MOLINISM AND THE THIN RED LINE

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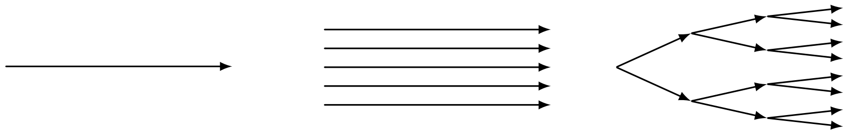
Abstract: Molinism is an attempt to do equal justice to divine foreknowledge and human freedom. For Molinists, human freedom *fits* in this universe for the future is open or unsettled. However, God's middle knowledge — God's contingent knowledge of what agents would freely do in this or that circumstance — underwrites God's omniscience in the midst of this openness. In this paper I rehearse Nuel Belnap and Mitchell Green's argument in "Indeterminism and the Thin Red Line" against the reality of a distinguished single future in the context of branching time [2], and show that it applies applies equally against Molinism + branching time. In the process, we show how contemporary work in the logic of temporal notions in the context of branching time (specifically, Prior–Thomason semantics) can illuminate discussions in the metaphysics of freedom and divine knowledge.

» 3 PICTURES

I will step back from the large themes of divine foreknowledge and human freedom, to start with three different conceptions of the structure of *moments in time*, and how we are to conceive of different possible outcomes of chance events and choices.[1] These three conceptions can be depicted as follows:



*See `http://consequently.org/writing/molinism-trl/` for the latest version of the paper, to post comments and to read comments left by others. ¶ My intellectual debt to Nuel Belnap is obvious in what I have written, but is worth recording making explicit, with gratitude. ¶ Thanks to Ken Perszyk for the invitation to come to the Molinism Conference in Wellington in June 2008, and to Ed Mares and Rob Goldblatt and the Marsden Fund of New Zealand for flying me across the Tasman. ¶ This paper is *so* rough it probably shouldn't be read, let alone cited. ¶ The writing of the paper was aided by the ARC Discovery grant DP0556827, and The Warumpi Band's album, *Too Much Humbug*.

[1] These aren't the only pictures one might have, of course: relativistic physics teaches us that there is no absolute frame-invariant notion of simultaneity, and so, these three pictures are *idealisations*. If you like, think of each picture as viewed from far away: the stem of the arrow of time is *thick* and there need be no such thing as a unique way to cut a *slice* through any one event in that stem. This issue is largely independent of everything I discuss here. For illuminating discussion concerning how to combine *branching* and *relativity*, start with Nuel Belnap's classic paper "Branching space-time" [1].

We can think of moments in time as arranged linearly, in a history, and all moments in time as constituting a single unified history, ordered[2] from earlier-to-later. Perhaps the line has a beginning, perhaps it has an end. Perhaps it does not. The important fact is that all moments are in the one history. They are all jointly possible: if this is the *actual* history, they are all jointly *actual*.

In the second picture, there are many different possible histories. In one, I wear a brown tie on June 11, 2008, and in another, I wear a green tie on June 11, 2008. Any possible outcome of a chance event or a choice is realised in some history or other. But within each history, moments are ordered from earlier to later, just as in the case of events being ordered in a single history. The event of me wearing a brown tie on June 11, 2008 is preceded by a *different* history to the history preceding the event of me wearing a green tie on June 11, 2008. Histories do not intersect.

In the third picture, chance events and choices have multiple possible outcomes, each of which are events ordered in time, but the ordering differs. Now a choice or a chance event is represented in the ordering by *branching*: the two states of affairs of 'Greg wearing a green tie on June 11, 2008' and 'Greg wearing a brown tie on June 11, 2008' are *later than* some *same* moment of time prior to the choice being made. Prior to my choice of tie, in a branching time understanding temporal priority, the two possible events are both *later than* the event of the choice, and *the very same event* (the antecedent circumstances of the choice) is in two histories: one in which I wear a green tie, and another in which I wear a brown tie. (And many others besides.)

