that if a speaker  $x$  utters a sentence  $\phi$  in a context  $c$ , then if our semantic theory is a good one, it ought be that  $\phi$  is true in  $c$  (according to the theory) just in case what  $x$  said in uttering  $\phi$  in  $c$  is in fact true in  $c$ . In this way, ordinary judgments about the truth-values of sentences in possible contexts can constrain our semantic theorizing.

A note on terminology. Any view that takes the notion of *truth at a context* to be the main ‘pragmatically relevant’ notion of truth, to use MacFarlane’s term, will here count as a species of *contextualism*. This is so whether or not the view adopts the precise Kaplanian definition of truth at a context given above. For example, we will later have cause to discuss ‘supervaluationist’ definitions of truth at a context; these too will count as versions of contextualism.

The above definition of truth at a context assumes that it makes sense to speak of ‘the world of the context.’ The first step in MacFarlane’s argument for relativism is to argue that it does *not* make sense to speak of the world of the context. He calls this the *Non-Determination Thesis*. Let’s say that  $\sigma$  is a set of worlds that *overlap at time*  $t$  just in case for any branches  $w, w'$  in  $\sigma$ ,  $w \approx_t w'$ . Then the Non-Determination Thesis says the following (MacFarlane 2014, 208):

#### NON-DETERMINATION THESIS

A context does not, in general, determine a unique ‘world of the context,’ but at most a set of worlds that overlap at the time of the context.

<sup>3</sup>Note that each time has an immediate successor under  $<$ . If  $t'$  is the immediate successor of  $t$ , we may suppose that  $t$  and  $t'$  are separated by one hour.

The second step in MacFarlane’s argument is to argue from the Non-Determination Thesis to relativism. We begin by assessing MacFarlane’s case for the Non-Determination Thesis.

### 3 The Non-Determination Thesis

One reason you might think that the Non-Determination Thesis is true is that you think, for whatever reason, that future contingents are neither true nor false. Suppose, for example, you think *Tomorrow there will be a sea-battle* is neither true nor false in our present context. Then it would seem to that you are committed to the Non-Determination Thesis. For suppose there was a unique world determined by our present context—which there would have to be if the Non-Determination Thesis was false. Then it is hard to see how *Tomorrow there will be a sea-battle* could be neither true nor false at our present context (at least if set aside any other sources of indeterminacy, such as vagueness). For suppose  $w$  is the world of our present context. Then either *There is a sea-battle tomorrow* is true tomorrow in  $w$  or it is false tomorrow in  $w$  (note that in the framework above, every sentence is either true or false at a point of evaluation). If it is true tomorrow in  $w$ , then *Tomorrow there will be a sea-battle* is true at our present context; if it is false tomorrow in  $w$ , then *Tomorrow there will be a sea-battle* is false at our present context. Either way it is not indeterminate.

Why think future contingents are neither true nor false? Perhaps you think this is the only way of making sense of the idea that the future is open. Or perhaps you think that this is required in order to escape *logical determinism*, the view that if it will be that  $\phi$ , then it is necessary (unalterable) that it will be that  $\phi$ . What’s interesting, however, is that MacFarlane doesn’t rest his case for the Non-Determination Thesis on metaphysical considerations like these. He writes:

Granted, if there are branching worlds, then none of the *present* and *past* facts about a concrete speech episode singles out one of them from the others. But why should we limit ourselves to present and past facts? Why not also consider facts about the episode’s *future*?

Consider a concrete speech episode  $Ep$  that occurs at time  $t_0$ , and suppose that the state of the universe at  $t_0$  is compatible with both sunny and cloudy weather at  $t_1$  (one day later). If  $Ep$  will be followed in one day by sunny weather, this is a fact about  $Ep$ . If  $Ep$  won’t be followed in one day by sunny weather, this is a fact about  $Ep$ . Either way, then, there is a fact about  $Ep$  that can discriminate between two worlds that coincide in their present and past states up through the time of  $Ep$ , but diverge thereafter.

Of course, someone might deny that there is any fact about what kind of weather will follow  $Ep$  in one day. *But some additional reason should be given for this denial*; it does not follow merely from the claim that the next day’s weather is not determined by the present

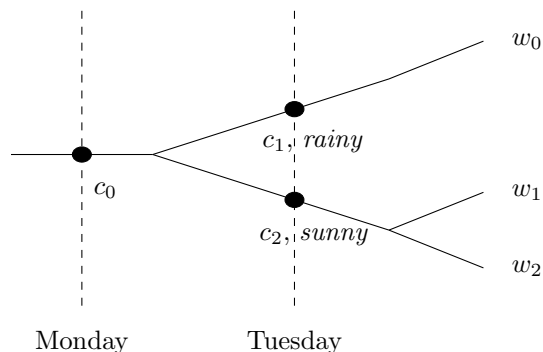


Figure 2: Jake's predicament

state of the universe. Why should we not say, then, that of the many worlds that coincide up through the production of Ep... *only one also accurately represents what is actually going to happen?* And that world is the 'world of the context.' (MacFarlane 2014, 209, emphasis added in the final paragraph)

Following Belnap and Green (1994), MacFarlane calls the view only one world that overlaps at the time of the context represents what is actually going to happen the *Thin Red Line View*. According to this view, each model specifies a function  $TRL$  that maps each context  $c$  onto a unique world  $TRL(c)$ , representing the unique actual future of  $c$ . We can then identify the world of context  $c$  with  $TRL(c)$ , and adopt the Kaplanian definition of truth at a context discussed above. MacFarlane's objection to this view is, to repeat, not metaphysical; rather, he thinks this view faces an independent semantic problem. To see what the problem is, let us return to Jake, who finds himself in a context  $c_0$  that can be depicted as in Figure 2. And suppose that at  $c_0$ , Jake asserts:

- (1) Tomorrow Berkeley will be sunny.

$\mathcal{T}_s$

Furthermore, suppose  $TRL(c_0) = w_1$ . In that case, the Thin Red Line View predicts that the sentence Jake uttered, (1), is true at  $c_0$ , since  $TRL(c_0) = w_1$ , and Berkeley is sunny on Tuesday in  $w_1$ . So the Thin Red Line View predicts that Jake's assertion was accurate.

MacFarlane then contrasts two situations. First, imagine someone situated in Berkeley at  $c_2$ , looking back on Jake's assertion at  $c_0$ . Thus, assuming she is apprised of the relevant facts, this assessor will take Jake to have made an accurate assertion, since Jake said that Berkeley would be sunny on Tuesday, and our assessor occupies a context in which Berkeley is indeed sunny on Tuesday. So this assessor's evaluation coincides with the prediction of the Thin Red Line

View. The trouble arises when we imagine someone situated at  $c_1$ , looking back on Jake’s assertion at  $c_0$ . MacFarlane writes:

...the assessor [at  $c_1$ ] should take Jake to have spoken accurately just in case (1) is true at  $c_0$ . Since, according to the Thin Red Line View, (1) is true at  $c_0$ , the assessor should take Jake to have spoken accurately. But that seems wrong; the assessor has only to feel the rain on her skin to know that Jake’s assertion was inaccurate. (MacFarlane 2014, 210)

The Thin Red Line View predicts that an informed assessor at  $c_1$  should take Jake to have spoken accurately. But that seems wrong: Jake said that Berkeley would be sunny on Tuesday, and here the assessor is, standing in the Berkeley rain on Tuesday. This is MacFarlane’s objection to the Thin Red Line View, and his argument in favor of the Non-Determination Thesis. My view is that while this may be a good argument against the Thin Red Line View, it isn’t a good argument for the the Non-Determination Thesis, for reasons I shall presently explain.

