Penultimate draft of January 2022. Final version to appear in the *Philosophical Review*.

Assertion, Evidence, and the Future*

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Abstract: This essay uses a puzzle about assertion and time to explore the pragmatics, semantics, and epistemology of future discourse. The puzzle concerns cases in which a subject is in a position to say, at an initial time t, that it will be that ϕ, but is not in a position to say, at a later time t', that it is or was that ϕ, despite not losing or gaining any relevant evidence between t and t'. We consider a number of approaches to the puzzle, and defend the view that subjects in these cases lose knowledge simply by moving through time.

Keywords: assertion, time, knowledge, semantics, pragmatics

1 Introduction

There are cases in which a subject seems to be in a position to say, at an initial time t, that it will be that ϕ, but then appears not to be in a position to say, at a later time t', that it is or was that ϕ,

*Earlier versions of this material were presented at the Subjective Language Workshop in Berlin, the Perspective in Language Workshop in Uppsala, Tufts University, the University of Wisconsin-Madison, the University of Maryland, the Zermatt Philosophy Workshop, the 2019 Pacific APA, the Arché Reunion Conference (St. Andrews), the Virtual Language WiP Group, Auburn University, Johns Hopkins University, and the Delhi-Hyderabad *Darshan Anveshanas* Group. Thanks to these audiences and to David Balcarras, Derek Ball, Bob Beddor, Corine Besson, David Boylan, David Braun, Mike Caie, Fabrizio Cariani, Herman Cappelen, Kit Fine, Valentine Hacquard, Samia Hesni, Norbert Hornstein, Jeff Horty, Paul Horwich, Torfinn Huvenes, Jonathan Jenkins Ichikawa, Harvey Lederman, Jerrold Levinson, Marco Maggiani, Matt Mandelkern, Matt McGrath, Sarah Moss, Stephen Neale, Ram Neta, Jonathan Phillips, Paolo Santorio, Allen Sidelle, Gillian Sinnott, Elliott Sober, Rachel Sterken, Mark Thakker, Mike Titelbaum, Malte Willer, and Robbie Williams. For extensive written comments on this material, thanks to the editors of the *Philosophical Review* and to two anonymous referees.

despite not losing or gaining any relevant evidence between t and t'. Assertions about the future cannot always be reiterated (adjusting for tense) at a later time unless the speaker acquires more evidence in the meantime. Here is the sort of case I have in mind:

> **Beth case**
>
> Andy is a personal chef to a wealthy entrepreneur named *Beth*. Andy is making a new dish for Beth's dinner tonight (suppose that it's a Friday). Based on his knowledge of the sorts of foods that Beth usually likes, Andy says to his friend Chris:
>
> (1) Beth will enjoy this when she eats it.
>
> Andy finishes preparing the dish, and heads home for the night, before Beth gets back from work. When Beth returns, she eats the dish Andy has prepared, and thoroughly enjoys it.
>
> The next morning, another one of Andy's friends asks Andy, *Did Beth enjoy the dish you made for her yesterday?* Andy hasn't heard from Beth or anyone else whether or not she enjoyed the dish.
>
> I think it would seem odd here for Andy to flat-out assert that Beth enjoyed the dish, that is,that is, to say,
>
> (2) Yes, she enjoyed it.
>
> In order to make that claim, Andy would need to be more directly connected to the fact that Beth enjoyed the dish in question. For example, Andy would need to have been told by Beth or someone else that she did in fact enjoy the dish. Absent evidence of that sort, it would be better for Andy to hedge in some way, that is, to say one of the following:
>
> (3) She probably enjoyed it.
>
> (4) She must have enjoyed it—it was just the sort of thing she usually likes.[1]

[1] This case was first discussed in Ninan 2014, 306.

In this example, it seems that Andy loses his standing to say something despite not losing or gaining any relevant evidence. It is worth mentioning that the general contrast seems to be between assertions about the future, on the one hand, and assertions about the past *and present*, on the other. For example, it doesn't seem that Andy can say, at dinner time on Friday, *Beth is enjoying the meal right now*. But for simplicity, I will for the most part set assertions about the present aside and focus on the contrast between the past and the future.

Although most of our discussion will concern the Beth case, it is of course not the only example of this phenomenon. Once one sees the general structure of these cases, new examples are not difficult to construct. Here is another:

> **Rain case**
>
> It's Friday. Ellen has been visiting her friend Frank in Chicago for the last few days, but the visit is over and he is driving her to the airport. He's telling Ellen about an outdoor concert he's planning to attend tomorrow, but he's worried about the weather. He asks Ellen if she can check the forecast. Ellen looks on her phone, and says,
>
> (5) Bad news—it's going to rain tomorrow.
>
> Frank replies, *Oh, that's too bad.* Ellen catches her flight back to Boston.
>
> It does indeed rain all weekend in Chicago, and Frank's concert gets cancelled.
>
> On Monday, Ellen goes to work and bumps into a co-worker who is also a friend of Frank's. The co-worker also knew about Frank's plan to attend the concert, but hasn't yet heard whether or not it was cancelled. He asks Ellen what the weather in Chicago was like on Saturday. Ellen hasn't heard from Frank or anyone else what it is was like in Chicago on Saturday.
>
> Again, it seems to me that it would be inappropriate for Ellen to flat-out assert that it rained on Saturday in Chicago, that is, to say to her co-worker:
>
> (6) Unfortunately, it rained in Chicago on Saturday.

This is so even if she makes it clear what her evidence for that assertion is. If she wants to make a comment about what the weather was like in Chicago on Saturday, she needs to hedge:

(7) It was supposed to rain on Saturday.

Now while the phenomenon here is quite general, I should emphasize that I am not suggesting that *any* case in which (i) one is, at an initial time t, in a position to say that it will be that ϕ, and (ii) one does not gain or lose any relevant evidence between between t and later time t', is a case in which (iii) one is not in a position to say, at t', that it is or was that ϕ. I am merely claiming that *there are* cases in which (i)–(iii) all hold. The corresponding universal claim is false, a point to which we shall return (Section 6.5).

What is going on in these cases? How can it be that Andy loses his standing to assert something as he moves from Friday afternoon to Saturday morning, despite not gaining or losing any relevant evidence between those two times? In what follows, we examine three answers to this question.

The epistemic view. Suppose knowledge is the 'norm of assertion' in the sense that one is in a strong enough epistemic position to assert p iff one knows p. Then perhaps Andy loses his standing to assert the proposition that Beth enjoys the dish because he loses knowledge of this proposition as he moves through time. On Friday, Andy knows that Beth will enjoy the dish, but he no longer knows this on Saturday morning, and this despite not losing or gaining any relevant evidence in the interim. Alternatively, the point might be put in terms of justification rather than knowledge, but either way, the epistemic view sees our puzzle as primarily an epistemic one: the phenomenon arises because Andy loses some salient epistemic property as he moves through time.

The modal view. This view says that Andy doesn't lose knowledge of the fact that Beth enjoyed the dish—he can't lose this knowledge because he never had it to begin with. What Andy *does* know on Friday afternoon is something weaker: that Beth will *probably* enjoy it, or that she will enjoy it *if things unfold normally*. But knowing this on Friday afternoon is all Andy needs to know in order to utter the sentence *Beth will enjoy the dish*, because all that Andy would say in uttering that sentence is that she will probably enjoy it, or will enjoy it if things unfold normally. According to the modal view, the present phenomenon arises because of a feature of the semantics (or perhaps pragmatics) of future operators.

The implicature view. This view says that Andy knows, throughout the case, that Beth enjoys the dish. According to this view, Andy is prevented from asserting this proposition on Saturday morning because assertions about the past typically implicate (in Grice's sense) that one's relevant evidence is suitably direct. Thus, were Andy to say, on Saturday morning, that Beth enjoyed the dish, his utterance would implicate that he had heard from Beth or someone else that she enjoyed the dish. Since he has not heard this from Beth or anyone else, it would be misleading for him to utter this sentence. The implicature view sees the present phenomenon as arising from a pragmatic feature of utterances about the past.

There may be other approaches to our puzzle, but in what follows we restrict ourselves to investigating these three. I shall argue that, of these three views, the epistemic view is the most promising. After detailing some of the difficulties facing the implicature and modal views (Sections 3-4), we develop and defend a version of the epistemic view (Sections 5-7). According to the version of the epistemic view defended here, we are typically permitted to ignore possibilities in which the future fails to unfold in a relatively normal manner. Since this permission does not extend to possibilities in which the past failed to unfold in a relatively normal manner, this allows knowledge to be lost simply by moving through time, that is, with no change in the factors usually thought relevant to knowledge. Knowledge can be destroyed when the passage of time transforms a fact about the future into a fact about the past or present.

But before we begin examining the above three views, we first need to put in place some preliminary assumptions, assumptions that help to bring the issues here into sharper focus.[2]

[2]As an anonymous referee observes, the phenomenon discussed in this essay bears some resemblance to the 'acquaintance inference' associated with predicates of taste; see Pearson 2013, Klecha 2014, Ninan 2014, 2020, 2021a, Anand and Korotkova 2018, and Willer and Kennedy 2020 on that issue. In fact, cases like the Beth case first arose in connection with that issue (Ninan 2014). How the two phenomena relate is an interesting question, but will not be pursued here.

Note that in Ninan 2014, I did not attempt to give any kind of account of cases like the Beth case. Besson and Hattiangadi (2020) discuss the case from Ninan 2014 in a footnote (footnote 29 of their paper), suggesting a pragmatic treatment of the case; see footnote 10 below for a potential worry about their suggestion.

2 Preliminaries

Although I said above that Andy lost his standing to assert something as he moved from Friday afternoon to Saturday morning, that claim turns out to be somewhat controversial, a point we shall discuss later (Section 4). But let us begin by examining a simple argument in favor of it. The argument requires a few assumptions about propositions and the semantics of temporal expressions, as well as some further stipulations about the Beth case.

It will help to stipulate that Andy knows throughout the case that Beth eats the dish in question at 7pm on Friday. So his initial utterance of (1) is essentially equivalent to:

(1′) Beth will enjoy the dish at 7pm on Friday.

in the sense that he is in a position utter (1′) just in case he is in a position to utter (1). Similarly, (2) is, for Andy on Saturday morning, essentially equivalent to:

(2′) Beth enjoyed the dish at 7pm on Friday.

in the sense that he is in a position utter (2′) just in case he is in a position to utter (2). In what follows, we will often focus on (1′) and (2′) instead of their more natural counterparts (1) and (2). The explicit temporal adverbial *at 7pm on Friday* in the former pair makes it easier to compare the propositions expressed by those two sentences in the relevant contexts.

If we are content to waive some of the compositional complexities that such temporal adverbials raise (Dowty 1982), we can regiment (2′) as follows:

$\mathcal{P}_{f_7}$ (Beth enjoys the dish).

(We use f_7 to abbreviate *7pm on Friday*, s_9 to abbreviate *9am on Saturday*, and f_4 to abbreviate *4pm on Friday*.) Here we treat the past tense and the temporal adverbial *at 7pm on Friday* as forming a sort of compound operator, and we assume the following semantics for such operators:

$[\![\mathcal{P}_i\phi]\!]^{w,t} = 1$ iff $i < t$ and $[\![\phi]\!]^{w,i} = 1$.[3]

[3] Here we use "i" in the object language as a *time nominal*, an expression that names a time (Braüner 2017). We also use "i" in the metalanguage as a singular term that refers to the denotation of object language "i".

(The semantic theories discussed in this essay are presented in more detail in an appendix.)