How are we to understand these three pictures? Let's grant that we are interested in developing an understanding of the world in which there is either genuine chance or choice (and maybe both), in which there is a future (there is something that *will be the case*, even though it may not yet be *settled* what that is), and which is generally theoretically plausible and not too outlandish. I take it that the Molinist can see the virtue of these three criteria: we have freedom to choose, so there are *choices* in some sense or other;[3] counterfactuals of freedom are true, so there is something that I *will do* in each appropriately specified circumstance; and it is hard to find a philosophical sensibility with *no place* for ontological economy.

So, consider these three different conceptions of time, one by one, on the three criteria of *ontological economy*, *objective indeterminacy*, and the presence of a *genuine future*.

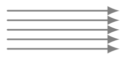
For the single arrow of time, there is great ontological economy. One may quibble about the status of past present and future events, and whether they are all

[2]Perhaps merely partially ordered, at the micro-level — see the previous footnote.

[3]I acknowledge that one may be a *compatibilist* Molinist [4]. I set this position aside for now.

equally real or real 'in the same way,' but putting that aside, and comparing the view with its rival conceptions here, you cannot go better than this for economy. Similarly, the future is well understood. For any point along the arrow of time, future events are those events to the right, and past events are those to the left. If g is true at some point along the line, then *after that* $\langle - \rangle g$ is true.[4] For any moment of time, we have a past, we have a future. We may not *know* what that future holds, but statements about the future are true, in virtue of what is there.

The single history fares less well with objective indeterminacy. My choice of green or brown tie may be explained in the picture, but the event of my choice of the brown tie on June 11, 2008 (given that I wear a *green* tie that day) does not occur at all. If we want to explain the truth of 'I *could* have worn a brown tie' in terms of some (merely possible) circumstance in which I *do* wear a brown tie, then this picture does not provide the raw materials. We must expand the picture with more events. There are two general ways to do this: One is to simply multiply histories.

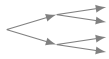


Here, we have just as much of a future as we had before. At any moment of time, $\langle + \rangle g$ is true if and only if there is a later moment (along that history) in which g is true; $\langle - \rangle g$ is true if and only if there is an earlier moment (along that history) in which g is true. The logic of temporal notions is unchanged. We have indeterminacy of a sort, too: some histories involve me wearing a green tie on June 11, 2008, and others involve me wearing a brown tie on that date (and presumably, many involve me wearing no tie, and don't involve me). That much is true: however, many friends of choice and chance think that there is something unsatisfactory about this picture when it comes to its analysis of indeterminacy. For my choice of tie to be *available* and not merely *hypothetical*, then prior to the moment of choice, the two possible events must both be possible future events of this very moment of choice. On this picture, we don't have that result. To be sure, the two different events of (g) a June 11, 2008 in which I'm wearing a green tie, and (b) a June 11, 2008 in which I'm wearing a brown tie, have corresponding *antecedent choice events* in which I'm standing at my wardrobe thinking of what to wear.[5] But on this picture, those choice events are different locations on the timeline. Given *where I am* at the moment of choice, there is only one possible outcome. The other outcome is possible in the hypothetical (had things gone differently; had I been in a *different* choice moment) sense, but it is not possible in *any* stronger sense. So, we have indeterminacy, but not objective indeterminacy—or so it appears.

[4] I use '$\langle - \rangle p$' to mean 'at some earlier moment, p.' Similarly '$\langle + \rangle p$' means 'at some *later* moment, p' and '$[+]p$' means 'at *all* later moments, p' and '$[-]p$' means 'at all earlier moments, p.' In other words '[ ]' means 'all' and '$\langle\ \rangle$' is 'some' and '$-$' is 'earlier' and '$+$' is 'later'. The notation is borrowed from modal logic, where a box is used for necessity and a diamond for possibility.