One complication in assessing this argument is that MacFarlane does not explicitly say what a context is. But we can work this out by examining the branching diagram in Figure 2. Assuming a fixed speaker, MacFarlane seems to hold that the points on the tree— $c_0, c_1$ , etc.—represent or correspond to contexts. Note that each point on the tree corresponds to pair of a time  $t$  and a set of worlds, namely the set of worlds that ‘flow through’ the point at  $t$ :  $c_0$  corresponds to (Monday,  $\{w_0, w_1, w_2\}$ ),  $c_1$  to (Tuesday,  $\{w_0\}$ ), and  $c_2$  to (Tuesday,  $\{w_1, w_2\}$ ). If we considered not just the highlighted points on the tree, but all the points on it, we could (given suitable assumptions) define a one-to-one correspondence between points on the tree and pairs consisting of a time and a set of overlapping worlds.<sup>4</sup>

If we include a speaker as a coordinate of a context, then this view seems to imply that a context is (or can be represented by) a triple consisting of a set of worlds, a time, and a speaker:

#### COARSE-GRAINED CONTEXTS

A triple  $(\sigma, t, x)$  consisting of a set of worlds  $\sigma$ , a time  $t$ , and a speaker  $x$  is a *context* iff (i) for each  $w \in \sigma$ ,  $x$  exists at  $t$  in  $w$ , and (ii) there is a world  $w$  such that  $\sigma = \{w' : w \approx_t w'\}$ .

The Thin Red Line View then supplements this conception of contexts with a definition of the world of the context:

#### TRL WORLD OF THE CONTEXT

For any context  $c = (\sigma_c, t_c, x_c)$ ,  $TRL(c) \in \sigma_c$ , and  $TRL(c)$  is the *world of  $c$* .

Thus, the Thin Red Line View amounts to the following:

<sup>4</sup>The pairs  $(t, \sigma)$  would be ones where  $\sigma$  was an equivalence class under  $\approx_t$ .



Thin Red Line View:

- (a) Coarse-grained definition of contexts
- (b) TRL definition of the world of the context
- (c) Kaplanian definition of truth at a context

Now, the Thin Red Line View is supposed to be a view that denies the Non-Determination Thesis and maintains that that, at any give context  $c$ , there is only one future continuation of  $c$ . It does have those features, but it is not the only such view, nor is it the most natural such view. For the standard definition of context that we find in the Kaplan-Lewis tradition is not COARSE-GRAINED CONTEXTS, but rather this:

FINE-GRAINED CONTEXTS

A triple  $(w, t, x)$  consisting of a world  $w$ , a time  $t$ , and a speaker  $x$  is a *context* iff  $x$  exists at  $t$  in  $w$ .

On this view, a context does not correspond to a point on a branching diagram, even holding the speaker fixed. If we hold the speaker fixed, then a context corresponds to a pair of a time and a *world*, i.e. a maximal path through the tree. Such a pair will determine a point on a branching diagram, but there will not, in general, be a way to recover a world-time pair from a point on the tree. For example,  $c_2$  does not determine a fine-grained context: it determines a time, namely Tuesday, but not a world, since both  $w_1$  and  $w_2$  flow through  $c_2$ . The point  $c_2$  corresponds to two different contexts, namely  $(w_1, \text{Tuesday}, x)$  and  $(w_2, \text{Tuesday}, x)$  (where  $x$  is our fixed speaker). Let us call this the *Standard View*. We may summarize it as follows:

Standard View:

- (a) Fine-grained definition of contexts
- (b) Kaplanian definition of truth at a context

The Standard View also appears to be incompatible with the Non-Determination Thesis, for this view seems to imply that, at any given context  $c = (w_c, t_c, x_c)$ , there is only one way things will go on from  $c$ , that way being represented by  $w_c$ . But—and here is the crucial point—the Standard View is not susceptible to MacFarlane’s argument against the Thin Red Line View.

To see this last point, recall that MacFarlane’s argument began with the supposition that:

“At  $c_0$ , Jake asserts (1), *Tomorrow Berkeley will be sunny.*”

But from that supposition alone, the Standard View does not yield a prediction about the truth value of Jake’s assertion. For  $c_0$ —understood as something that corresponds to the relevant highlighted point on the diagram—is not, on the Standard View, a context. Rather, it corresponds to three different contexts: one whose world is  $w_0$ , one whose world is  $w_1$ , one whose world is  $w_2$ . So we

might consider instead the more fine-grained supposition that, at the context  $c_0^1$ , Jake asserts (1), where  $c_0^1 = (w_1, \text{Monday}, \text{Jake})$ . Then the Standard View predicts that Jake’s assertion is true, since (1) is true at  $c_0^1$ . For it is sunny on Tuesday in  $w_1$ , the world of  $c_0^1$ .

Now, recall that the problem with the Thin Red Line View arose when we considered someone at  $c_1$  looking back on Jake’s assertion. If we try to reproduce MacFarlane’s earlier reasoning, we get something like the following:

“Imagine someone at  $c_1$  looking back and assessing Jake’s assertion at  $c_0^1$ . The assessor should take Jake to have spoken accurately just in case (1) is true at  $c_0^1$ . Since, according to the present view, (1) is true at  $c_0^1$ , the assessor should take Jake to have spoken accurately. But that seems wrong; the assessor has only to feel the rain on her skin to know that Jake’s assertion was inaccurate.”

But, by hypothesis, when we consider an observer at  $c_1$ , we are considering an observer at world  $w_0$ . Since  $w_0 \neq w_1$ , and since  $w_1$  is the world of  $c_0^1$ , when we consider someone at  $c_1$  ‘looking back’ on Jake’s assertion at  $c_0^1$ , we are in fact imagining someone looking *back* in time and *across* in modal space. Such an observer should presumably *agree* that Jake’s assertion at  $c_0^1$  is accurate. For she is considering the status of an assertion of (1) made on Monday in world  $w_1$ , and in  $w_1$ , such an assertion is accurate, since Berkeley is sunny on Tuesday in  $w_1$ .