We adopt the following account of the proposition expressed by a sentence at a context:

The proposition expressed by ϕ at c is: $\{w : [\![\phi]\!]^{w,t_c} = 1\}$.[4]

Now there are many objections to taking propositions to be sets of possible worlds, but this account is adopted here mainly for expository convenience: it makes it easier to connect the notion of a proposition to standard semantic theories of tense. We could avoid making this assumption, but this would complicate the exposition without offering any compensating benefit. Note also that this account of propositions assumes the truth of *eternalism*, the doctrine that no proposition varies in truth value over time. The reason we assume eternalism is that we are interested in comparing what an agent knows or is in a position to assert at various points in time, and such comparisons are more easily carried out assuming eternalism. Given eternalism, the question of whether a person loses knowledge as they move through time, for example, reduces to the question of whether there is a proposition they once knew but no longer know. Temporalism's account of knowledge loss is more complex, and so we set that view aside here for the sake of simplicity.

For the sake of concreteness, let us suppose that Andy's Saturday morning context is located at 9am on Saturday. Then, relative to that context, these assumptions imply that (2′) expresses proposition (8):

(8) $\{w$: $f_7 < s_9$ and Beth enjoys the dish at f_7 in $w\}$

Note that this proposition is essentially equivalent to the conjunction (intersection) of the following two propositions:

(i) the proposition that Friday 7pm is earlier than the time of the context (Saturday 9am), and

(ii) the proposition that Beth enjoys the dish at 7pm on Friday.

The first of these propositions simply relates the event time to the context time; the second tells us something about the world, namely that Beth enjoys the dish at 7pm on Friday.

[4]On the status of definitions like this, see, for example, Lewis 1980, Ninan 2010, 2012, Rabern 2013 and Yalcin 2021.

If Andy were to utter (2′), he would assert proposition (8). Since (8) is equivalent to the conjunction of (i) and (ii), it is relatively harmless to treat the question of whether Andy is in a position to utter (2′) on Saturday at 9am as equivalent to the question of whether he is in position to assert propositions (i) and (ii). Furthermore, I shall stipulate that Andy never loses track of time at any point in the case, which means that he *is* in a position to assert proposition (i) on Saturday morning.[5] Thus, the question of whether he is in a position to utter (2′) on Saturday morning reduces to the question of whether he is in a position to assert proposition (ii). We use "β" to denote proposition (ii). That is, $\beta := \{w : \text{Beth enjoys the dish at } f_7 \text{ in } w\}$.

We also assume the following standard definition of truth at a context (Kaplan 1989):

A sentence ϕ is true at a context c iff $[\![\phi]\!]^{w_c,t_c} = 1$.

Note that this assumes that there is a unique 'world of the context,' which, in the present setting, amounts to the assumption that there is a unique actual future. Proponents of a 'branching time' metaphysic might deny this, but how these issues look within that metaphysical framework is an issue I leave for another time.[6]

The foregoing assumptions will be held fixed for the remainder of the essay.

According to the preceding theory, past tense operators simply serve to shift the time of evaluation backwards. A parallel theory of future operators says that future operators simply serve to shift the time of evaluation forwards, and this is in some sense the standard theory of the future in tense logic and natural language semantics. We shall examine an alternative approach in Section 4, but for the moment, let us assume a simple time-shifting semantics for the future. We regiment (1′) as follows:

$\mathcal{F}_{f_7}$ (Beth enjoys the dish)

and offer the following semantics:

[5] Actually, within our framework, proposition (i) turns out to be the necessary proposition, and so Andy trivially knows it. We make no serious attempt to model temporally indexical knowledge here; we abstract away from that issue by simply stipulating that Andy never loses track of time.

[6] On branching time, see, for example, Prior 1967, Thomason 1970, 1984, Burgess 1978, Belnap et al. 2001, MacFarlane 2014, Ch. 9 and Ninan 2021b.

$[\![\mathcal{F}_i\phi]\!]^{\mathcal{E},w,t} = 1$ iff $t < i$ and $[\![\phi]\!]^{\mathcal{E},w,i} = 1$.

Note that I have included an extra parameter of evaluation, $\mathcal{E}$, here. This indicates that this clause is accepted by only one of the two semantic theories we shall be discussing, namely the *epistemic view*. Clauses, like the clause for $\mathcal{P}_i$ given above, that do not contain this extra parameter are assumed to be endorsed both theories (see the appendix for details).

Assume, for the sake off concreteness, that Andy utters (1′) at 4pm on Friday afternoon. Then given our assumptions this implies that, relative to Andy's Friday 4pm context, (1′) expresses the following proposition:

(9) $\{w\colon f_4 < f_7$ and Beth enjoys the dish at f_7 in $w\,\}$

As before, this proposition is essentially equivalent to the conjunction (intersection) of a pair of propositions:

(i) the proposition that Friday 7pm is later than the time of the context (Friday 4pm), and

(ii) the proposition that Beth enjoys the dish at 7pm on Friday.

As before, the first proposition simply relates the time of the context to the event time. The second proposition is 'about the world.' And note, in particular, that this second proposition is just β again. This means that (1′), considered at 4pm on Friday, is equivalent to (2′), considered at 9am on Saturday, *modulo* the information each contains about how each context time relates to the time of Beth's eating.

Since Andy never loses track of time in the Beth case, he knows, at 4pm on Friday, that the time of the context precedes 7pm on Friday. Thus, the question of whether he is in a position to utter (1′) on Friday afternoon again reduces to the question of whether he is in a position to assert β on Friday afternoon. So given these assumptions, the fact that Andy is in a position to utter (1′) on Friday afternoon, but not in a position to utter (2′) on Saturday morning, means that he is in a position to assert β on Friday morning, but not in a position to assert that same proposition on Saturday morning. So, according to this approach, there is something that Andy loses his standing to assert as he travels from Friday afternoon to Saturday morning.

One final preliminary. It is a familiar idea that assertions are subject to an epistemic norm of propriety (see, for example, Grice 1989, 27); this idea will play an important role in what follows. I shall assume in what follows the familiar view that *knowledge* is the norm of assertion, in the sense that a speaker x is in a strong enough epistemic position to assert proposition p at time t in world w iff x knows p at t in w.[7] While this view is quite influential, it is not uncontroversial, and a number of theorists maintain instead that *justification* (or some similar non-factive notion) provides the norm of assertion.[8] My assumption of the knowledge norm is largely for expository convenience: for the most part, the dialectic of this essay could equally well be conducted under the alternative assumption that justification is the norm of assertion. While we could proceed by trying to remain neutral on this matter, it will greatly simplify matters if we concentrate our attention on just one epistemic state, and knowledge is the state I have chosen. But for each of the views discussed in this essay—all of which make claims about knowledge—there is a counterpart view concerning justification. Readers who favor the idea that justification is the norm of assertion may wish to consider which of those counterpart views they favor.

But before we leave this issue, I should pause here to discuss the possibility that what is going on in our cases is that the subject's initial utterance is not in fact an assertion at all, but some sort of speech act that is subject to a weaker norm.[9] Perhaps Ellen, for example, is merely making a *prediction* or a *conjecture* about the weather, and perhaps these speech acts are subject to a norm that is weaker than the norm governing assertion. In the literature on the speech of act of prediction, the claim that some sincere utterances of declarative sentences are predictions and not assertions is typically supported by noting that it sometimes inappropriate to reply to such utterances by asking, *How do you know?* (Benton and Turri 2014). Suppose, for example, that we are skipping stones at the lake. I find a really flat stone and say, *This one will skip at least five times*. Here it would be odd for you to ask me, *How do you know?* If you did, I might say: *Well, I don't know, it's just a*

[7]Views along these lines are defended by Unger (1975), Williamson (1996, 2000), DeRose (2002), and Hawthorne (2004) among others. Williamson takes the knowledge norm to be constitutive of assertion; I understand it as a proposal for how to formulate the Maxim of Quality (Gazdar 1979, Benton 2016).

[8]See Douven 2006, Lackey 2007, Kvanvig 2009, and Brown 2010, among others.

[9]Thanks to an anonymous referee for raising this possibility, and for suggesting the 'skipping stones' example used below.

prediction. Let's see what happens. In contrast, the question *How do you know?* is usually thought to be appropriate in response to genuine assertions.

But if this is the diagnostic we use to distinguish (non-assertoric) predictions from genuine assertions, then it seems that some instances of our puzzle really do involve assertions about the future. Consider the Rain case. If Frank doesn't notice Ellen checking the weather forecast on her phone, he might by surprised when she answers, *It's going to rain tomorrow*—surprised because he's wondering how she knows this despite not having checked the forecast. He might then ask, *How do you know?* to which Ellen can say, *Oh, I just checked the weather on my phone*. The appropriateness of Frank's question suggests that Ellen's initial utterance was in fact an assertion, not merely a (non-assertoric) prediction.[10]

3 The implicature view

According to the implicature view, Andy knows throughout the story that Beth enjoys the dish. Given that knowledge is the norm of assertion, this helps to explain why he is in a position to assert this on Friday afternoon. But if he still knows this on Saturday morning, why isn't he in a position to assert it then? One answer is that if Andy were to assert this on Saturday morning, his assertion would implicate that he possesses direct evidence for the claim that Beth enjoyed dish. Since he doesn't possess such evidence, this implicature would be misleading, a fact that would presumably explain why Andy can't assert, on Saturday morning, that Beth enjoyed the dish. But why would his assertion generate this misleading implicature?

One possible answer to this question begins by returning to our earlier observation that, although Andy isn't in a position to utter (2), *Beth enjoyed the dish*, he *is* in a position to utter a hedged variant of that sentence, namely (4), *Beth must enjoyed the dish*. Now suppose, as Mandelkern (2019) suggests, that *must* ϕ and ϕ are 'informationally equivalent' in the sense that the essential effect of uttering either of these sentences is to make the common ground entail ϕ. If that is correct, then there is perhaps a sense in which *must* ϕ and ϕ are in competition with each other, insofar

[10]These remarks would also seem to cast doubt on the account of the Beth case suggested by Besson and Hattiangadi (2020, n. 29).

as a speaker who wishes to make the common ground entail ϕ can do so by uttering either one of these sentences (Mandelkern 2019, 253–254). But even if *must* ϕ and ϕ are informationally equivalent, they are obviously different. In particular, an utterance of *must* ϕ suggests that one's evidence for ϕ is in some sense indirect (von Fintel and Gillies 2010, 353–354). It is, for example, odd to walk in from the pouring rain and say, *It must be raining—I'm absolutely soaked*. So perhaps the competition between ϕ and *must* ϕ is sometimes resolved by exploiting this particular difference between them. For example, for a speaker who wants to communicate ϕ and who has direct evidence for ϕ, the competition will naturally be resolved in favor of ϕ—for such a speaker is in some sense prohibited from using *must* ϕ. This might also suggest, conversely, that for a speaker who wants to communicate ϕ and who has only indirect evidence for ϕ, the competition will tend to be resolved in favor of *must* ϕ. For if such a speaker uses ϕ instead, she leaves open the nature of her evidence; if she uses *must* ϕ, she does not.

So perhaps what is going on in the Beth case is this. Suppose Andy were to utter (2) on Saturday morning. Then his audience might reason as follows: "Andy could have conveyed the information that Beth enjoyed the dish by saying either (2), *Beth enjoyed the dish*, or by saying (4), *Beth must have enjoyed the dish*. Given that he didn't say the latter, that must be because his doing so would have been inappropriate. The most natural explanation for why it would have been inappropriate for him to say (4) is that Andy's evidence for the claim that Beth enjoyed the dish is direct, and (4) would have been appropriate only if his evidence for that claim had been indirect. So his evidence for the claim that Beth enjoyed the dish must be direct." Thus, if Andy were to utter (2) on Saturday morning, it would lead his audience to a false conclusion about the nature of his evidence.

This is an interesting idea, but I'm not sure how well it withstands further scrutiny. One worry about this proposal is that it threatens to predict that one can never say *must* ϕ if one is in a position to say ϕ. But that prediction simply isn't correct. For example: A and B are inside the house and hear a noise in the distance. B recognizes the sound as that of a lawnmower.

(10) (a) A: What's that?