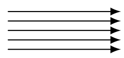
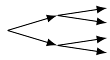
[5] Actually, having written this in advance, I don't think that's what's going to happen.

The 'multiple linear histories' picture has one further issue that is the flip-side of the concern voiced above: it suffers from massive ontological inflation. If we are to think of these as real events, then we have ontological inflation on a truly immense scale, for now, we not only have *two* different choice situations involving me standing in front of my wardrobe, contemplating ties, but we have innumerably many of these, for they proliferate with every subsequent choice or chance event throughout time. It is one thing to have ontological profligacy by admitting a circumstance in which I choose a green tie, and another in which I choose brown. It is another to 'backdate' such choice, to require that each choice brings with it a duplication of history to that point. It is for this reason that many find the picture of *branching time* compelling:



We have objective indeterminacy: an antecedent choice event c can be followed both by a consequent choice g and a choice b such that *both* are not part of the same history. The history between g and b however is *shared*, so while there is ontological profligacy of a sort, it is just what is required by considering both possible outcomes of a chance or choice event as *outcomes*. Where this picture falls short is on the matter of the future. Now take the circumstance c in which I am contemplating my choice of tie: is it the case that $\langle + \rangle g$ or $\langle + \rangle b$? Looking *backwards*, a branching time picture can tell us what *has* happened, because each point has a unique *past* history. But the picture does not determine a *future* history past any choice.[6] Given that $\langle + \rangle g$ (it will be the case that g) doesn't mean either that it *must* be the case that g (we're not asking that it be *settled*) nor that it *might* be the case that g (we don't want it to both be the case that I will wear a green tie *and* that I'll wear a brown tie) — both of which we *could* interpret on this picture — our structure doesn't give us enough materials to interpret future tense statements.

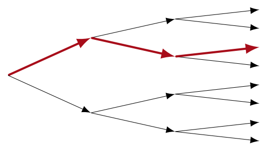
So, here is our scorecard:

			
ECONOMY	*excellent*	*terrible*	OK
OBJECTIVE INDETERMINACY	*no*	*no*	*yes*
A FUTURE	*yes*	*yes*	*no*

[6] I have not specified what properties are satisfied by the 'priority' ($\leqslant$) relation in a branching time picture. Setting aside problems of simultaneity and considering times as maximal world-slice events then (a) *reflexivity* ($m \leqslant m$), (b) transitivity (if $m_1 \leqslant m_2$ and $m_2 \leqslant m_3$ then $m_1 \leqslant m_3$), (c) antisymmetry (if $m_1 \leqslant m_2$ and $m_2 \leqslant m_1$ then $m_1 = m_2$) and (d) *historical connection* (for any moments m_1, and m_2 there's some $m_3 \leqslant m_1$ and $m_3 \leqslant m_2$) will do.

It is tempting to *combine* the three conceptions of the metaphysics of time to provide something of the benefits of each picture. From the branching picture, we would like objective indeterminacy. From either of the other pictures we would like a unique future.

One natural option, then is to add to our picture, the *thin red line*: a single path through the maze of choices which is the way things *actually* turn out. At any choice point along that path, there are options, but nonetheless there is always a single option that *actually* obtains. At any antecedent choice circumstance along the path of history, there are options that are genuinely possible (in the sense of being genuinely *later* than this, and part of *some* history involving this moment), but only one of those is the option that *will* obtain.[7] It is an appealing picture.



Unfortunately, it can't be right.

» 1 ISSUE

At least, it can't be right in the 'thin red line' is to be any help in determining when statements of the form $\langle + \rangle p$ are true. That is, a thin red line — a distinguished 'actual history' in a branching time structure — is inert when it comes to the truth or falsity of claims about the future. I will rehearse this beautiful argument of Belnap and Green [2] in this section, and then in the next section draw out the analogy with Molinism.