Of course, since  $w_0$  is just like  $w_1$  up until sometime just after Jake’s assertion, Jake also asserts (1) in  $w_0$ . If our observer at  $c_1$  is considering Jake’s assertion of (1) in  $w_0$ , then she ought to regard it as inaccurate: Jake said, in  $w_0$ , that Berkeley would be sunny on Tuesday, and Berkeley is not sunny on Tuesday in  $w_0$ . So our observer in  $c_1$  should regard Jake’s assertion in  $w_0$  as inaccurate. But then our observer is not considering the assertion Jake makes in context  $c_0^1$ , for  $c_0^1$  is located in  $w_1$ , not  $w_0$ . Rather, she is considering the assertion Jake makes in context  $c_0^0$ , where  $c_0^0 = (w_0, \text{Monday}, \text{Jake})$ . And the Standard View predicts that (1) is false at  $c_0^0$ , since Berkeley is not sunny on Tuesday in  $w_0$ . So again, there will be no conflict between theory and pre-theoretic judgment.

As far as I can see, there is nothing in MacFarlane (2014, Ch. 9) that tells against the Standard View. This view is, for example, compatible with the truth of *indeterminism*, as MacFarlane defines that term, for indeterminism merely says that there are worlds  $w, w'$  that overlap at one time  $t$  and then fail to overlap at later time  $t'$ . Thus, indeterminism is a constraint on the relation  $\approx$  about which the Standard View says nothing. Is MacFarlane simply assuming that, in the framework of branching time, contexts are coarse-grained, in the sense described above? If so, then the question arises as to what justifies that assumption. Why think coarse-grained contexts are appropriate theoretical representations of situations in which someone utters something? We need to be given a reason for thinking that, and no such reason has been given. So MacFarlane’s argument for the Non-Determination Thesis fails. A contextualist can resist that argument by adopting the Standard View, a view that rejects

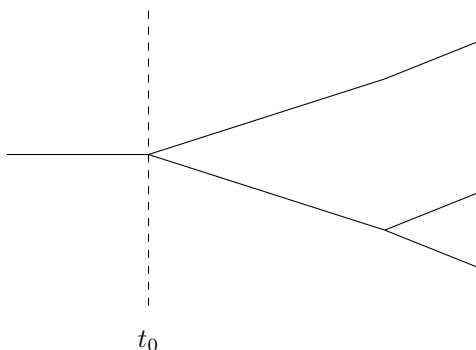


Figure 3: A branching diagram

the Non-Determination Thesis but is not subject to MacFarlane’s objection to the Thin Red Line View.

#### 4 Two kinds of branching time

But this is not the end of the matter. For, as we noted earlier, MacFarlane’s is not the only argument in favor of the Non-Determination Thesis. To appreciate this, note that, within the context of our formal framework, the Non-Determination Thesis is closely related to the claim that there is no unique actual future. And *that* claim is one that has been defended by a number of philosophers on a variety of grounds. It will be useful to organize the philosophical terrain here by distinguishing two ways in which the claim that there is a unique actual future might fail: first, it might fail because that there are *no* actual futures; second, it might fail because there are *many* actual futures (and so no *unique* actual future). Let us examine these two views in turn.

One prominent ‘no actual future’ view is the Growing Block Theory, which holds that while past and present things and events are real, future things and events are not (Broad 1923, Tooley 1997). (The Growing Block Theory also holds that what counts as past, present, and future is constantly changing, but this aspect of the theory will not concern us here.) Now, even if you deny that future things and events are real, you might still hold that there are *possible futures*, ways things might go, given how things have gone up until now and given the laws of nature. Furthermore, if you hold that the facts about the past, the present, and the laws do not determine a unique possible future, you might hold that there are *multiple* possible futures, multiple ways things might go on from the present. On the view I am envisioning, no one of these possible futures is distinguished as the actual future, the unique way things will go: all these possible futures are on a metaphysical par.

Philosophers who advocate the Growing Block Theory—understood to include the further claim that there are multiple possible futures, no one of which is *the* actual future—sometimes employ a version of the branching time frame-

work when giving a semantics for future-oriented sentences; Briggs and Forbes (2012), for example, develop a view along these lines. But if one does this, branching diagrams like the one in Figure 3 must be interpreted with some care. For if  $t_0$  represents the present time, then the line that includes and extends to the left of  $t_0$  represents reality in a way that the lines to the right of  $t_0$  do not (Briggs and Forbes would draw a double line extending left from  $t_0$  to indicate this). The line extending left from  $t_0$  corresponds to the concrete past and present, whereas the lines extending right from  $t_0$  represent merely possible futures. Exactly how to state the Growing Block Theory and how to develop a branching time semantics consonant with it are somewhat delicate matters; see Briggs and Forbes (2012) for detailed discussion. But however it is developed, this view seems to require thinking of the branches in an intended branching time model as abstract objects of some kind—‘ersatz worlds’ in the terminology of Lewis (1986)—and, indeed, Briggs and Forbes (2012) construct possible worlds out of abstract propositions. For it is not easy to see how to square the idea that the branches in an intended branching time model are concrete with the Growing Block Theorist’s insistence that future times and events are not real. For whatever *real* means in this context, surely it excludes being concrete.

In any case, we needn’t insist on this last point here; we are simply observing that there is a version of the Growing Block Theory that adopts the branching time framework and interprets the branches therein as ersatz possible worlds. Let us call this view *ersatz branching*. Someone who accepts ersatz branching would likely accept the Non-Determination Thesis, interpreting the talk of *possible worlds* in that thesis as referring to ersatz possible worlds:

ERSATZ NON-DETERMINATION THESIS

A context does not, in general, determine a unique ersatz possible world, but at most a set of such worlds that overlap at the time of the context.

Our present context, for example, would not seem to determine a unique ersatz possible world, if the sort of Growing Block Theory I have in mind is true.

But the branching time framework is sometimes interpreted in a more ‘eternalist’ manner, though the eternalist’s traditional ‘block universe’ is replaced by a ‘branching multiverse’ (e.g. Belnap *et al.* 2001, Saunders and Wallace 2008). For example, branching time is sometimes mentioned in connection with the Everett Interpretation of quantum mechanics—a connection MacFarlane himself alludes to (MacFarlane 2014, 201)—and this is usually understood as implying that the ‘multiple futures’ under discussion are as real and concrete as the past and present.<sup>5</sup> According to this view, the ‘possible worlds’—the elements of  $W$ —in an intended branching time model are concrete parts of the actual world that are unified in a particular way.

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<sup>5</sup>Whether the Everett Interpretation of quantum mechanics really requires concrete branching in this sense is a matter of debate. Bacciagaluppi (2002), Wallace (2005), Saunders and Wallace (2008), and Belnap and Müller (2010) seem to assume that it does; Saunders (2010) and Wilson (2012) argue that it requires only ‘diverging histories’ in roughly Lewis’s sense.

This interpretation of the branches in an intended branching time model might make it inappropriate to call them *possible worlds*. For if one holds that possible worlds are abstract entities of some kind (as most philosophers do), then such branches are not possible worlds. And even if one holds that possible worlds are concrete (as Lewis does), the standard way of individuating possible worlds on that approach implies that distinct worlds never share a common part.<sup>6</sup> Thus, given this interpretation of an intended branching time model, it would likely be better to call the elements of  $W$  in such a model *branches* or *histories*, rather than *possible worlds*.