(b) B: ✓ Someone's mowing the lawn.

(c) B: ✓ Someone must be mowing the lawn.

It seems to me that B may say either (10b) or (10c) in this situation. But suppose B says (10b). The foregoing view would seem to imply that this utterance should prompt A to reason as follows: "B could have conveyed the information that someone is mowing the lawn either by saying *Someone is mowing the lawn*, or by saying, *Someone must be mowing the lawn*. Given that she didn't say the latter, that must be because her doing so would have been inappropriate...". But that last claim just seems false: as we just observed, it seems fine for B to say *Someone must be mowing the lawn* in this scenario. Sometimes *must* is optional, a point often made in the literature (see, for example, Mandelkern 2019, 226).

Where did things go wrong? The problem is that that from the fact that a speaker didn't say *must* ϕ, it doesn't follow from the competition story that it would have been inappropriate for her to do so. All the competition story says is that for a speaker who wants to communicate ϕ and who has indirect evidence for ϕ, the competition will *tend to* be resolved in favor of *must* ϕ. The use of *tend to* suggests that it will sometimes *not* be resolved in favor of *must* ϕ. And there is an obvious reason why a speaker with indirect evidence might choose to say ϕ instead of *must* ϕ: ϕ is shorter. If the implicature view is to be maintained, some other story about how the hypothesized implicature is generated is needed.[11]

Let us say that an account of cases like the Beth case is *anti-skeptical* just in case it maintains that, on Saturday morning, Andy knows that Beth enjoyed the dish; otherwise a view is *skeptical*. The implicature view is an anti-skeptical view, but it may not be the only one. It is thus worth mentioning two problems that would appear to apply to *any* anti-skeptical account, for these objections

[11] An anonymous referee suggests that what might be going on in our lawnmower example is that it is unclear whether or not B's evidence for the claim that someone is mowing the lawn is indirect or not. It may then be up to B to decide whether or not that evidence should count as indirect or not. If he decides to count it as direct, he may not utter (10c) and so must utter (10b) (if he is to answer the question); if he decides to count it as indirect, he may utter either. This is plausible, but it is not clear how it helps the implicature view. For suppose we say it is unclear whether Andy's evidence on Saturday counts as indirect. Then we predict (falsely) that he may utter either (2) or (4) on Saturday: for Andy may choose to count his evidence as indirect, in which case he may (according to this account) utter either. Suppose we say instead that it is clear that his evidence is indirect. Then we again predict (falsely) that he may utter either. What is needed is an account that yields the result that one may not utter bare ϕ if it is clear that one's evidence is indirect. That would explain why Andy is not in a position to utter (2), at least on the assumption that it is clear that Andy's evidence is indirect. But no such account has been given. Moreover, if we had such an account, that would directly explain what needs explaining, and the additional story about how ϕ competes with *must* ϕ would not be needed.

target the claim that Andy knows, on Saturday morning, that Beth enjoyed the dish.

First, a number of philosophers hold—quite plausibly—that knowledge is a norm of practical reasoning, in the sense that one may use p as a premise in one's practical reasoning iff one knows p (see, for example, Hawthorne 2004, 30). Now, it seems to me that, on Saturday morning, Andy is not in a position to use the proposition that Beth enjoys the dish as a premise in his reasoning about what to do. Suppose, for example, he is planning the menu for the upcoming week. Imagine him reasoning as follows: *If Beth enjoyed last night's dish, I should make it again on Friday. Beth enjoyed last night's dish. So I should make it again on Friday.* It seems to me that Andy is not entitled to reason in this way; the most obvious explanation of this fact is that Andy doesn't know that Beth did indeed enjoy the dish in question.

Second, a number of philosophers hold—again quite plausibly—that ignorance is a norm of inquiry, in the sense that one may inquire into the question of whether ϕ iff one does not know whether ϕ.[12] To a first approximation, to inquire into whether ϕ is to attempt to find out whether ϕ. So this norm is perhaps motivated by the thought that you ought not waste energy attempting to find out whether ϕ if you already know whether ϕ. If ignorance is a norm of inquiry, and, as the anti-skeptic claims, Andy knows, on Saturday morning, that Beth enjoyed the dish in question, it would seem to follow that it is inappropriate for Andy to inquire into the question of whether she enjoyed it. But that just seems false. There would be nothing odd about Andy checking with Beth to see whether or not she enjoyed the dish—that might be a perfectly reasonable thing for Andy to do if, say, he's trying to decide whether or not to make that dish again. If ignorance is a norm of inquiry, that suggests, *contra* the anti-skeptic, that Andy does not in fact know on Saturday that Beth enjoyed the dish.

4 The modal view

I will return to anti-skepticism later in the essay (Section 7), but I take the preceding discussion to cast some doubt on the viability of that approach, particularly when it comes in the guise of

[12]For views in this vicinity, see Whitcomb 2010 and Friedman 2019.

the implicature view. So let us turn now to what I earlier called the *modal view*. In Section 2, we presented a simple semantics for future operators, one on which future operators simply serve to shift the time of evaluation forward. But while that semantics is in some sense the standard one, it is not wholly uncontroversial. One reason to doubt that approach is that, unlike the past tense, future operators often exhibit behavior characteristic of *modals*—epistemic modals in particular.[13] This seems potentially relevant in the present context, since, as we've just been discussing, it is sometimes easier to assert *must* ϕ than it is to flat-out assert ϕ.

To introduce the specific proposal I have in mind, let us begin with the notion of a *future possibility*. Given a possible world w and a time t, a world w' is a *future possibility for* w *at* t only if w' is exactly like w up to (and including) t; w and w' may differ thereafter. If w' is a future possibility with respect to w and t, we write $w \approx_t w'$. We assume that, for any time t, $\approx_t$ is an equivalence relation on the space of worlds. The views I want to consider are ones on which *will* quantifies over a distinguished subset of future possibilities, a subset that need not include the actual world. For example, according to Kaufmann (2005), *will* quantifies over the set of future possibilities that are *sufficiently likely*. According to Copley (2009), the uses of *will* in which we are interested quantify over the future possibilities that are *sufficiently normal*. Either of these views would suffice for present purposes, but we focus on Copley's normality-theoretic approach here, since it provides a useful contrast with the theory of knowledge developed later in the essay.

Copley's sufficiently normal future possibilities are what Dowty (1979) calls *inertial worlds*. David Lewis (p.c. to Dowty) glosses an inertial world for w at t as one in which a "natural course of events" takes place after t (Dowty 1979, 148). Given a world w and time t, let $N_{w,t}$ be the set of sufficiently normal future possibilities for w at t. Since every sufficiently normal future possibility is a future possibility, we have that for any w, t, $N_{w,t} \subseteq \{w' : w \approx_t w'\}$. But a crucial feature of this account is that a world w may fail to be a sufficiently normal future possibility for itself at a given time t; this will happen if something sufficiently abnormal occurs in w after t. So there may well be worlds w and times t such that $w \notin N_{w,t}$ (see the appendix for further details). The modal view then

[13] See Palmer 1986, Enç 1997, Klecha 2014, Winans 2016, and Cariani and Santorio 2018, among others.

offers the following account of $\mathcal{F}_i$:

$$[\![\mathcal{F}_i\phi]\!]^{\mathcal{M},w,t} = 1 \text{ iff } t < i \text{ and } \forall w' \in N_{w,t} : [\![\phi]\!]^{\mathcal{M},w',i} = 1.$$

The extra parameter $\mathcal{M}$ here indicates that this clause is accepted only by the modal view. Given the definition of the proposition expressed by a sentence at a context adopted in Section 2, it follows from the modal view that Andy's utterance of (1′) at 4pm on Friday expresses the following proposition:

(10) $\{w : \forall w' \in N_{w,f_4}$: $f_4 < f_7$ and Beth enjoys the dish at f_7 in $w'\}$

Note that, as before, this proposition is essentially equivalent to the conjunction (intersection) of two propositions:

(i) the proposition that Friday 7pm is later than the utterance time (Friday 4pm), and

(ii) the proposition that in all sufficiently normal future possibilities at f_4, Beth enjoys the dish at 7pm on Friday.

Let α be the second of these propositions; so we have:

$$\alpha := \{w : \forall w' \in N_{w,f_4}\text{: Beth enjoys the dish at } f_7 \text{ in } w'\}.$$

Note that since we have stipulated that Andy never loses track of time, he knows, at 4pm on Friday, that his temporal location precedes the time of Beth's eating. Thus, the question of whether he is in a position to utter (1′) is essentially equivalent, on this view, to the question of whether he is in a position to assert α.

Modal theories of future operators are typically combined with a non-modal semantics for the past tense, like the one presented in Section 2. So, given our assumptions, Andy will be in a position to utter (2′) on Saturday morning just in case he is in a position to assert β, the proposition that Beth enjoys the dish at 7pm on Friday. Thus, according to this view, it is not the case that (1′)-on-Friday is equivalent to (2′)-on-Saturday, *modulo* the information each contains about how its context time relates to the event time. This is because α is not equivalent to β, and neither entails the other. This allows the modal view to offer the following account of the Beth case. Suppose that, throughout the case, Andy knows proposition α: he knows (roughly) that if things unfold normally after 4pm on Friday, Beth enjoys the dish in question. Since we are assuming that knowledge is the norm of assertion, it follows that Andy is in a position to assert α on Friday afternoon, which means that he is in a position to utter (1′) on Friday afternoon. But it is consistent with the above that Andy does not know β at any point in the story. For α does not entail β: even if it's true that Beth will enjoy the dish if things unfold normally, it might be false that Beth will in fact enjoy the dish—for things might not unfold normally. More precisely, it might be that Beth enjoys the dish at every world in N_{w,f_4} without it being the case that Beth enjoys the dish in w—for w need not be an element of N_{w,f_4}. In that case, α will be true at w, while β is false at w. So suppose Andy does *not* know β at any point in the story. In that case, Andy is not in a position to assert β on Saturday morning, and so not in a position to utter (2′) on Saturday morning.[14]

Now, while I think we should reject this view for reasons to be offered presently, I also think it contains a kernel of truth: it captures something important about the difference between the assertability conditions of sentences about the future and those of sentences about the past. I shall return to this point later in the essay (Section 6.4), but what I want to concentrate on here is a serious problem facing the modal view: it assigns the wrong truth-conditions to assertions about the future. There are several points to be made here, but I refer the reader to the case against this view offered in Cariani and Santorio 2018 (see also Prior 1976) and confine myself to the following observation. Suppose that, in world w, Andy says *Beth will enjoy the dish* at 4pm on Friday. But suppose that, in world w, Beth does not in fact enjoy the dish at any later time. Then it would seem to follow that what Andy said is false; he said Beth would enjoy the dish, but she didn't. But the modal view does not predict this; it allows that what Andy said might well be true. For suppose that in all the sufficiently normal future possibilities for w at 4pm on Friday, Beth enjoys the dish at

[14]The view just presented derives the result that Andy's Friday afternoon utterance of *Beth will enjoy the dish* expresses α from a specific claim about the semantics of future operators. But MacFarlane (2014, 230–231) adopts a pragmatic variant of this view, one which agrees with the time-shifting semantics on the literal semantic content of utterances of the form $\mathcal{F}_i\phi$, but agrees with the modal view that what one asserts in uttering such a sentence is very often a modalized proposition. Thus, an advocate of MacFarlane's view could adopt the account of the Beth case just discussed; it is also vulnerable to the objection discussed below. I return to MacFarlane's view in Section 6.4.

some later time—she only failed to enjoy it in *w* because of some unexpected event that happened in *w* after 4pm on Friday. In that case, the modal view would predict that what Andy said is true. But this is quite clearly wrong: Andy said that Beth would enjoy the dish, but she didn't, and so what Andy said is false.