Belnap and Green point out two problems with the thin red line. The first and simpler problem is sufficient to rule out the straightforward picture: let's consider a branching time structure with a distinguished history TRL.[8] It is fine enough (for the moment) to think of $\langle + \rangle p$ as true at a moment along TRL if and only if there is some later moment along TRL at which it is true. But what of moments that are off the thin red line? If $m \notin$ TRL how are we to evaluate $\langle + \rangle p$ at m? Had I chosen a brown tie instead of a green tie, then there would have been other things that would have then happened, and there would have then been a different history instead of the one which actually obtains. The history TRL is not enough to evaluate statements of the form $\langle + \rangle p$ at moments off TRL. The thin red line is not enough.

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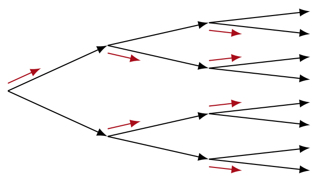
[7]Actually, one can have branching time structures in which there fail to be well-defined 'choice points' for outcomes, because of infinite branching [3]. Nothing here turns on this, but it is very much worth keeping in mind that branching time structures can be more complicated than we can easily depict.

[8]A history is a maximal collection of moments totally ordered by $\leqslant$.

It would seem desirable, then, to modify the picture so that instead of a single thin red line, there is, for any moment of time, a unique specified history passing through that time: that is, the history that is the future 'given that we've got here.' Instead of a single TRL, we have, for every moment m, a relativised TRL(m), the thin red line, *through* m. We can depict this in simple (finite) cases by specifying at each choice point which direction to take from there, since in these branching time structures, the past is determined and we need no directions concerning the way from which we have come.



There is no doubt that this helps. We now have a way to evaluate future tense statements at every moment, whether on or off TRL. This requires both more and less information than the mere specification of which history is TRL: *more*, in that a distinguished future is specified for every moment; and *less*, in that a unique thin red line is determined only when we have some place to start. If we have no first moment, no distinguished place for the history to start, then there may be equally good paths on each of which no 'wrong turn' was taken. Call the view that a branching time structure has a TRL(m) for each moment m, commitment to a '*local* thin red line'.[9]

Unfortunately, having a local TRL is not enough to solve the problems of the future tense, but to see why, we need to consider the logic of the past and future tenses a little more. We have already referred to the way that $\langle + \rangle$ should be

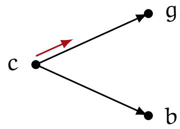
[9]A history h contains 'no wrong turns' if and only if $h = \text{TRL}(m)$ for each $m \in h$. Here is a model in which many histories have this property: the moments are all the descending infinite streams of real numbers — infinite sequences $\langle n_0, n_1, n_2, \ldots \rangle$ where each number n_{i+1} is smaller than its predecessor n_i. The immediate successors of a stream $\langle n_0, n_1, n_2, \ldots \rangle$ are the streams $\langle n_{-1}, n_0, n_2, n_3, \ldots \rangle$ and the temporal ordering is the reflexive transitive closure of the immediate successor relation. So, $\langle 0, -1, -2, -3, \ldots \rangle$ is a moment, and $\langle 1, 0, -1, -2, -3, \ldots \rangle$ and $\langle 2, 0, -1, -2, -3, \ldots \rangle$ and $\langle \pi, 0, -1, -2, -3 \ldots \rangle$ and $\langle r, 0, -1, -2, -3, \ldots \rangle$ for any $r > 0$ are immediate successors of that moment. A moment's predecessors are found by stripping initial elements from the head of that stream: clearly each moment has a unique totally ordered collection of predecessors, but the same is not true of successors. A history can be represented by a two-way stream $\langle\!\langle \ldots, n_{-2}, n_{-1}, n_0, n_1, n_2, \ldots \rangle\!\rangle$. The moments in a history are the closed-left/open-right segments of the two-way stream.