But however that terminological matter is settled, what we are interested in is the view that says that we live in a branching multiverse, and which takes the branches of an intended branching time model to be concrete parts of the actual world that are unified in a certain way. Let us call this view *concrete branching*. Someone who held this view might be motivated to adopt a corresponding version of the Non-Determination Thesis:

CONCRETE NON-DETERMINATION THESIS

Contexts do not, in general, determine a unique concrete branch in the branching multiverse, but at most a set of such branches that overlap at the time of the context.

The distinction between ersatz and concrete branching—or something very much like it—has been made elsewhere in the literature. Meyer (2016), for example, distinguishes between “anti-realism about a single future” ( $\approx$  ersatz branching) from “realism about many futures” ( $\approx$  concrete branching) (206). He writes that:

For the branch-realist, future histories are part of the fully determined, branching future. All of the branches are as real as the past. Anti-realists, by contrast, do not think that the future has any branches. Their possible futures are not actual futures, but are only supposed to model the openness of a single unreal future. (Meyer 2016, 206)

Pooley (2013, 339) distinguishes between “ $A$ -theoretic branching” ( $\approx$  ersatz branching) and “ $B$ -theoretic branching” ( $\approx$  concrete branching), between interpreting the branches as representing “several equally real possible ways that the single future might turn out” ( $\approx$  ersatz branching) as opposed to representing “several equally real futures” ( $\approx$  concrete branching). Similar distinctions are also drawn in Earman (2008, 188–190), Williams (2008, §1), and Percival (2013, 4268).

Precisely how to state this distinction is again a delicate matter—one would, for example, want to sort out this talk of *real* vs. *unreal* futures, and *actual* vs. *possible* futures. But the rough distinction is, I hope, clear enough, and

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<sup>6</sup>See Lewis (1986, 71, 208–209), Belnap and Müller (2010, n.4), and Percival (2013) for relevant discussion.

there is one consequence of the distinction that seems relatively straightforward: according to ersatz branching, the past and present are concrete, but the future branches in question are not; according to concrete branching, the future branches in question are as concrete as the past and present.

Despite the authors just cited, the distinction between ersatz and concrete branching is not always carefully attended to in discussions of branching time. One reason for this might be that many philosophers arrive at branching time not via their views in the ontology of time, but rather because the branching time framework provides a convenient way of making sense other commitments they have. For example, according to some interpretations of Aristotle's celebrated discussion of future contingents in *De Interpretatione* 9, he arrives at the view that future contingents are neither true nor false in the course of trying to escape an argument in favor of logical determinism, the doctrine that if it will be that  $p$ , then it is necessary (unalterable) that it will be that  $p$  (Sorabji 1980, Ch. 5).<sup>7</sup> If one is impressed by Aristotle's reasoning, one might employ the framework of branching time in order to formulate a precise semantics that yields the result that future contingents are neither true nor false. But, at least at first glance, these motivations for adopting the branching time framework leave it open whether the branches in an intended branching time model should be understood as ersatz or concrete.<sup>8</sup>

Let us take stock. Although MacFarlane's argument for the Non-Determination Thesis fails, there may be other ways to motivate it. But when we look at *how* one might motivate that Thesis, we see that there are two different ways of interpreting it, since there are two different ways of interpreting the term *possible world* as it occurs in the Thesis. Since we were originally interested in examining MacFarlane's argument from 'the' Non-Determination Thesis to relativism, we now need to examine *two* questions: Does the argument go through assuming the Ersatz Non-Determination Thesis? Does it go through assuming the Concrete Non-Determination Thesis? My strategy for addressing these questions is as follows. In the next section, I present MacFarlane's argument in a way that is neutral on the underlying interpretation of the Non-Determination Thesis, Ersatz or Concrete. In the section that follows, I highlight an assumption of that argument that looks relatively safe given the Ersatz Non-Determination Thesis, but which appears highly questionable given the Concrete Non-Determination Thesis. I then step back to consider what all this means for the dispute between relativism and contextualism.

## 5 Supervaluationism, relativism, and retraction

So let us suppose that the Non-Determination Thesis—however we interpret it—is true. That supposition sends us back to the coarse-grained conception of

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<sup>7</sup>Sorabji interprets Aristotle as responding to an argument that is very similar to the Master Argument of Diodorus Cronus (Sorabji 1980, Ch. 6). But, of course, Sorabji's interpretation is not the only one.

<sup>8</sup>That said, some philosophers argue the 'branching multiverse' picture is not one that accommodates genuine future openness (Pooley 2013, 339, Cameron 2015, §5.2).

contexts, and renders Kaplan’s definition of truth at a context—with its talk of the ‘world of the context’—inapplicable. So how then shall we define truth at a context? The standard answer to this question is provided by the *supervaluationist* approach of Thomason (1970, 1984) (though Thomason doesn’t describe his approach in these Kaplanian terms). Since we’ve returned to the coarse-grained conception of contexts, if we hold fixed the speaker for a moment, we can again think of a context as corresponding to a point on a branching diagram. The basic idea of the supervaluationist approach is that a sentence is true at a context  $c$  just in case it is true at every branch flowing through  $c$ , false at  $c$  just in case its negation is true at every such branch, and neither true nor false otherwise:

SUPERVALUATIONIST TRUTH AT A CONTEXT

A sentence  $\phi$  is true at a (coarse-grained) context  $c = (\sigma_c, t_c, x_c)$  iff  $\llbracket \phi \rrbracket^{c,w,t_c} = 1$ , for all worlds  $w$  in  $\sigma_c$ .

A sentence  $\phi$  is false at  $c$  just in case  $\neg\phi$  is true at  $c$ .

Here is a summary:

Orthodox Supervaluationism

- (a) Coarse-grained definition of contexts
- (b) Supervaluationist definition of truth at a context

I call this view *Orthodox* Supervaluationism, since I shall later contrast it with another version of supervaluationism. Note that Orthodox Supervaluationism counts as a species of contextualism insofar as it proposes to treat the notion of truth at a context as the pragmatically relevant notion of truth.

One argument in favor of Orthodox Supervaluationism is that it secures a number of results that are plausible in light of the Non-Determination Thesis. For example, it allows that both (1) and (2) might be indeterminate at a context  $c$ :

- (1) Tomorrow Berkeley will be sunny.

$\mathcal{T}s$

- (2) Tomorrow Berkeley will not be sunny.

$\mathcal{T}\neg s$

But it achieves this while allowing that (3) might still be true at  $c$ :

- (3) Tomorrow Berkeley will not be sunny or tomorrow Berkeley will not be sunny.

$\mathcal{T}s \vee \mathcal{T}\neg s$

Orthodox Supervaluationism has further virtues as well, virtues which arguably make it more attractive than standard alternatives, such as three-valued approaches or the ‘Peircean’ semantics, an approach that treats future operators

as necessity operators of a certain kind; see MacFarlane (2014, 213–224) for a run-down of the relevant considerations.<sup>9</sup>

MacFarlane argues that relativism is superior to Orthodox Supervaluationism. Since the latter is assumed to be the strongest version of contextualism, this yields an argument for relativism over contextualism. MacFarlane’s argument concerns the conditions under which it is appropriate for a speaker to *retract* or ‘take back’ a previously-made assertion. The problem for Orthodox Supervaluationism arises when that view is combined with a plausible claim about the conditions under which it is appropriate to retract an assertion.