Thus, the proposed truth-conditions are not sufficient: they can be satisfied even when Andy speaks falsely. It seems that ordinary utterances about the future are not typically understood in the way in which this proposal suggests. When we assess whether a sentence of the form *It will be that* ϕ is true, all we care about is what happens in the actual world; what happens in other worlds—whether normal continuations of the actual world or not—simply doesn't enter into it. The time-shifting semantics for future operators discussed in Section 2 avoids this problem, and so I shall assume in what follows that future operators simply serve to shift the time of evaluation forward.[15]

5 Knowledge and available evidence

The final view to be considered here is the epistemic view. According to this view, Andy loses his standing to assert that Beth enjoys the dish as he moves from Friday afternoon to Saturday morning because he loses his knowledge of this proposition as he moves between these two times. Andy loses knowledge despite not losing or gaining any relevant evidence.[16] The claim that one can lose knowledge despite no change in one's relevant evidence might seem surprising, but it actually isn't that distinctive in the context of contemporary epistemology. For a number of other theories of knowledge also allow for knowledge to be lost without a change in one's evidence. Do any of these theories cast light on the present phenomenon?

[15]Cariani and Santorio (2018) defend a version of the view that future operators are modals. But on their version of that view, when a sentence of the form $\mathcal{F}_i\phi$ occurs unembedded, it is assigned the same sort of content that the simple, time-shifting semantics assigns to $\mathcal{F}_i\phi$ (see pp. 147–148 of their article). Thus, the idea that future operators are modals in their sense does not, by itself, seem to help with our puzzle.

[16]If one's evidence is just what one knows (Williamson 2000, Ch. 9), then if Andy loses knowledge, he loses evidence, evidence that is presumably relevant to the question of whether Beth enjoyed the dish. Still, none of the epistemic factors that usually explain knowledge loss appear to be present here: Andy hasn't forgotten anything, hasn't remembered something he previously forgot, nor has he gained any new misleading evidence. That is all I mean by saying that Andy 'hasn't lost or gained any relevant evidence'.

For example, according to some versions of 'sensitive invariantism', whether an agent x knows p at t may depend on how important it is for x at t that p be true, or on how salient certain $\neg p$-possibilities are to x at t (Fantl and McGrath 2002, 2009, Hawthorne 2004, Stanley 2005). Either of these factors may change over time even if x's evidence does not; as a result x may lose knowledge despite not gaining or losing any evidence. But neither of these factors seems to be the source of knowledge loss in our cases. We may stipulate that neither the relevant practical stakes nor the salient possibilities of error change for Andy as he moves from Friday afternoon to Saturday morning. This doesn't seem to make a difference to what Andy is in a position to assert at those two times. Philosophers impressed by Harman's cases involving 'evidence one does not possess' (Harman 1973, 143–144) might also agree that an agent can lose knowledge without gaining or losing any relevant evidence, and even if the practical stakes and the salient possibilities are held fixed. But in Harman's cases, the agent's knowledge is undermined by the presence of easily accessible evidence that, if obtained, would *defeat* the agent's evidence. But this is not a feature of our cases.

That said, 'evidence one does not possess' might be relevant to our puzzle in a slightly different way. To see how this might go, first note although the evidence Andy possesses doesn't change as he moves through time, the evidence available to him does. For example, on Saturday morning, Andy could call up Beth and ask her whether she liked the dish he had prepared for her. She could tell him that she did indeed like it, in which case Andy would come to know that she liked it. Two observations are potentially relevant here. First, it seems that, on Saturday morning, Andy is in a position to get evidence for proposition β that is *stronger* than the evidence he in fact has. This is suggested by the fact that, were Andy to obtain that testimonial evidence, it would be rational for him to increase his confidence in β. Second, the evidence Andy is in a position to get on Saturday morning is of a *different kind* than the evidence he in fact has. The evidence he has is *causally upstream* from the fact that Beth enjoys the dish: it consists of facts that concern the *causes* of Beth's liking the dish (her tastes, the nature of the dish). The testimonial evidence he could get, on the other hand, is *causally downstream* from the fact that Beth enjoys the dish: that evidence would be an *effect* of Beth's liking the dish.

In contrast, on Friday afternoon, Andy can't get evidence that is much stronger than the evidence he already has. He could get more evidence, of course: he could learn a bit more about Beth's tastes, he could learn a bit more about the ingredients he is using. That might make him a bit more confident in β, but it wouldn't seem to make him much more confident than he already is. And he can't really get evidence of a different kind, at least not if 'kinds' are individuated causally (and we ignore possibilities involving time-travel, divine revelation, etc.). The only relevant evidence available to Andy on Friday afternoon is broadly inductive evidence, and he already has evidence of that kind.

We can summarize these points by saying that, on Saturday morning, Andy could be in a much stronger epistemic position with respect to β than he is in fact in, whereas this isn't true of Andy on Friday afternoon. Perhaps it is this difference that explains why Andy knows β on Friday afternoon, but not on Saturday morning. On this approach, what one knows is sensitive not just to the evidence one has, but also to the evidence one could get. How strong of an epistemic position with respect to a proposition p one needs to be in in order to know p partly depends on how strong of an epistemic position one could be in with respect to p.[17]

We should distinguish two claims. One is the claim that what epistemic position one needs to be in in order to know p depends how strong of an epistemic position one could be in with respect to p. The second claim is that *this* is what explains what's going on in the Beth case. Even if we were grant the first claim, I have my doubts about the second.[18] The reason for this is that we can replicate the judgments about the Beth case even if we change the case so that no more relevant evidence is available to Andy on Saturday morning than was available to him on Friday afternoon.[19] To see this, consider the Death case:

Death case

The Death case is exactly like the Beth case, except that Beth dies immediately after

[17]Feldman (2003, 47–48, 79) entertains, but does not accept, a similar condition on justification, what he calls the *Get the Evidence Principle*.

[18]For reasons to doubt the first claim, see Section 6.6.

[19]Thanks to Samia Hesni and Marco Maggiani for discussion on this point.

> eating and enjoying the dish. She leaves no trace of the fact that she enjoyed her last meal. On Saturday morning, Andy learns of Beth's death.

I take it that, in respect of what Andy is in a position to assert, the Death case is just like the Beth case. On Friday afternoon, Andy can say, *Beth will enjoy the dish when she eats it*, but on Saturday morning he is not in a position to say, *Beth enjoyed the dish*, even once he learns that Beth is dead. But it doesn't seem that Andy could get into a much stronger position with respect to β on Saturday morning than he is in fact in. What could he do? Beth is gone and has left no trace of the fact that she enjoyed the meal. Despite this, if we accept these claims about what Andy is in a position to assert, it would seem to follow from the logic of the epistemic view that Andy knows, on Friday afternoon, that Beth enjoys the dish, but no longer knows this on Saturday morning. But Andy's loss of knowledge in the Death case cannot be explained by appealing to the fact that the evidence available to him has changed.

6 Knowledge and future normality

According to the available evidence approach, the temporal structure of the Beth case is not, in a certain sense, essential to the underlying phenomenon. For we could have cases in which x knows p at t, but x' does not know p at t, with the only difference between x and x' being that more evidence concerning p is available to the latter than to the former. Or we could have a case in which p concerns x's past at t, x knows p at t, and x loses this knowledge at later time t' when more evidence for p becomes available. Similarly, if evidence was 'destroyed'—if evidence that was once available became unavailable—then one might *gain* knowledge as a result.

What the Death case seems to show is that *time matters*. In the Death case, what is the relevant difference between Andy on Friday afternoon and Andy on Saturday morning? Not the evidence Andy possesses, not what's at stake for Andy, not the salient possibilities of error, not the presence of potential defeaters, not the evidence available to Andy. The only relevant difference seems to be Andy's temporal location with respect to Beth's meal: that meal lies in his future on Friday and in his past on Saturday. If this is right, then the conclusion that presents itself is that one's location in time can, by itself, affect what one knows. One can lose knowledge *simply* by moving through time. The remainder of the essay is devoted to developing and defending a theory of knowledge—the *future normality view*—that permits knowledge to be lost in this way. In the present section, we set out the view (Section 6.1), show how it permits knowledge to be lost simply by moving through time (Section 6.2), and then offer four further arguments for the view (Sections 6.3–6.6). In the section that follows, we respond to some objections to the view (Section 7).

6.1 The future normality view

The core idea of the future normality view is that we are typically permitted to ignore possibilities in which the future fails to unfold in a relatively normal manner.[20] But since what counts as 'the future' is constantly changing, possibilities that are properly ignored at one time may not necessarily be ignored at a later time, even if one's epistemic situation is otherwise the same. This allows one to lose knowledge simply by moving through time, that is, with no change in the factors usually thought relevant for knowing.

We shall implement this idea by borrowing some ideas from the 'relevant alternatives' tradition in epistemology (Dretske 1970, Stine 1976, Cohen 1988). Following Lewis (1996), we assume the following:

> RELEVANT ALTERNATIVES
>
> An agent x knows proposition p at time t in world w iff p is true in every possibility w' such that: (i) w' is relevant for x at t in w, and (ii) w' is not eliminated by x's evidence at t in w.

For simplicity, I will take the notions of evidence and of *a possibility's being eliminated by one's evidence* as primitives. But I will assume that an agent's evidence never eliminates the actual world;

[20] Compare Goodman and Salow (2018, 191) whose theory of justification involves the idea that "we have a default entitlement to assume that things are relatively normal." The proposal offered below is partly inspired by their approach and by the approach of Beddor and Pavese (2018). But one important difference between those approaches and ours is that we emphasize *future* normality over past and present normality. For other recent applications of the notion of normality in epistemology, see Smith 2010, 2017, Greco 2014, and Stalnaker 2015.

this is needed to ensure the factivity of knowledge.[21]

Lewis lays down a set of principles—'rules of relevance'—which constitute a partial theory of which possibilities count as relevant for a given agent on a given occasion. One uncontroversial rule is the Rule of Actuality, which says that the actual world is always relevant (w is always relevant for x at t in w); this is again needed to ensure the factivity of knowledge. We may also suppose that all relevant possibilities are sufficiently similar to the actual world (cf. Lewis's Rule of Resemblance), and that, other things being equal, if a proposition p is salient to a subject, then some possibility in which p is true is relevant for that subject (cf. Lewis's Rule of Attention). Earlier we noted that some epistemologists hold that other 'non-evidential' factors can affect whether one knows (for example, the practical stakes); these factors may also play a role in determining relevance.

We shall encode our license to ignore possibilities with abnormal futures as a further rule of relevance. Whether a world w unfolds in a relatively normal manner after time t depends on the way things in w develop after t, given what happened in w up until and including t. I assume that we have some intuitive grip on how we might *compare* worlds in this respect: we have the idea that the way w' develops after t, given what happened in w' up until and including t, might be *more normal than* or *less normal than* or *as normal as* the way w develops after t, given what happened in w up until and including t. This gives us, for each time t, a binary relation $\succeq_t$ on the space of worlds, where $w' \succeq_t w$ just in case the way w' develops after t, given what happened in w' up until and including t is at least as normal as the way w develops after t, given what happened in w up until and including t. We assume that for any time t, $\succeq_t$ is reflexive and transitive. If $w' \succeq_t w$, we say that, *from the point of view of w, w' unfolds in a relatively normal manner after t*. The idea behind the 'Rule of Future Normality' is that an agent at a world w and time t is permitted to ignore worlds that, from the point of view of w, fail to unfold in a relatively normal manner after t. You are entitled to ignore worlds whose futures are less normal than the actual future.[22]

[21]Lewis offers a contextualist account of knowledge ascriptions, whereas the account presented here is better classified as a version of sensitive invariantism. But I am not necessarily opposed to a contextualist version of the account to come; I simply set the dispute aside for the sake of simplicity. I also set aside the question of whether belief is required for knowledge.

[22]Thanks to an anonymous referee for suggesting that the future normality theory be stated using a comparative, rather than a non-comparative, notion of normality.