Given a moment $\langle n_0, n_1, n_2, \ldots \rangle$, define the thin red line from that moment to be the two-way stream $\langle\!\langle \ldots, n_0 + 2, n_0 + 1, n_0, n_1, n_2, \ldots \rangle\!\rangle$, in which from that moment on we simply add 1 to the head of the stream. A history h takes no wrong turns when $n_i - 1 = n_{i+1}$ for each i: in this case $h = \text{TRL}(m)$ for each m on h. But this doesn't determine a unique history with no wrong turns: take $\langle\!\langle \ldots 2 + \epsilon, 1 + \epsilon, \epsilon, -1 + \epsilon, -2 + \epsilon, \ldots \rangle\!\rangle$ for any ϵ from 0 to 1.

FUN LOGICAL EXERCISE #1: instead of discrete time, make this continuous, by taking histories to be continuous functions from $\mathbb{R} \to \mathbb{R}$.

FUN LOGICAL EXERCISE #2: modify the setup minimally so that *all* histories contain 'wrong turns' but TRL(m) is defined for every m.

stronger than '*might be*' and weaker than '*must be*'. For $\langle + \rangle p$ to be true at a moment in a branching model we need more than its truth in some future moment, and less than its truth in some future moment in every history through here. With TRL(m) we have what appears to be a *via media*: we take $\langle + \rangle p$ to be true at m if and only if p is true at some point further on along TRL(m). Now we have a way to evaluate future tense claims at every moment. Unfortunately, it has a problematic consequence. Consider the following setup:



Here, at the moment at which c is true, $\langle + \rangle g$ is true. I *will choose a green tie*. At the moment at which g is true, it is also the case that it *was* the case (at all earlier times) that I *would* choose a green tie $[-]\langle + \rangle g$. However, this is *also* the case where b is true. There, in that circumstance, g is not true, but it *was* the case that $\langle + \rangle g$! Back at the prior moment c, what was *going to happen* (g, wearing a green tie) *didn't happen*. Similarly what *did* happen (b) was going to *not* happen: it *was* the case that $[+]\neg b$ (let's suppose that I get sick of green and brown ties and these two tie-wearing occasions are the last on these two branches). The results here are not merely odd: they indicate the crucial flaw in local thin red lines in a branching time model.[10] The principle violated is the familiar tense logical principle

If p then it always was the case that it will be the case that p.

Or, put more succinctly, as an entailment:

$$p \vdash [-]\langle + \rangle p$$

The failure of this principle is why the thin red line is to be rejected — at least by the friend of branching time who finds a place for the *via media* future tense between *must be* and *might be*. Why accept this principle? There is much to be said here, and Belnap and Green's paper contains much fine material about the nature of assertion and the analogy between assertion and betting. Here, I will just give one argument to the effect that this principle is valid. Suppose at point c, as I stand looking at my tie collection, my son Zachary and my spouse Christine are there, and Zachary says "Dad will wear a green tie" and Christine says, "Greg will wear a brown tie." Then, retrospectively, from the point of view of g, what Zachary said at c *was* correct, and what Christine said *was* incorrect.

[10]This is to say *nothing* against models in which we indicate at each branch point the range of *probabilities*, or what is *more likely*. But there is nothing problematic about saying that the outcome of lower probability — even an outcome of *zero* probability, I think — obtains. There is something deeply problematic about taking a possible circumstance and saying that *had that been the outcome*, the outcome that was not going to obtain, did obtain.

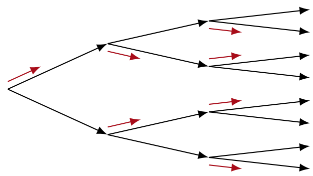
Conversely, from the point of view of b, what Zachary said was correct, and what Christine said was true. If we are truly in a moment c which contains *both* g and b as possible moments, then there is nothing in c itself that settles the matter, for from the perspective of a history containing c and then g, $\langle + \rangle g$ is true at c, but from the perspective of a history containing c and then h, $\langle + \rangle g$ it is false at c. The same would hold were Zachary or Christine (or anyone else) to make the (risky) prediction at any time prior to my choice, and the result would be the same. If g is the case, then any prior prediction – to the effect that it will be the case that g – pays off.