To appreciate the claim in question, suppose I assert some sentence  $\phi$ . I then later learn that  $\phi$  was not true in the context in which I asserted it. If asked whether I ‘stand by’ my assertion of  $\phi$ , I presumably ought to say *no*. If for some reason someone presses me to take back my assertion—to retract it—I might feel some pressure to do so. I can see that I have a *pro tanto* reason to retract my assertion. Of course, all things considered, it might be odd or unnecessary for me to retract it if, for example, nothing much hung on my being right in the first place. Given the semantic framework we are working with, we might take these remarks to motivate the following norm on retraction:

CONTEXTUALIST RETRACTION RULE

An agent  $x$  in context  $c_1$  has a *pro tanto* reason to retract an (unretracted) assertion of  $\phi$  that  $x$  made at  $c_0$  if  $\phi$  is not true at  $c_0$ .

But, as MacFarlane (2014, 224–226) observes, when combined with this rule, Orthodox Supervaluationism has some odd consequences concerning the conditions under which one ought to retract a previously-made future-directed assertion. To see this, return to Jake’s assertion of sentence (1) in context  $c_0$  (recall that we are again taking contexts to be coarse-grained). Now imagine Jake looking back on that assertion from the point of view of Tuesday. Given our assumptions about the metaphysical situation, there are two cases to consider, the case in which Jake looks back on this assertion from  $c_1$ , and the case in which he looks back on this assertion from  $c_2$  (recall Figure 2).

Start with the case in which Jake looks back on his assertion from  $c_1$ . At  $c_0$ , Jake said that Berkeley would be sunny on Tuesday, but then he learns on Tuesday in  $c_1$  that Berkeley is in fact rainy. It would seem in that case that Jake has a *pro tanto* reason to retract his assertion of (1). And, together with the contextualist retraction rule, Orthodox Supervaluationism yields this prediction. For Orthodox Supervaluationism predicts that Jake’s assertion of (1) at  $c_0$  was neither true nor false, since Berkeley is rainy on Tuesday in some but not all worlds flowing through  $c_0$ . Since Jake’s assertion was not true in the context in which he made it, the contextualist retraction rule predicts that Jake has a *pro tanto* reason to retract that assertion. So, at least in this respect, Orthodox Supervaluationism agrees with ordinary judgment.

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<sup>9</sup>Though see Todd and Rabern (2019) for discussion of a problem for supervaluationism that alternative approaches avoid.



Things are different, however, when we consider the case in which Jake looks back on his assertion from  $c_2$ . For the theory still predicts that Jake has a *pro tanto* reason to retract his assertion. The fact that Jake is now located at  $c_2$  has no effect on the truth value of his assertion of (1) at  $c_0$ —it is still neither true nor false. Thus, the theory question—Orthodox Supervaluationism plus the contextualist retraction rule—still predicts that Jake has a *pro tanto* reason to retract that assertion. But this seems strange. After all, Jake said that Berkeley would be sunny on Tuesday, and here he is now on Tuesday basking in the warm Berkeley sun. Wasn't he right? If he was right, why is there any pressure on Jake to retract his earlier assertion? In this case, Orthodox Supervaluationism yields a prediction at odds with ordinary judgment.<sup>10</sup>

Building on an earlier proposal due to Belnap *et al.* (2001), MacFarlane proposes an alternative to Orthodox Supervaluationism which avoids this result.<sup>11</sup> As described above, Orthodox Supervaluationism comprises a definition of the notion of truth at a context and then uses that notion in characterizing rules of assertion and retraction. MacFarlane's relativist proposal, in contrast, takes the form of a definition of the notion of *truth at a context of use and a context of assessment* and then uses this notion in characterizing those rules. It is this that separates relativism from all the contextualist views we have discussed thus far (the Thin Red Line View, the Standard View, and Orthodox Supervaluationism).

A context of assessment is, intuitively, simply a situation in which one is assessing an assertion made at an earlier time. Formally, a context of assessment is just a coarse-grained context. The relativist definition of 'truth at a context of use and a context of assessment' runs as follows:

RELATIVIST TRUTH AT A CONTEXT OF USE AND A CONTEXT OF ASSESSMENT

A sentence  $\phi$  is true at a context of utterance  $c_0$  and a context of assessment  $c_1$  if and only if  $\llbracket \phi \rrbracket^{c_0, w, t_{c_0}} = 1$ , for all worlds  $w \in \sigma_{c_0, c_1}$ , where  $\sigma_{c_0, c_1}$  is defined as follows:

$$\sigma_{c_0, c_1} = \begin{cases} \sigma_{c_1} & \text{if } \sigma_{c_1} \subset \sigma_{c_0} \\ \sigma_{c_0} & \text{otherwise.} \end{cases}$$

This looks a bit complicated, but we can get a handle on what it is saying by seeing how it applies to our example. Consider the case in which Jake is

<sup>10</sup>Of course, perhaps there is a sense in which Jake should never have made the assertion in the first place. It would seem, for example, that Jake didn't know, on Monday, that Berkeley would be sunny on Tuesday, since it wasn't true, on Monday, that Berkeley would be sunny on Tuesday. If knowledge is the norm of assertion (Williamson 1996), then Jake was not in a position to say what he did. Still, sometimes we get lucky and our unwarranted assertions turn out to be true. In such cases, one should perhaps agree that one wasn't in a position to make the assertion in the first place. But it isn't clear why, in such a case, one would be under any pressure to *retract* it.

<sup>11</sup>See also Belnap (2002) and MacFarlane (2003, 2008). For discussion of MacFarlane's earlier presentations, see Heck (2006), Briggs and Forbes (2012), and Dietz and Murzi (2013).

at  $c_2$ , looking back on the assertion of (1) that he made at  $c_0$ . As we noted above, it does not seem like there should be pressure on him to retract that assertion: he said that Berkeley would be sunny on Tuesday, and he's in Berkeley on Tuesday, enjoying the sunny weather. Now note that  $\sigma_{c_0} = \{w_0, w_1, w_2\}$ , and that  $\sigma_{c_2} = \{w_1, w_2\}$ . So  $\sigma_{c_2} \subset \sigma_{c_0}$ . That means that (1) is true at  $c_0$  and  $c_2$  just in case it is sunny in Berkeley on Tuesday on  $w_1$  and  $w_2$ . Since Berkeley is sunny on Tuesday at both of those worlds, (1) is true at  $c_0$  and  $c_2$ . Roughly speaking, when we assess Jake's assertion from  $c_2$ , we check to see whether it is sunny at all worlds flowing through  $c_2$ , the context of assessment, rather than at all those flowing through  $c_0$ , the context of use. The context of assessment, rather than the context of use, fixes which set of worlds we superevaluate over.