Let us say that a possibility is *prima facie* relevant for x at t in w iff it would it be deemed relevant on the basis of the sorts of considerations typically countenanced by relevant alternatives theorists: actuality, similarity, salience, etc.. Then the Rule of Future Normality tells us how to get from the set of *prima facie* relevant alternatives to the set of alternatives that are relevant *tout court*:

> FUTURE NORMALITY
>
> Other things being equal, a possibility w' is relevant for an agent x at time t in world w just in case: (i) w' is *prima facie* relevant for x at t in w, and (ii) $w' \geq_t w$.

So when the rule is in effect, a possibility w' is relevant at t in w only if w''s post-t future is at least as normal as w's. Note that the reflexivity of $\geq_t$ means that, from the point of view of w, w always counts as unfolding in a relatively normal manner after t.

The 'other things being equal' proviso reflects the fact that our permission to assume that things will develop in a suitably normal manner is merely a *default* permission, one that can be over-ridden in certain situations. For example, if a determined skeptic succeeds in making the proposition that I will be killed tomorrow by a falling piano salient to me, some possibility w' in which that proposition is true may be relevant for me, even if w' does not unfold in a relatively normal manner (from the point of view of the actual world). Or perhaps if a great deal hangs on whether it will rain tomorrow, some possibility w' in which it rains tomorrow might be relevant for me even if w' does not unfold in a relatively normal manner (from the point of view of the actual world). But having acknowledged this proviso, I propose to ignore it for the remainder of the essay for the sake of simplicity. So we restrict the discussion in what follows to (w, t, x)-triples for which other things are equal.

6.2 Normality and knowledge loss

Now, having proposed this rule of relevance, I should say that I do not think our grip on the intended notion of comparative normality $\geq_t$ is completely independent of our of our grip on the notion of knowledge. In difficult cases, it may be hard to say whether $w' \geq_t w$ without falling back on our knowledge of the truth-conditions of knowledge ascriptions. Thus, our relevant alternatives theory is not intended as an *analysis* of knowledge in the traditional sense; we have not attempted to give a set of non-circular necessary and sufficient conditions for knowing. But that doesn't mean that the our theory provides us with no useful information about the nature of knowledge. For our intuitive glosses on the relation of comparative normality can be used to motivate certain structural constraints on that relation, and the resulting theory turns out to be informative on certain structural features of knowledge, as I shall now proceed to demonstrate.[23]

For example, when the foregoing theory is combined with a certain plausible structural claim about $\geq_t$, the theory predicts that knowledge can be lost simply by moving through time. It is this feature of the account that is relevant for understanding how it accounts for the possibility of cases like the Beth case. The needed claim is this:

ABNORMALITY NEEDN'T PERSIST

There are worlds w, w' and times t, t' such that $t < t'$, $w' \not\geq_t w$ and $w' \geq_{t'} w$.

This says that there are worlds that, from the point of view of w, do not count as unfolding in a relatively normal manner after some time t, but then do count as unfolding in a relatively normal manner after some later time t'. The reason this is plausible is that although something out of the ordinary might happen in w' after t that prevents it from counting as normal at t (from the point of view of w), that abnormality may be confined to the interval between t and t'. Things in w' may then 'return to normal' after t' in such a way that w' counts as normal at t' (from the point of view of w).

To see how the resulting account allows knowledge to be lost simply by moving through time, suppose that you know at time t_0 in world w that some event e will occur at later time t_1. But suppose that the Rule of Future Normality plays a role in securing your knowledge—you wouldn't have known this if the Rule of Future Normality hadn't been in effect. What I mean by this is that your evidence at t_0 in w doesn't eliminate all possibilities in which e fails to occur at t_1, and some such possibilities are *prima facie* relevant for you at t_0 in w. For simplicity, let us suppose that there

[23] Williamson (2009, 305–307), Ichikawa (2011), and Greco (2014, 182) all approach epistemological theorizing in a similar spirit.

is exactly one such possibility, w'. So w' is a world in which e fails to occur at t_1; your evidence at t_0 in w doesn't rule w' out; and w' is *prima facie* relevant for you at t_0 in w . All this is still consistent with your knowing, at t_0 in w, that e will occur at t_1, since it may be that, from the point of view of w, w' fails to unfold in a sufficiently normal manner after t_0. If so, it will thus be rendered irrelevant for you at t_0 in w by the Rule of Future Normality, and you will count as knowing, at t_0 in w, that e will occur at t_1.

You now move forward in time from t_0 to t_2 ($t_0 < t_1 < t_2$). You neither gain nor lose any relevant evidence between t_0 and t_2, and the usual factors thought to determine relevance—similarity, salience, practical stakes, etc.—remain unchanged for you between t_0 and t_2. Thus, your evidence at t_2 in w still fails to eliminate w', and w' remains *prima facie* relevant for you at t_2 in w. All this is consistent, on the present approach, with your *not* knowing, at t_2 in w, that e occurred at t_1. For everything we've said up until now is consistent with w''s being relevant for you at t_2 in w. For what we said earlier about w' was that, from the point of view of w, it failed to develop in a suitably normal manner after t_0, and that this prevented it from being relevant for you in *w at that time*. But it might be that whatever unusual occurrence in w' prevented it from being relevant for you in w at t_0 is confined to the interval between t_0 and t_2—it may be that, after t_2, things go back to normal in w', so that, from the point of view of w, w' unfolds in a sufficiently normal manner after t_2 (ABNORMALITY NEEDN'T PERSIST). And if that happens, the Rule of Future Normality implies that w' will be relevant for you in w at t_2. But if w' is relevant for you in w at t_2, then you do not know, in w at t_2, that e occurred at t_1. For w' is now a relevant possibility that is not eliminated by your evidence in which e fails to occurs at t_1.

Thus, the present account permits knowledge to be lost simply by moving through time, since it allows the passage of time to render a once irrelevant possibility relevant.[24] Thus, this theory gives us a model of how Andy could have lost knowledge in the Beth case. The situation there would be exactly analogous to the one schematically described above: just take 'you' to be Andy, w to be the world of the Beth case, t_0 to be Friday afternoon, e to be Beth's enjoyment of the dish, t_1

[24] See **Proposition 1** of the appendix for a more precise version of this result.

to be 7pm on Friday, and t_2 to be Saturday morning. The 'error possibility' w' might be a world in which something unexpected happens after Andy finishes preparing the dish which causes Beth not to enjoy the dish. Perhaps in w', the temperature in the kitchen unexpectedly rises after Andy leaves and this causes the dish to taste unpleasant. Or perhaps Beth contracts a stomach bug on Friday afternoon in w' with the result that she doesn't enjoy the dish when she eats it.

So the claim that knowledge can be lost simply by moving through time follows from a relatively simple and coherent model of knowledge, a fact that provides some support for that claim. In what follows, we offer a series of further arguments intended to provide further motivation for this model of knowledge. The first argument is that, when supplemented by a further plausible structural claim about comparative normality, the view predicts, apparently correctly, that one cannot *gain* a license to assert something simply by moving through time. The second is that the future normality view assigns assertability conditions to sentences about the future similar to those assigned by the modal view, and is thus able to explain some of the attraction of that view. The third is that the future normality view correctly predicts that we should encounter cases in which knowledge of the future is *not* lost simply by moving through time. The fourth argument shows how the future normality view can be motivated by reflecting on the role knowledge ascriptions plays in the normative assessment of inquiry and practical reasoning. Taken together, these arguments constitute a strong case for the future normality view.

6.3 Normality and knowledge gain

We have been discussing cases in which one can assert, at an initial time t, that it will be that ϕ, but one cannot assert, at a later time t', that it is or was that ϕ, despite no change in the factors usually thought relevant to knowledge. But are there cases in which the reverse happens, cases in which one *cannot* assert, at an initial time t, that it will be that ϕ, but one *can* assert, at later time t', that it is or was that ϕ, again with no change in the factors usually thought relevant to knowledge? It would seem not; at any rate, such cases are hard to imagine. When combined with an independently plausible structural claim about comparative normality, the present theory predicts that such cases are indeed impossible.

The further plausible claim is the reverse of ABNORMALITY NEEDN'T PERSIST:

NORMALITY PERSISTS

For all worlds w, w' and times t, t', if $t < t'$, then if $w' \succeq_t w$, then $w' \succeq_{t'} w$

This says that if from the point of view of w, w' counts as unfolding in a relatively normal manner after t, then w' can't lose this status. To see why this is plausible, consider a case in which $t < t'$ and in which w' does not count as unfolding in a relatively normal manner after t', from the point of view of w (that is, $w' \not\succeq_{t'} w$). Now ask: why does w' not count as unfolding in a relatively normal manner after t' (from the point of view of w)? Well, it must be because some course of events that takes place in w' after t' is unusual enough to prevent w' from counting as sufficiently normal after t' (from the point of view of w). But since t is earlier than t', that unusual course of events lies in w''s future at t as well. Thus, that unusual course of events will presumably also deprive w' from counting as unfolding in a sufficiently normal manner after t, from the point of view of w (that is, $w' \not\succeq_t w$). While there is more to be said about the matter, this line of thought is, I think, quite plausible. And if we accept this constraint, the resulting theory predicts that knowledge cannot be gained simply by moving through the time. Assuming, as we are, that knowledge is the norm of assertion, this, in turn, implies that one cannot gain the license to assert something simply by moving through time.

Let's say that a world w' is a *prima facie alternative* for x at t in w iff (i) w' is *prima facie* relevant for x at t in w, and (ii) w' is not eliminated by x's evidence at t in w. Then if $R(w, t, x)$ is the set of x's *prima facie* alternatives at t in w, then the set of x's epistemic alternatives at t in w is given by: $R(w, t, x) \cap \{w' : w' \succeq_t w\}$. So according to the future normality view, x knows p at t in w just in case p is true at every world in $R(w, t, x) \cap \{w' : w' \succeq_t w\}$.

To see how the resulting view predicts that knowledge cannot be gained simply by moving through time, note that NORMALITY PERSISTS implies:

($\star$) For all worlds w, w' and times t, t', if $t < t'$, then $\{w' : w' \succeq_t w\} \subseteq \{w' : w' \succeq_{t'} w\}$.

Now suppose that x is an agent whose evidence in w does not change between t and later time t', and whose *prima facie* relevant alternatives in w do not change between t and t'. Then $R(w, t, x) = R(w, t', x)$. But since $t < t'$, this together with ($\star$) implies that:

$$R(w, t, x) \cap \{w' : w' \geq_t w\} \subseteq R(w, t', x) \cap \{w' : w' \geq_{t'} w\}.$$

So x's epistemic alternatives at t in w are a subset of his alternatives at t' in w. This means that anything x knows at t' in w is something he already knew at t in w—x didn't gain any knowledge as he moved from t to t'.[25]

6.4 Normality and assertability

Another argument for the future normality view is that it helps to explain some of the appeal of rival approaches. MacFarlane (2014, 231) suggests that often when I say something like *I'll arrive on the 9:30 train*, what I'm really saying is that I will arrive on the 9:30 train "barring strikes accidents, or other rare and unpredictable mishaps"; I'm saying something about "what will happen barring unforeseen circumstances" (MacFarlane 2014, 231). While MacFarlane offers a pragmatic account of how utterances of sentences about the future can be used to assert such propositions, the modal view discussed in Section 4 offers a semantic account of how such utterances come to be paired with such propositions.