Future tense statements are true or false at a moment relative to a history through that moment, and if we wish to get the logic of our assertions right (granted a branching time understanding of moments) then the thin red line through a moment is completely inert in evaluating statements of the form $\langle + \rangle p$. The result is Prior–Thomason path semantics for indeterminist time [5].

What are we to say about the status of $\langle + \rangle g$ at c itself, independently of any path through c? We can say that at c, $\langle + \rangle g$ is *unsettled*, for at some paths through c is is true, and at others, it is false. Truth at a point can be determined by supervaluation over truth at point/history pairs, and objective indeterminism gives rise to truth value gaps. These are innocuous gaps, to the same effect as considering a *moment* to be a bundle of histories which agree up to some point. However, the metaphysics is different, for it is not a matter of you being at some place or other but not knowing which one you're in. On this picture, indeterminacy is *not* ignorance of location in that sense. Rather, you are at a determinate spot on the map (barring other indeterminacy, at least). It is unsettled which future path we (together) will take.

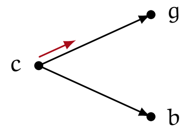
» 1 ANALOGY

Now we have the raw materials ready to apply to Molinism. The analogy should be clear. Consider the local TRL picture:

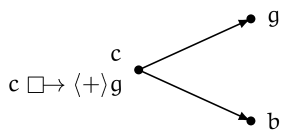


If all branch points arise out of the choices of free agents, then we can think of the annotating arrows as determined by counterfactuals of creaturely freedom (CCFS).[11] In particular, in our prosaic model of choice featuring c, g and b, we can think of the little fragment of a structure

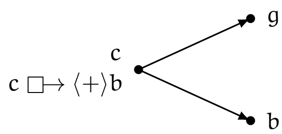
[11] A CCF is a counterfactual statement of the form 'were agent a placed in circumstance c, she would freely choose to ϕ.' The precise boundaries between CCFS and other counterfactuals do not need to detain us: we need only note that our prosaic tie-choosing-situation is one about which we can form CCFS of the form we discuss below.



as determined by the fact that $c \mathrel{\Box\!\!\rightarrow} \langle + \rangle g$. If we choose the statements c, g and b carefully enough, they are the right sort of things to ensure that $c \mathrel{\Box\!\!\rightarrow} \langle + \rangle g$ and $c \mathrel{\Box\!\!\rightarrow} \langle + \rangle b$ are CCFs. How are we to choose? By taking c to be comprehensive enough to take in a description of the world up until my choice is made, and to take g and b to include 'Greg freely chooses the green tie' and 'Greg freely chooses the brown tie' respectively (let's suppose that some compulsion means that I am not free to refrain from wearing a tie, or expand the example appropriately). If c is comprehensive enough, the Molinist is committed to one of $c \mathrel{\Box\!\!\rightarrow} \langle + \rangle g$ or $c \mathrel{\Box\!\!\rightarrow} \langle + \rangle b$ is true. So, let the arrow point in the direction corresponding to the true counterfactual.



Now we see that we are in a bind: Consider what would have happened had I chosen b. Then the CCF $c \mathrel{\Box\!\!\rightarrow} \langle + \rangle g$ wouldn't have been true at c, it would have been $c \mathrel{\Box\!\!\rightarrow} \langle + \rangle b$ that was true instead



Given a semantics for temporal phenomena including objective indeterminacy which is not merely ignorance of location, CCFs must be *unsettled* at the moment of choice. In a branching time structure, the truth of a CCF like $c \mathrel{\Box\!\!\rightarrow} \langle + \rangle g$ varies not merely with the moment of choice but also with how history turns out. Given that history turns out differently in different branches, it is not settled at the moment of choice.