This significance of all this emerges when we examine MacFarlane's proposed retraction rule:

RELATIVIST RETRACTION RULE

An agent  $x$  in context  $c_1$  has a *pro tanto* reason to retract an (unretracted) assertion of  $\phi$  that  $x$  made at  $c_0$  if  $\phi$  is not true as used at  $c_0$  and as assessed at  $c_1$ .<sup>12</sup>

So, in the case in which Jake looking back on his assertion from  $c_2$ , this rule does *not* predict that he has a *pro tanto* reason to retract that assertion. For, as we just observed, (1) is true relative to  $c_0$  and  $c_2$ . Thus, relativism avoids supervaluationism's problematic prediction. Note that relativism still predicts that (1) is *not* true relative to  $c_0$  and  $c_1$ . For (1) is true relative to  $c_0$  and  $c_1$  if and only if Berkeley is sunny on Tuesday at  $w_0$ , since  $w_0$  is the only world flowing through  $c_1$ . Since Berkeley is not sunny on Tuesday in  $w_0$ , (1) is not true relative to  $c_0$  and  $c_1$ . So when we consider the case in which Jake is looking back on his assertion from  $c_1$ , the relativist matches the supervaluationist in correctly predicting that Jake has a *pro tanto* reason to retract that assertion. So relativism does seem to have an advantage here over supervaluationism.

## 6 Ersatz branching, concrete branching, and personal identity over time

How does the distinction between ersatz and concrete branching bear on this argument? Note that in MacFarlane's setup of the problem, he assumes a situation in which one and the same Jake is located at  $c_0, c_1$ , and  $c_2$ . For we are considering whether or not Jake, *at*  $c_1$ , has a *pro tanto* reason to retract the assertion that *he* made *at*  $c_0$ . And we are considering whether or not Jake, *at*  $c_2$ , has a *pro tanto* reason to retract the assertion that *he* made *at*  $c_0$ . That way of framing the issue seems to assume that one and the same Jake exists at  $c_0, c_1$ , and  $c_2$ . But the plausibility of that assumption arguably depends

<sup>12</sup>MacFarlane tends to state 'retraction rules' so that they concerns *requirements* rather than *pro tanto reasons*; see, for example, (MacFarlane 2014, 108). I think it is more plausible to formulate the rules in terms of *pro tanto* reasons, but nothing in the present essay turns on this difference.

on whether we are thinking of the relevant branches here as ersatz possible worlds representing merely possible futures or, instead, as concrete branches in a branching multiverse.

Let's consider ersatz branching first. Suppose that  $c_0$  represents our present context: we are here now with Jake who assertively utters (1), *Berkeley will be sunny tomorrow*. Suppose further that the Growing Block Theorist is right, and that there are no real future things and events, only possibilities for how things might turn out. Then the branching diagram in Figure 1 represents three ways things might turn out:  $w_0, w_1$ , and  $w_2$ . I think most Growing Block Theorists would, at least in principle, be happy to concede that these are all possibilities that Jake might figure in: Jake might end up at a rainy Berkeley on Tuesday (as in  $w_0$ ) or he might end up at a sunny Berkeley on Tuesday (as in  $w_1$  or  $w_2$ ). So they might concede that Jake exists on Monday and Tuesday according to all three ersatz possible worlds. Thus, the Growing Block Theorist will likely accept the claim that Jake is 'located at'  $c_0, c_1$ , and  $c_2$ , for, suitably interpreted, this is simply a model-theoretic representation of the fact that there are three possibilities for how the future might go, and that Jake figures in each of them. And once we grant that assumption, MacFarlane's argument for relativism can proceed in the manner described above. So perhaps MacFarlane's argument succeeds in showing that an advocate of ersatz branching, such as the Growing Block Theorist, should be a relativist.

I will return to the significance of this last point later on, but I want to turn now to concrete branching. For in the context of concrete branching, the assumption that one and the same Jake is located at  $c_0, c_1$ , and  $c_2$  turns out to be highly questionable. To see why I say this, we need to shift our gaze for a moment to a slightly different issue—the issue of personal identity over time.

Suppose that concrete branching is true: we live in a branching multiverse in which the future is partitioned into different histories that are unified in a certain way. Now the question I want to focus on is this: what happens to *people* when the world branches? (We could ask the same question about any macroscopic object, but people—speakers—turn out to be the objects of interest for us.) Suppose the world branches at a time  $t$ , and a person  $x$  exists just prior to  $t$ , and that, at time  $t'$  shortly after  $t$ , there are persons  $y, z$  such that (i) both  $y$  and  $z$  are, at  $t'$ , perfectly physically and psychologically continuous with  $x$  at  $t$ , and (ii)  $y$  is located on a distinct branch from  $z$  at  $t'$ .<sup>13</sup> That is, suppose the world splits in two and there is an  $x$ -like figure appearing on both branches. What, now, are the relevant facts concerning identity? Is  $x$  identical to  $y$ ? To  $z$ ? To both? To neither?

As Saunders and Wallace (2008) observe, the case here is akin to a case of *fission*, a type of hypothetical case that has been extensively discussed in the literature on personal identity.<sup>14</sup> (In fact, this case is even purer than

<sup>13</sup>By “perfectly physically and psychologically continuous” I mean to be invoking the relations of physical and psychological continuity, as these are typically understood in the literature on personal identity.

<sup>14</sup>See Wiggins (1967, 1976), Parfit (1971, 1984), Lewis (1976), and Blackburn (1997), among others.

standard cases of fission, since  $x$  at  $t$  is almost exactly like her post-branching counterparts,  $y$  and  $z$ , at  $t'$ .) Thus, the various answers we could give to our question about the identity facts under branching correspond to the various theoretical options available in fission cases. This is an important difference between concrete branching and ersatz branching; ersatz branching doesn't seem to raise questions of personal identity over time in this way.

MacFarlane's discussion—when interpreted in terms of concrete branching—thus seems to presuppose a particular view of personal identity over time. His view seems to be that  $\text{Jake}_0$  (i.e. Jake-at- $c_0$ ) is identical to  $\text{Jake}_1$  (i.e. Jake-at- $c_1$ ), and that  $\text{Jake}_0$  is identical to  $\text{Jake}_2$  (i.e. Jake-at- $c_2$ ), which, given the symmetry and transitivity of identity, implies that  $\text{Jake}_1$  is identical to  $\text{Jake}_2$ . This corresponds to the view of fission that says that when an object  $x$  undergoes fission, it is identical to both of its post-fission counterparts,  $y$  and  $z$ . This view, in turn, implies that the two fission products,  $y$  and  $z$ , are identical to one another. But, as Parfit (1971, 7) observes, this is not a particularly plausible result:

After I have [undergone fission], the two “products” each have all the attributes of a person. They could live at opposite ends of the earth.... It would become intolerable to deny that they were different people.<sup>15</sup>

While I agree with Parfit that this view of fission is not particularly plausible, I do not wish to argue for that claim here. Rather, I have the more modest aim of showing that, if we interpret the Non-Determination Thesis as the *Concrete* Non-Determination Thesis, then the contextualist has a viable way of resisting the argument from that Thesis to relativism. So it will suffice for my purposes to show that that argument doesn't go through given a view of personal identity that is at least as plausible as the one MacFarlane tacitly assumes.