On either approach, Andy can say, *Beth will enjoy the dish* even if he can't rule out abnormal future possibilities in which Beth fails to enjoy the dish (possibilities in which the dish goes off for some unexpected reason or in which Beth contracts a stomach bug, etc.). For what Andy is asserting in saying *Beth will enjoy the dish* is that Beth will enjoy the dish barring unforeseen

[25] An anonymous referee objects to NORMALITY PERSISTS on the following grounds. Suppose that, from the point of view of w, things unfold normally in w' for a very long time after t (say ten billion years) and then some bizarre event occurs in w'. Should an unexpected event so distant in the future really prevent w' from counting as unfolding in a sufficiently normal manner after t (from the point of view of w)? The referee finds an affirmative answer implausible. One alternative would be to delimit $\geq_t$ so that $w' \geq_t w$ so long as, from the point of view of w, things unfold in a relatively normal manner over the interval $(t, t + \delta)$, where δ is some sufficiently large unit of time. While I am not strongly opposed to this alternative, I have not adopted it here for two reasons. First, this alternative view seems more complex than the view adopted in the text, and the referee's claim that the alternative view is more plausible than the view taken here is not obvious to me. Second, this alternative would predict that one can gain knowledge of the distant future simply by moving through time, but it is not clear that this is so.

circumstances; and the circumstances just mentioned, if they occurred, would be unforeseen. But these views don't extend the same flexibility to sentences about the past: in order for Andy to later say, *Beth enjoyed the dish*, he would need to be able to rule some such possibilities out. This is how views like MacFarlane's and the modal view of Section 4 can account for the possibility of cases like the Beth case.

At a certain level of abstraction, the future normality view agrees with these claims about the assertability conditions of sentences about the future, and how they differ from the assertability conditions of sentences about the past. But where it diverges from these views is in the proper explanation of how sentences about the future come to be associated with these assertability conditions. These views explain these assertability conditions by hypothesizing that the sentences of the form *It will be that* ϕ are used to assert a certain modalized content: *It will be that* ϕ*, if things unfold normally*. The future normality view, on the other hand, adopts a more straightforward account of the content of *It will be that* ϕ, but then hypothesizes that one can *know* that content even if one can't rule out certain unforeseen possibilities. But despite this difference, the future normality theorist can see MacFarlane and the modal theorist as offering a genuine insight concerning the assertability conditions of sentences about the future; they simply give the wrong account of that insight. This allows future normality theorist to explain some of the appeal of those approaches, while at the same time avoiding the problems they face.

6.5 Stable foreknowledge

In both the Beth case and the Rain case, three conditions obtain. (i) A subject is in a position to say, at an initial time t, that it will be that ϕ. (ii) The subject's relevant evidence does not change between t and later time t'. (iii) The subject is not in a position to say, at t', that it was that ϕ. But, as I noted in Section 1, it is not true that in every case in which (i) and (ii) hold is a case in which (iii) holds. An example illustrates the point:

Jack case

Jack tells me on Thursday morning that he's leaving tomorrow to go to New York for

> the weekend. On Thursday evening, I run into Jill, a mutual friend of mine and Jack's. She asks me how Jack is doing. I reply by saying, *He's great. He's going to spend the weekend in New York.*
>
> Jack does indeed spend the weekend in New York, though I don't hear from him (and didn't expect to). On Monday morning, Jane, another mutual friend of mine and Jack's, also asks me how Jack is doing. Here it seems fine for me to say, *He's great. He spent the weekend in New York.*

Let's agree that my final utterance is acceptable here. Then given the acceptability of my two utterances in this scenario, it would seem to follow from the logic of the epistemic view that I know that Jack spent the relevant weekend in New York both on Thursday (prior to the weekend in question) and on Monday (after the weekend in question). Let us call cases like this *cases of stable foreknowledge*, and let us call cases like the Beth case *cases of easy foreknowledge*.

The existence of cases of stable foreknowledge should not be surprising if the future normality view is true, since the structure of that view predicts that we should encounter such cases; this yields another argument in favor of the future normality view. For suppose that no possibility in which a particular event e fails to occur at t_1 is even a *prima facie* alternative for you at time t_0—perhaps such possibilities are too dissimilar from the actual world to count as relevant for you at t_0. Then you will automatically know, at t_0, that e will occur at t_1. If the various standard factors determining relevance (salience, similarity, etc.) do not change for you between t_0 and t_2, then no possibilities in which e fails to occur at t_1 will be relevant for you at t_2 either. And in that case, you will retain your knowledge that e occurred at t_1, as you travel forward in time from t_0 to t_2. So the future normality view predicts that you can lose knowledge of a fact p as the passage of time transforms p from a fact about the future into a fact about the past (easy foreknowledge), and it also predicts that you can retain knowledge of a fact p as the passage of time transforms p from fact about the future into a fact about the past (stable foreknowledge).

Of course, it would be desirable to have a principle that explained why it is that some possibilities of error are *prima facie* relevant for Andy in the Beth case, but no possibilities of error are *prima facie* relevant for me in the Jack case. The future normality theorist might look to the relevant alternatives toolkit in order to try to explain the difference between these two cases. For example, perhaps the process by which I formed my belief in the Jack case is more reliable than the process by which Andy formed his belief in the Beth case; given Lewis's 'Rule of Reliability' this might explain why certain possibilities of error are *prima facie* relevant for Andy in while no possibilities of error are *prima facie* relevant for me (Lewis 1996, 558). But it is not clear that such a story will work to distinguish all cases of easy foreknowledge from all cases of stable foreknowledge, and so it is not clear that we have a general account of the distinction between these two types of cases.[26]

But it is important to note that, given the dialectical context of the present essay, this limitation of (our development of) the future normality theory is of limited significance. For it seems that none of the views discussed in this essay provide much illumination on the difference between these two types of cases. Consider first the modal view. Given the logic of that view, it too would say that, in the Jack case, I know throughout that Jack spends the weekend in New York. And it says that, in the Beth case, Andy never knows that Beth enjoys the dish. But what, according to the modal view, is the difference between the Jack case and the Beth case? Why do I know while Andy does not? The modal view, by itself, is silent on these questions.

The implicature view doesn't help here either. For that view would have to say that while Andy's utterance on Saturday morning implicates that he has direct evidence concerning Beth, my utterance on Monday does not implicate that I have direct evidence concerning Jack. But since that view struggled to explain how the former implicature was supposed to arise in the first place (recall the failure of the 'competition story'), it gives us little guidance as to why a similar implicature fails to arise in the Jack case. So this explanatory limitation of the future normality view is not a reason to prefer one of its rivals.

[26]Thanks to Bob Beddor, Fabrizio Cariani, and anonymous referee for discussion here.

6.6 The argument from inquiry and deliberation

The foregoing arguments for the future normality view all concern the (non)-assertability of various sentences in various contexts. Our final argument for the future normality view is somewhat different in character; it concerns the role of knowledge ascriptions and denials in our assessment of practical reasoning and inquiry. We discussed this role earlier in connection with the following norms:

DELIBERATION NORM

One may use p as a premise in one's practical reasoning iff one knows p.

INQUIRY NORM

One may inquire into the question of whether ϕ iff one does not know whether ϕ.

These two norms serve as the first two premises of our final argument. The third premise is that it is sometimes perfectly legitimate to treat a question about the future as settled *when it is a question about the future*, and to then re-open that question at a later time, *once that question becomes a question about the past*. And it can be legitimate to do this even when one's epistemic situation has not changed in the interim. One *treats a question as settled*, in the relevant sense, just in case one no longer inquires into that question and one is disposed to use a particular answer to that question as a premise in one's practical reasoning. One *re-opens a question* at a time t_1 just in case one treated the question as settled at some earlier time t_0, and one no longer treats it as settled at t_1.

Our third premise can be motivated by imagining a creature C who lives in an environment that is in some ways hospitable, in some ways hostile. Imagine that C is trying to reach a decision about where to look for food on a particular occasion t_0. She needs to consider where food is likely to be found, and where predators are not likely to be found. In the course of this deliberation, it may make sense for C to treat a particular question

whether there will be a predator of kind K in location L at time t_1

as settled in the affirmative (where $t_1 > t_0$). We may suppose that her past evidence supports this hypothesis fairly strongly, and that a predator of kind K will almost certainly be prowling around L at t_1 unless something unexpected happens between t_0 and t_1. Furthermore, we may suppose that, for various reasons, it will complicate C's reasoning about what to do if she leaves this possibility open (even leaving it open and assigning it a low probability may complicate her deliberative task). There are many predators and many locations to keep track of, and given C's cognitive limitations, she cannot quickly and efficiently come to a decision about where to seek food if she does not treat some such questions as settled one way or the other. Let "$k(t_1)$" be an ambiguous sign that may stand either for the tenseless sentence *there is a predator of kind K at location L at time* t_1 or for the proposition that sentence expresses. At t_0, C uses $k(t_1)$ as a premise in her practical reasoning, and let us suppose that it is permissible for her to do so.

Now suppose C eventually reaches a decision about what to do: she decides to look in location L' for food ($L' \neq L$). Things go well for her: she finds food in L' and does not encounter any predators. Furthermore, she was right that a predator of kind K was in location L at t_1, and so she was wise to avoid that area. Now, even though she has achieved her goal, it may make sense (at time $t_2 > t_1$) for C to re-open the question of whether there was indeed a predator of kind K in location L at t_1. It may make sense for her to re-open this question even if she hasn't gained or lost any relevant evidence, even if the practical stakes haven't changed, even if the salient possibilities of error haven't changed. For she might hope to obtain stronger evidence as to whether there was indeed such a predator at that location at that time. Although obtaining such evidence may not be immediately practically relevant for C, it may well result in her getting a more accurate picture of the relevant predators' habits, and thereby promote her long-term prospects for survival. More generally, we can suppose that having a general practice that involves sometimes treating a question about the future as settled and then re-opening that question at a later time is a good one for creatures like C to have, a practice that is reasonable for them to have given their goals, their cognitive limitations, and their environment.

Now suppose we accept: (i) that it was permissible for C to employ $k(t_1)$ as a premise in her practical reasoning at t_0, and (ii) that it is permissible for C to inquire into whether $k(t_1)$ at t_2. Assuming that (i) implies that C did not violate the DELIBERATION NORM at t_0, then (i) together with that norm implies that that C knows $k(t_1)$ at t_0. And assuming that (ii) implies that C did not violate the INQUIRY NORM at t_2, then (ii) together with that norm implies that C does not know $k(t_1)$ at t_2. And since we are supposing that the other factors ordinarily thought relevant to knowledge have not changed for C between t_0 and t_2, it would appear to follow that C lost knowledge simply by moving through time. Since the future normality view predicts that this sort of knowledge loss is indeed possible, we have a further argument in favor of that view.

It might be objected that this argument does not actually establish that C lost knowledge *simply* by moving through time, since we have not ruled out the the possibility that what explains C's knowledge loss is not the mere passage of time, but a change in the evidence available to her as she moves from t_0 to t_2. For recall that in our discussion of the available evidence vew (Section 5), we argued not that that view was *false*, but merely that it *failed to explain* the general phenomenon in which we were interested (recall the Death case). So, for all we've said so far, it might be that knowledge *is* sensitive to the available evidence in the way envisioned by that view. And if that were the case, then that would presumably suffice to explain C's knowledge loss, and so the present argument for the future normality view would be undermined.

The reply to this reply is that we do, in fact, have reason to doubt the truth of the available evidence view. For it seems that, once properly spelled out, the available evidence view is likely to conflict with the claim that that knowledge is closed under competent deduction. To really make the point stick, we would need to elaborate the available evidence view in more detail than it is possible to do here, but let me briefly sketch the problem as I see it. Suppose that you know p in a situation in which there is not a great deal of evidence available for p. Suppose further that there *is* a great deal of available evidence for some other (compatible) proposition q, but that you possess none of that evidence. In that case, it would seem to follow that there is a great deal of evidence for the disjunction p *or* q that you do not possess. Now suppose you infer p *or* q from p. You know p; you inferred p *or* q from p; but are you guaranteed to know p *or* q? It is not obvious that the available evidence view will secure an affirmative answer to this question. For it seems possible that you might still fail to know *p or q*, for the reason that you may not possess a sufficient amount of the evidence available for *that* proposition.