This gives rise to a puzzle for the Molinist. How can a CCF be known by God if it is unsettled? If everyone's *epistemic* alternatives in a situation at least include the *objective* alternatives (which seems quite plausible), then God does not know the truth of CCFs prior to choice, for they vary in truth value in objective alternatives (the alternative possible histories). But God is meant to know these CCFs prevolitionally, so *that* won't do.

Another option may recommend itself: perhaps God doesn't need to know CCFs them *at* c, perhaps God knows them *atemporally*. I think that this won't do for the Molinist, for the CCFs are meant to help ground God's omniscience, and at

c, if it is not settled that $\langle + \rangle g$ then it also is not settled at c that God atemporally knows that $\langle + \rangle g$ either: at least if 'God atemporally knows that p' entails p. (If p entails q and if q is unsettled, so is p. This is an elementary fact of Prior–Thomason semantics.) We may take it that God's knowledge is somehow atemporal, but our claims about God's knowledge aren't. If God is atemporally omniscient, then it is now true that God is atemporally omniscient. If God atemporally knows which CCFs are true, then God now atemporally knows which CCFs are true.

In desperation, the Molinist could reject the inference from p to $[-]\langle + \rangle p$, which was crucial to the puzzle. For reasons I have already rehearsed (the semantics of retroactive evaluation of past predictions) I think that this would be a mistake.[12]

» 4 RESPONSES

So, here is where we are: there are four responses a Molinist can take. I have already indicated that I think that the first three are untenable. Only RESPONSE 4 remains.

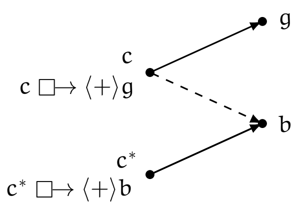
RESPONSE #1: $p \not\vdash [-]\langle + \rangle p$. That is, it does not necessarily follow from p that it always *was* the case that it *will be* the case that p.

RESPONSE #2: CCFs are *unsettled* before choice, but nonetheless, they can be *known* at that time (by God).

RESPONSE #3: CCFs do not need to be known before choice.

RESPONSE #4: Reject branching time.

In fact, this is not that surprising. If at c, God knows that $c \mathrel{\Box\!\!\rightarrow} \langle + \rangle g$, then at c, only circumstance g is epistemically possible for God, given God's knowledge *at* c. But then, state b is not in the future of *that* state c. At best, it is in the future of some similar prior state c^*, in which the true counterfactual is different.



Objective indeterminacy has collapsed into ignorance of location. If I am in circumstance c, then it is settled that I choose the green tie. The only way for

[12] I think this is not really a *new* puzzle. I think that it shares the a great deal of the intuition behind general puzzles concerning Molinism. I don't ask what makes a CCF true, but I do ask whether or not it is settled at a moment of choice, and what that means. I do not here go in for the difference between hard and soft facts, but I do go in for what is settled at a time and what is not. I use these latter concepts because their formal and structural features may be precisely deliniated, and I think that this is a Good Thing.

option b to obtain is for *things to have been different*. My freedom to choose otherwise must be understood partly in terms of our ignorance in which state I am in as I look at my wardrobe and contemplate my ties.

» REFERENCES

[1] NUEL BELNAP. "Branching space-time". *Synthese*, 92(3):385–434, 1992.

[2] NUEL BELNAP AND MITCHELL GREEN. "Indeterminism and the Thin Red Line". *Philosophical Perspectives (Logic and Language)*, 8:365–388, 1994.

[3] PERLOFF M. BELNAP, N. AND M. XU. *Facing the future: Agents and choices in our indeterminist world*. Oxford University Press, Oxford, 2001.

[4] KENNETH J. PERSZYK. "Molinism and Compatibilism". *International Journal for Philosophy of Religion*, 48(1):11–33, 2000.

[5] RICHMOND H. THOMASON. "Indeterminist Time and Truth-Value Gaps". *Theoria*, 36:246–281, 1970.