There are a number of alternative accounts of personal identity that are relevant here, but for the sake of simplicity, I shall focus my energies on developing the one I find most plausible. The view I want to discuss is a slight variant on the ‘coinciding persons’ view of Lewis (1976). According to this view, in cases of fission there are in fact two persons who *coincide* prior to fission and then ‘come apart’ afterward. For example, if I am about to undergo fission, there are in fact two people seated in this chair right now; in fact, for every time  $t$  in the relevant birth-to-fission interval, the two of us have been in the same place at  $t$ . Fission will separate us, and we will no longer have to share space in this way. If this view is developed in conjunction with the doctrine of temporal parts—as it might, but need not, be—the two of us share the same birth-to-fission temporal part, but share no post-fission temporal parts.<sup>16</sup>

One formal difference between this view of personal identity and the one MacFarlane seems to presuppose concerns the following thesis:

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<sup>15</sup>See also Parfit (1984, 228–229).

<sup>16</sup>On the doctrine of temporal parts, see Sider (2001).

For any individual  $x$ , time  $t$ , and branches  $w, w'$ , if  $x$  exists at  $t$  and  $w$  and  $x$  exists at  $t$  and  $w'$ , then  $w \approx_t w'$ .

This constraint implies that the life-history of an individual never has the shape of a tree. Note that if  $\text{Jake}_1$  is identical to  $\text{Jake}_2$ , then this constraint is violated. For then  $\text{Jake}_1$  would exist at Tuesday on  $w_0$  and at Tuesday on  $w_1$ , even though  $w_1$  is not accessible from  $w_0$  on Tuesday. In contrast, the coinciding persons view respects this constraint.

The version of the coinciding persons view we shall consider is closely related to one discussed by Saunders and Wallace (2008).<sup>17</sup> On this approach,  $\text{Jake}_1$  and  $\text{Jake}_2$  coincide on Monday (and the singular term  $\text{Jake}_0$  would, on this view, seem to be indeterminate in reference between  $\text{Jake}_1$  and  $\text{Jake}_2$ ). Since we have two persons here, if we continue to individuate contexts via speakers, it follows that we have two contexts where we previously thought we had just one. Let  $c_0^1$  be the relevant context whose time is Monday and whose speaker is  $\text{Jake}_1$ , and let  $c_0^2$  be the relevant context whose time is also Monday, but whose speaker is  $\text{Jake}_2$ .

I want now to revisit the question of how a contextualist might define the notion of truth at a context given this view of personal identity. I shall first argue that, if a contextualist adopts this picture, they should not accept the same conception of contexts that the Orthodox Supervenientist and the relativist endorse. Instead, they should—for reasons independent of anything to do with relativism and retraction—endorse what I shall call the *coincidence-friendly* conception of contexts. And it turns out that, when one marries this conception of contexts to the supervenientist definition of truth at a context, the resulting theory—‘Coincidence-Friendly Supervenientism’—avoids MacFarlane’s objection to Orthodox Supervenientism. The resulting theory thus provides the contextualist with a way of resisting the argument for relativism, at least when that argument is understood as presupposing concrete branching.

We can begin by considering the following sentence:

- (4) Tomorrow I will enjoy sunny weather.

$\mathcal{T}Si$

Given the view of personal identity we are presupposing, it would be natural to suppose that this sentence is false at  $c_0^1$  and true at  $c_0^2$  (recall Figure 1 again). For it seems that  $\text{Jake}_1$  will not be enjoying sunny weather on Tuesday, for he ends up at  $c_1$  on Tuesday and it’s raining on Tuesday at  $c_1$ . And it seems that  $\text{Jake}_2$  *will* be enjoying sunny weather on Tuesday, since he ends up at  $c_2$  on Tuesday and it *is* sunny on Tuesday at  $c_2$ .

Although our formal language doesn’t contain a singular term that translates the first-person pronoun nor any relation symbols, it isn’t hard to see how our recursive semantics would extend to this case:

<sup>17</sup>In particular, like Saunders and Wallace, and unlike Lewis, I assume that the subjects of attitudes and speech acts are *persons* rather than person-stages. But the ultimate postsemantic view developed here is not, as I understand it, the view Saunders and Wallace (2008) advocate. The view being suggested in the text is closer to what Wilson (2011) calls *literal fission*. See also Ismael (2003), Ninan (2009), and Sider (2018) for relevant discussion.

$\llbracket Si \rrbracket^{c,w,t} = 1$  iff  $x_c \in I(S, w, t)$ , where  $x_c$  is the speaker of  $c$  and  $I(S, w, t)$  is the extension of  $S$  at  $(w, t)$ .

Now, if we combine this recursive semantics with Orthodox Supervaluationism, i.e. with the coarse-grained conception of contexts and the supervaluationist definition of truth, we get an unwelcome prediction. For that view would seem to predict that (4) is false at  $c_0^1$  (a good prediction), and neither true nor false  $c_0^2$  (a bad prediction). To see how the first prediction results, note first that Jake<sub>1</sub> is presumably not in the extension of *enjoys sunny weather* at  $(w_0, \text{Tuesday})$ , since it rains on Tuesday in  $w_0$ . But nor would Jake<sub>1</sub> seem to be in the extension of that predicate on Tuesday at any other branch that flows through  $c_0$ , since he doesn't exist on Tuesday on any of those other branches. That's the good prediction; now for the bad one. Note that while Jake<sub>2</sub> is in the extension of *enjoys sunny weather* on Tuesday at both  $w_1$  and  $w_2$ , he is presumably not in the extension of that predicate on Tuesday at  $w_0$  for the simple reason that he does not exist at  $w_0$  on Tuesday. Thus, the present view seems to predict that (4) is neither true nor false at  $c_0^2$ , when it should predict that that sentence is true in that context.<sup>18</sup>

The problem is that the present version of supervaluationism 'supervaluates' over *all* the branches flowing through a context, even those that don't 'fully contain' the speaker. So when we consider whether (4) is true as uttered by Jake<sub>2</sub> on Monday, supervaluationism takes into consideration branches, like  $w_0$ , on which Jake<sub>2</sub> doesn't exist after Monday. We get better results if we instead supervaluate over only those branches that contain the speaker. One way to implement this is to adopt a different definition of context. To state that definition, it will first help to define the notion of 'containment' appealed to above:

**Definition 4.** For any branch  $w$  and individual  $x$ ,  $w$  *contains*  $x$  iff: for any time  $t$  and branch  $w'$ , if  $x$  exists at  $t$  in  $w'$ , then  $x$  exists at  $t$  in  $w$ .