As I said, to really make this argument stick, we would need to spell the available evidence view out in more detail; but I believe that once this is done, the threat here is real. Thus, to the extent that we have reason to believe that knowledge is closed under competent deduction, we have reason to believe that the available evidence view is false.[27] And if that is correct, then it would seem that the foregoing argument for the future normality view stands.

7 Objections: *must* and counterfactuals

That completes my positive case for the future normality view; we now cosider two objections to it. Actually, the objections are objections to any *skeptical* view, any view that says that subjects in our cases do not know at the later time (for example, that Andy does not know, on Saturday morning, that Beth enjoys the dish). The future normality view is a skeptical view, but so, for example, is the modal view of Section 4.

7.1 *Must*

Recall that although Andy isn't in a position, on Saturday morning, to flat-out assert that Beth enjoyed the dish, he is in a position to say that she *must* have enjoyed it. But according to a well-known view about epistemic *must*, it is factive: *must* ϕ entails ϕ (von Fintel and Gillies 2010, 2021). If that's right, then *Beth must have enjoyed the dish* entails *Beth enjoyed the dish*. And given that knowledge is the norm of assertion, if Andy is in a position to assert that Beth must have enjoyed the dish, he presumably knows that she must have enjoyed it. And if he knows this, then it seems that he's in a position to infer that Beth did enjoy it. Suppose he performs this inference. Then, assuming knowledge is closed under competent deduction, it should follow that he knows that Beth enjoyed the dish. If that line of reasoning is correct, then it suggests that whatever it is that explains

[27] Thanks to David Boylan for discussion of this point.

why Andy isn't in a position to assert that Beth enjoyed the dish, it isn't his lack of knowledge. For that argument seems to show that Andy *does* know this—or could easily come to know this by performing a simple inference. But even if Andy were to perform this inference, he wouldn't be in a position to say, on Saturday morning, that Beth enjoyed the dish.[28]

Now, although there are strong arguments in favor of the thesis that *must* is factive (von Fintel and Gillies 2010, 2021), the case isn't water-tight, and a number of theorists have presented data that, at least at first glance, seem to conflict with it.[29] For there are many examples in which a speaker seems to be in a position to assert *must* ϕ despite not being in a position to assert ϕ, a fact that is puzzling if *must* ϕ entails ϕ. Consider, for example, the following case due to Giannakidou and Mari (2016). Imagine that you and your sister have been out of touch for a few years, and you're visiting her today for the first time in a while. As she shows you around her apartment, you notice that she has a piano. You know that your sister doesn't play, but lives with her daughter, Maria, who is quite musical. Later, while telling your husband about your visit, you say:

(11) Maria must play the piano now.

While it seems fine for you to say that, it isn't clear that your evidence puts you in a position to say:

(12) Maria plays the piano now.

To say that, it seems like you'd need stronger evidence, such as testimony from your sister. Similar examples are not hard to construct:

(13) A: Where's Sarah? She was supposed to be here by now.

B: ✓ She must be stuck in traffic.

B: ? She's stuck in traffic.

If all B knows is that Sarah should be here by now and that her being stuck in traffic is the most likely explanation of the delay, it isn't clear that he's in a position to flat-out assert that Sarah is

[28]Thanks to an anonymous referee for raising this challenge, along with the problem involving counterfactuals discussed below.

[29]See Ninan 2014, 305, Lassiter 2016, Giannakidou and Mari 2016, Goodhue 2017, and Del Pinal and Waldon 2019.

struck in traffic. Asserting that would likely convey, for example, that Sarah or someone else had told him that she was stuck in traffic. In contrast, the corresponding *must*-claim seems fine.

Another difficulty for friends of factivity is Lassiter's observation that it is sometimes felicitous to say *must ϕ, but I don't know that for sure*, whereas *ϕ, but I don't know that for sure* is almost always infelicitous (Lassiter 2016):

(13) (a) This is a very early Mustang that has been in a private collection for a long time. The speedometer shows 38,000 miles. It must actually be 138,000 miles, though I don't know that for sure.

(b) ? This is a very early Mustang that has been in a private collection for a long time. The speedometer shows 38,000 miles. It is actually 138,000 miles, though I don't know that for sure.[30]

(14) (a) Carl proposed to Diane. He looked happy afterwards, so she must have said, "yes," though I don't know that for sure.

(b) ? Carl proposed to Diane. He looked happy afterwards, so she said, "yes," though I don't know that for sure.[31]

Now, these data might motivate one of two responses. First, one might deny that epistemic *must* is factive, as a number of theorists do.[32] If this is the correct response, then the above challenge to skeptical views of our puzzle is undercut, since it depends crucially on the claim that *must* is factive. Second, one might instead maintain the factivity of *must*, and then seek an alternative explanation of the above data. Suppose for the moment that we take this second option. Does the above challenge to the skeptical view still go through? That depends—it depends on how exactly the alternative explanation proceeds.

For example, von Fintel and Gillies (2021, 99) handle example (13a) by positing a mid-sentence context shift, so that *knows* ends up quantifying over a wider set of possibilities than *must* quantifies

[30]This pair is based on a corpus-derived example from Lassiter 2016, 23.

[31]This pair is based on an example discussed in Ninan 2014, 305.

[32]Non-factive theories of *must* are developed in Veltman 1985, Kratzer 1991, Giannakidou and Mari 2016, Goodhue 2017, and Del Pinal and Waldon 2019.

over. This allows *must* ϕ to be true in its context while also allowing *I don't know for sure* to be true in *its* context. The speaker counts as knowing ϕ when *must* ϕ is uttered, but they no longer count as knowing ϕ when *I don't know for sure* is uttered. Now that may suffice to explain why (13a) is felicitous, but it doesn't immediately explain why there is a *contrast* in acceptability between (13a) and (13b). Similarly, what should the friend of factivity say about the contrast between (11) and (12) in the Maria case? One way to extend von Fintel and Gillies's story to these cases is to hypothesize that a discourse-initial utterance of *must* ϕ tends to have the effect of 'lowering the standards' for knowing ϕ, that is, asserting *must* ϕ tends to render certain $\neg\phi$-possibilities irrelevant, $\neg\phi$-possibilities that would have been relevant were it not for the fact that *must* ϕ had been asserted. Then what might be going on in the Maria case is that your assertion of *Maria must play the piano now* renders certain possibilities in which Maria doesn't play irrelevant, with the result that your rather indirect evidence suffices for knowing that Maria plays the piano now, and, indeed, for knowing that she must play the piano now. But had you instead asserted *Maria plays the piano now*, the 'not-play' possibilities in question would not have been rendered irrelevant, and so you would not have known that Maria plays the piano now.

As far as I can see, this story is essentially compatible with the future normality view, though we must take some care in formulating certain claims. For example, on this approach, when Andy's friend asks him on Saturday morning whether Beth enjoyed the dish, Andy is not strictly speaking in a position to say, *Beth must have enjoyed the dish*. For nothing has yet be done to render the relevant possibilities of error irrelevant, and so Andy doesn't know that Beth enjoyed the dish. Thus, he doesn't know that Beth must have enjoyed the dish, and so isn't in a position to assert that. But we can nevertheless explain why it seems plausible to say that Andy is in a position to say, *Beth must have enjoyed the dish*. For if he *were* to say this, he *would* be in a position to say it. We must distinguish between what Andy is in a position to assert given how things actually are and what he would be in a position to assert if he were to say, *Beth must have enjoyed the dish*.

Does this appeal to contextual shifting of the relevant alternatives undermine the motivation future normality view? It does not. For according to this explanation, in Andy's Friday context, certain *prima facie* relevant possibilities of error are rendered irrelevant by the Rule of Future Normality. But in Andy's 'default' Saturday context, such possibilities become relevant for Andy; this hypothesis is needed to explain why he is not in a position to say, *Beth enjoyed the dish*. Of course, if Andy says, *Beth must have enjoyed the dish* on Saturday, this may have the effect of altering the context in such a way that those possibilities of error become irrelevant once again. But note that in order to tell this whole story, we need two mechanisms affecting relevance: the Rule of Future Normality and the claim specific to *must*.

So it might turn out that best explanation of these data available to the friend of factivity is also available to the future normality theorist. If that turns out to be the case, then the future normality theorist *qua* future normality theorist may be able to remain neutral on the question of whether or not *must* is factive. Thus, to reinstate the original challenge from the factivity of *must*, the opponent of the future normality view must argue both that *must* is factive *and* that the best factivity-friendly explanation of the foregoing data is not the one sketched above, but one that is in fact incompatible with the future normality view. I leave the task of constructing such an argument in the hands of my opponent.

7.2 Counterfactuals

Counterfactuals raise a related problem. Suppose we alter the Beth case so that, on Friday afternoon, Andy does not know whether or not Beth will make it home in time to eat the dish he has prepared for her. On Saturday morning, he then comes to believe, for reasons we needn't enter into, that she probably didn't eat it. In this scenario, it seems acceptable for Andy to say:

(15) Beth would have enjoyed that dish if she had eaten it.

The story continues: Suppose now that Andy learns, contrary to what he suspected, that Beth did in fact eat it. Then assuming that counterfactual *modus ponens* is a valid form of inference, Andy should be able to infer, and so come to know, that Beth enjoyed the dish. And yet even if he were to perform this inference, he still wouldn't be in a position to assert that Beth enjoyed the dish.

So his inability to assert that, the objection goes, does not appear to be explained by his lack of knowledge.

How should the defender of the future normality view respond to this argument? One thing to note is that, while widely-assumed, counterfactual *modus ponens* is not above reproach (Williamson 2020, 185–186). But even if we set that issue aside, we may question the objector's assumption that Andy's knowledge of that counterfactual survives his learning that its antecedent is true. This assumption is not at all obvious, for we know that learning ϕ often undermines one's rational confidence in the counterfactual *If* ϕ, ψ. Consider this example:

(16) If Oswald hadn't shot Kennedy, Kennedy would have celebrated Thanksgiving that year.

I strongly suspect that this counterfactual is true (Kennedy died only days before Thanksgiving in 1963). But were you to present me with convincing evidence that Oswald didn't shoot Kennedy, I would not conclude that Kennedy celebrated Thanksgiving in 1963 after all, since I would remain quite sure that Kennedy was dead by then. Instead, I would become much less confident in the counterfactual.

The Kennedy example shows that one's body of evidence might initially support a counterfactual conditional, but fail to support it once one learns that its antecedent is true. If that is generally true, then it should not be that surprising if one could know a counterfactual, and then lose that knowledge upon learning that its antecedent was true. Does the claim that Andy loses knowledge of (15) after learning that its antecedent is true conflict with pre-theoretic judgment? It is not clear that it does. For it is not that easy to directly assess the question of whether Andy knows that counterfactual once he learns that its antecedent is true. For note that, on anyone's view, Andy wouldn't be disposed to assert it, since, certain well-known cases aside, we do not standardly assert counterfactuals when we believe their antecedents to be true.

8 Conclusion

In this essay, we have examined three approaches to cases like the Beth case. Of these, the epistemic view—in the guise of the future normality theory—strikes me as the most promising. That theory predicts the possibility of cases like the Beth case, and is supported by a wide range of additional considerations. And although there are some *prima facie* objections to this theory, there are plausible responses to these objections, as we have just seen. In contrast, the other two views we examined appear to face far more serious problems. The implicature view of Section 3 barely gets off the ground insofar as it lacks a plausible explanation of how the hypothesized implicature arises. The modal theory of Section 4 simply assigns the wrong truth conditions to assertions about the future.

One surprising consequence of the future normality view is that it implies that it is, in a certain sense, easier to know the future than it is to know the past or present. This contrasts with our usual sense that precisely the reverse is true, that the past and present are easier to know than the future. Isn't it obvious that it is easier to know who won the last election than it is to know who will win the next one, and easier to know that it is raining right now than it is to know whether it will rain tomorrow? Isn't it easier to talk yourself into skepticism about the future than it is to talk yourself into skepticism about the past or present?