For example: branch  $w_0$  does not contain Jake<sub>2</sub>, since Jake<sub>2</sub> exists on Tuesday on  $w_1$  but does not exist on Tuesday on  $w_0$ . Then we have the following:

#### COINCIDENCE-FRIENDLY CONTEXTS

A triple  $(\sigma, t, x)$  consisting of a set of branches  $\sigma$ , a time  $t$ , and a speaker  $x$  is a context iff (i) for each  $w \in \sigma$ ,  $x$  exists at  $t$  in  $w$ , and (ii)  $w$  contains  $x$ .<sup>19</sup>

Let's call this view *Coincidence-Friendly Supervaluationism*:

#### Coincidence-Friendly Supervaluationism

- (a) Linear speakers

<sup>18</sup>The argument depends on the plausible assumption that, if an object fails to exist at a branch-time pair  $(w, t)$ , then it is not in the extension of *enjoys sunny weather* at  $(w, t)$ .

<sup>19</sup>Given LINEAR SPEAKERS, it follows that if  $(\sigma, t, x)$  is a context, then  $\sigma$  is a set of branches that overlap at  $t$ . So LINEAR SPEAKERS is compatible with the Non-Determination Thesis.

- (b) Coincidence-friendly definition of contexts
- (c) Supervaluationist definition of truth-at-context

This view yields better results when combined with the supervaluationist definition of truth at a context: sentence (4) comes out false at  $c_0^1$  and true at  $c_0^2$ , as desired.

But the crucial issue for our purposes is what this view says about sentence (1), *Tomorrow Berkeley will be sunny*. To that end, note that, on this account, sentence (1) is false at  $c_0^1$  and true at  $c_0^2$ . For the only branch flowing through  $c_0^1$  that contains Jake<sub>1</sub> is  $w_0$ , and Berkeley is not sunny on Tuesday on that branch. And the only branches flowing through  $c_0^2$  that contain Jake<sub>2</sub> are  $w_1$  and  $w_2$ , and Berkeley *is* sunny on Tuesday on both of those branches. And that means that this account, when combined with the contextualist retraction rule, yields no untoward predictions in MacFarlane’s case. To see this, suppose that both Jake<sub>1</sub> and Jake<sub>2</sub> assert (1) on Monday. Jake<sub>1</sub>’s assertion is false in his context,  $c_0^1$ . Jake<sub>2</sub>’s assertion is true in his context,  $c_0^2$ . Given the contextualist retraction rule, this implies that, on Tuesday, Jake<sub>1</sub> has a *pro tanto* reason to retract his earlier assertion, as he indeed seems to have. Moreover, this view does *not* predict that Jake<sub>2</sub> has, on Tuesday, a *pro tanto* reason to retract his earlier assertion. For according to the present view, that assertion is *true* in the context in which it was made, not neither true nor false (*per* Orthodox Supervaluationism).

Thus, Coincidence-Friendly Supervaluationism seems to face no problem concerning retraction in this case. Note the notion of truth that is pragmatically relevant according to Coincidence-Friendly Supervaluationism is *truth at a context*. Thus, Coincidence-Friendly Supervaluationism is a form of contextualism—a form of contextualism that is not vulnerable to MacFarlane’s retraction argument. Note that the Non-Determination Thesis is still true according to Coincidence-Friendly Supervaluationism. For example,  $c_0^2 = (\text{Jake}_2, \text{Monday}, \{w_1, w_2\})$ . There is no unique ‘world of the context’ for  $c_0^2$ . It is just that the Non-Determination Thesis manages to be true on this view in a way that doesn’t support MacFarlane’s argument for relativism.<sup>20</sup>

<sup>20</sup>Saunders and Wallace (2008) can be seen as endorsing Coincidence-Friendly Supervaluationism, together with the following thesis:

ONE OBJECT, ONE BRANCH

For any object  $x$ , times  $t, t'$ , and branches  $w, w'$ , if  $x$  exists at  $t$  on  $w$  and at  $t'$  on  $w'$ , then  $w = w'$ .

Their view seems to be that two macroscopic objects  $x, y$  may coincide at all times at which  $x, y$  exist; see Wilson (2011) for discussion. Once one makes this assumption, supervaluationism isn’t really needed, for each speaker will be contained in exactly one branch, which means that each coarse-grained context will determine exactly one branch (the unique branch that contains the speaker). In that case, Coincidence-Friendly Supervaluationism collapses into the Standard View. But framing it this way helps to clarify the relationship between the different views in the vicinity. Although I have not tried to spell the Saunders and Wallace view out in detail, the hints provided here may go some way to answering Belnap and Müller’s (2010) complaint that Saunders and Wallace offer “no rigorous semantic rules – rules that at least in idealized cases measure up to the standard set by Tarski...” (682).

## 7 Conclusion

What is the upshot of all this for relativism about future contingents? Since MacFarlane’s ‘semantic’ argument for the Non-Determination Thesis fails, that Thesis needs to be motivated by some additional metaphysical argument. But when we look more closely at alternative motivations for that Thesis, we see that there are really two versions of the Thesis, an Ersatz one and a Concrete one. And I have just been arguing that the argument from the Concrete Non-Determination Thesis to relativism only goes through given a certain implausible conception of personal identity over time. The contextualist can thus resist the argument from concrete branching to relativism by rejecting that conception of personal identity and adopting one that is certainly no less plausible than the one assumed by the relativist.

But that still leaves open the route from the Ersatz Non-Determination Thesis to relativism, an argument I have not objected to. But the ultimate success of that argument depends on whether or not ersatz branching can be motivated. And while the arguments in support of ersatz branching have a distinguished history, I count myself among the many philosophers who remain unconvinced by them. It is not obvious that acknowledging the openness of the future requires denying that there is a unique actual future (Barnes and Cameron 2009, Torre 2011). And it appears that one can resist arguments for logical fatalism without giving up the uniqueness of the actual future (Plantinga 1986). The Growing Block Theory is a piece of speculative metaphysics which faces many of the well-known problems faced by *presentism*, the doctrine that only present things and events are real. For example, the Growing Block Theory seems to face a challenge from physics, insofar as it appeals to an absolute distinction between past, present, and future (Putnam 1967, Turner 2020). In addition, ersatz branching faces the notorious ‘assertion problem’, a problem for which there appears no adequate solution.<sup>21</sup> These are contentious claims, and I shall not try to substantiate them here. But my sense is that the extant literature makes it easy for the contextualist to resist ersatz branching, and so makes it easy for the contextualist to resist the argument from ersatz branching to relativism.

So the challenges facing the relativist are more formidable than one might have thought. The relativist who hopes to argue from the Concrete Non-Determination Thesis has to persuade us to adopt what looks like a rather implausible conception of personal identity over time. The relativist who hopes instead to argue from the Ersatz Non-Determination Thesis faces the difficult task of trying to defend that Thesis in the first place. Thus, our discussion of relativism illustrates a more general point: theorists who employ branching time diagrams and explicit branching time models need to pay close attention to what those devices are being used to represent.

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<sup>21</sup>See Lewis (1986, 206–209), Belnap and Green (1994), Belnap *et al.* (2001), and MacFarlane (2014, 230–236) for discussion.



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