We can resolve the tension by distinguishing two senses of 'easier to know'. According to the future normality view, it is easier for Andy to know that Beth enjoys the dish on Friday afternoon than it is for him to know this on Saturday morning in the sense that *he needs less evidence* to know this on Friday than to know it on Saturday. Less is required of Andy if he is to know on Friday than if he is to know on Saturday. This is analogous to the sense in which it is easier for a golfer with a high handicap to make the cut than it is for a golfer with a low handicap—the standard is lower.

What then is the contrasting sense in which easier to know the past and present than it is to know the future? One way to precisify this thought is to note that one typically has access to stronger evidence for a fact when it lies in one's past or present than when it lies in one's future. (This is only *typically* the case, as the Death case reminds us.) Among other things, this means that it is typically *easier to conduct an inquiry* that results in knowledge of p when p lies in one's past or present than when p lies in one's future. For example, in order for a meteorologist to come to know on Friday that it will rain on Saturday, she may need to undertake a variety of intellectually demanding tasks.

In contrast, in order for her to come to know on Sunday that it rained on Saturday, she need only consult a newspaper. These observations are closely related to the fact that we generally regard ourselves as having more, and more reliable, ways of learning about the past and present than we have for learning about the future. Our access to the future is largely limited to what we can learn via induction and simulation, what we can learn on the basis of our plans and intentions, and what we can learn via inferential and testimonial chains that terminate in such sources. These same sources may also play a role in learning about the past and present, but we of course have additional—and seemingly more direct—ways to learn about the past and present, namely perception, memory, and inferential and testimonial chains that terminate in perception and memory. In contrast, we can't see the future nor can we remember events that have yet to occur.

Thus, it is perhaps not so surprising that we should demand more from those who seek to know a fact when it lies in the past or present than of those who seek to know it when it lies in the future. For this is simply to make our demands for what must be done sensitive—not perfectly sensitive, as the Death case reveals, but sensitive nonetheless—to what can be done.

Appendix: The epistemic view and the modal view

The epistemic view (future normality version) of Section 6 and the modal view of Section 4 here take the form of alternative semantic theories for a common language $\mathcal{L}$. The vocabulary of $\mathcal{L}$ consists of atomic formulas p, q, etc., time nominals i, j, etc., and the logical symbols: left and right parentheses, the truth-functional connectives $\neg, \wedge$, a knowledge operator $\mathcal{K}$, and for each time nominal i, three temporal operators $\mathcal{P}_i$, $\mathcal{F}_i$, and $\mathcal{A}_i$. (We use $\mathcal{A}_i\phi$ to symbolize *At time i, ϕ*.) The formulas of $\mathcal{L}$ are defined in the usual way. We first present the epistemic view, and then construct a model which verifies the claim that the epistemic view allows knowledge to be lost simply by moving through time. We then present the modal view.

Definition 1. An *e-model for $\mathcal{L}$* is a tuple $\mathcal{E} = \langle W, T, <, R, \geq, I\rangle$ consisting of:

(1) a non-empty set W of *worlds*,

(2) a non-empty set T of *times*,

(3) a strict total order $<$ on T (the 'earlier-than' relation),

(4) a function R from T into $\mathcal{P}(W \times W)$ such that for each $t \in T$, $R(t)$ is a reflexive binary relation on W,

(5) a function $\geq$ from T into $\mathcal{P}(W \times W)$ such that for each $t \in T$, $\geq_t$ is a reflexive, transitive binary relation on W, and

(6) an interpretation function I that assigns to each time nominal i an element $I(i)$ of T, and assigns to each atomic formula p a function $I(p)$ from $W \times T$ into $\{0, 1\}$.

We use "i" to denote $I(i)$. For any model, world w, and time t in that model, let $R(w,t) = \{w' \in W : wR(t)w'\}$. Since interaction between subjects plays no significant role in our theory, subjects are not elements of the model. We can think of these models as being given relative to an arbitrary fixed subject x. Given our fixed subject x, $R(w,t)$ is intended to represent $R(w,t,x)$, the set of *prima facie* alternatives for x at t in w. Our claim NORMALITY PERSISTS may be regarded as a constraint on admissible models. We demonstrate below that some models verify ABNORMALITY NEEDN'T PERSIST.

Definition 2. Let $[\![\phi]\!]^{\mathcal{E},w,t}$ be the *truth value of a formula ϕ of $\mathcal{L}$ relative to an e-model $\mathcal{E}$, a time $t \in T$, and a world $w \in W$*. We define this notion as follows:

(i) $[\![p]\!]^{\mathcal{E},w,t} = 1$ iff $I(p)(w,t) = 1$, where p is atomic

(ii) $[\![\neg\phi]\!]^{\mathcal{E},w,t} = 1$ iff $[\![\phi]\!]^{\mathcal{E},w,t} = 0$

(iii) $[\![(\phi \wedge \psi)]\!]^{\mathcal{E},w,t} = 1$ iff $[\![\phi]\!]^{\mathcal{E},w,t} = [\![\psi]\!]^{\mathcal{E},w,t} = 1$

(iv) $[\![\mathcal{A}_i\phi]\!]^{\mathcal{E},t,w} = 1$ iff $[\![\phi]\!]^{\mathcal{E},i,w} = 1$

(v) $[\![\mathcal{P}_i\phi]\!]^{\mathcal{E},t,w} = 1$ iff $i < t$ and $[\![\phi]\!]^{\mathcal{E},i,w} = 1$

(vi) $[\![\mathcal{F}_i\phi]\!]^{\mathcal{E},t,w} = 1$ iff $t < i$ and $[\![\phi]\!]^{\mathcal{E},i,w} = 1$

(vii) $[\![\mathcal{K}\phi]\!]^{\mathcal{E},t,w} = 1$ iff for all $w' \in W$, if $w' \in R(w,t) \cap \{w'' : w'' \succeq_t w\}$, $[\![\phi]\!]^{w',t} = 1$

In Section 6.2, we argued that, according to the epistemic view, an agent can lose knowledge simply by moving through time. We provide a model here to demonstrate this. Note that to claim that a model represents knowledge as being lost between a pair of times t, t' ($t < t'$), it is not sufficient to show that $\mathcal{K}\phi$ is true at (w,t) but not at (w,t') (for some ϕ and w), for this may simply be the result of ϕ's expressing different propositions at t and t' respectively. We can avoid this worry by constructing a model in which there are times t, t' ($t < t'$) such that $\mathcal{K}\mathcal{A}_i p$ is true at (w,t), but not at (w,t'); this avoids the worry because $\mathcal{A}_i p$ expresses the same proposition at every time t, namely $\{w' : [\![p]\!]^{\mathcal{E},i,w'} = 1\}$. (If p translates *Beth enjoys the dish*, $\mathcal{A}_{f_7} p$ would express the proposition β discussed in the text.)

Proposition 1. *There is an e-model $\mathcal{E} = \langle W, T, <, R, \succeq, I\rangle$, a world $w \in W$, and times $t, t' \in T$ such that $t < t'$, $R(w,t) = R(w,t')$, $[\![\mathcal{K}\mathcal{A}_{t'} p]\!]^{\mathcal{E},w,t} = 1$, and $[\![\mathcal{K}\mathcal{A}_{t'} p]\!]^{\mathcal{E},w,t'} = 0$.*

Proof. Let $W = \{w, v\}$ and let $T = \{t_1, t_2\}$, where $t_1 < t_2$. Assume $\succeq_{t_1} = \{(w,w),(v,v)\}$ and $\succeq_{t_2} = \{(w,w),(v,v),(w,v)\}$. Note that both $\succeq_{t_1}$ and $\succeq_{t_2}$ are reflexive and transitive, and that NORMALITY PERSISTS is satisfied. Assume that for all $t \in T, u \in W$, $R(u,t) = W$. So for all $t \in T$, $R(t)$ is reflexive; and $R(w,t_1) = R(w,t_2)$. Assume that for all $t \in T$, $I(p)(w,t) = 1$ and $I(p)(v,t) = 0$; for all other atomic formulas q, worlds $u \in W$, and times $t \in T$, $I(q)(u,t) = 0$. Since for any $u \in W$ and $t \in T$, $R(u,t) = W$, it follows that for any $u \in W$ and $t \in T$, $R(u,t) \cap \{u' : u' \succeq_t u\} = \{u' : u' \succeq_t u\}$. We may depict the situation as in Figure 1, where an arrow leading from one world u to another u'' at time t indicates that u'' is epistemically accessible from u at t, that is, that $u'' \in R(u,t) \cap \{u' : u' \succeq_t u\}$. Observe that $[\![\mathcal{K}\mathcal{A}_{t_2} p]\!]^{\mathcal{E},w,t_1} = 1$, since only w itself is in $R(w,t_1) \cap \{u : u \succeq_{t_1} w\}$, and $[\![p]\!]^{\mathcal{E},w,t_2} = 1$. But $[\![\mathcal{K}\mathcal{A}_{t_2} p]\!]^{\mathcal{E},w,t_2} = 0$, since $v \in R(w,t_2) \cap \{u : u \succeq_{t_2} w\}$ and $[\![p]\!]^{\mathcal{E},v,t_2} = 0$.

□

The fact that $R(w,t_1) = R(w,t_2)$ indicates that knowledge of $\mathcal{A}_{t_2} p$ was lost simply by moving through time, that is, with no change in the agent's *prima facie* alternatives. Notice also that the model verifies ABNORMALITY NEEDN'T PERSIST, since $t_1 < t_2$, $v \not\succeq_{t_1} w$, and $v \succeq_{t_2} w$.

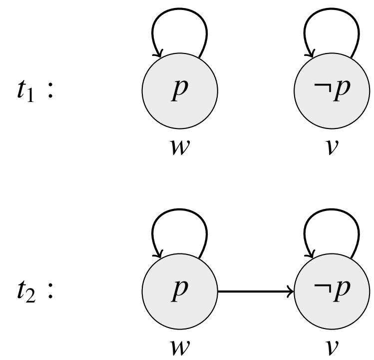

Figure 1: Losing knowledge of $\mathcal{A}_{t_2} p$

Here are the details for the modal view:

Definition 3. An *m-model for $\mathcal{L}$* is a tuple $\mathcal{M} = \langle W, T, <, R, \approx, N, I \rangle$, where $W, T, <$, and R are given by (1)-(4) of **Definition 1**, and:

(5) $\approx$ is a function from T into $\mathcal{P}(W \times W)$ such that: (i) for all $t \in T$, $\approx_t$ is a binary equivalence relation on W, and (ii) if $w \approx_{t'} w'$ and $t < t'$, then $w \approx_t w'$,

(6) N is a function from $\{\{w' : w \approx_t w'\} : w \in W, t \in T\}$ into $\mathcal{P}(W)$ such that $N_{w,t} \subseteq \{w' : w \approx_t w'\}$ (we write "$N_{w,t}$" for $N(\{w' : w \approx_t w'\})$), and

(7) I is an interpretation function that assigns to each time nominal i an element $I(i)$ of T, assigns to each atomic formula p a function $I(p)$ from $W \times T$ into $\{0, 1\}$, and meets the following condition: if $w \approx_{t'} w'$ and $t \leq t'$, then $I(p)(w, t) = I(p)(w', t)$, for all atomic formulas p.

Definition 4. Let $[\![\phi]\!]^{\mathcal{M},w,t}$ be the *truth value of a formula ϕ of $\mathcal{L}$ relative to an m-model $\mathcal{M}$, a time $t \in T$, and a world $w \in W$*. The first five clauses of this definition are the same as those in **Definition 2** except that we replace the superscripted "$\mathcal{E}$" on the double-brackets with an "$\mathcal{M}$" throughout. The only other differences are in the final two clauses:

(vi) $[\![\mathcal{F}_i \phi]\!]^{\mathcal{M},t,w} = 1$ iff $t < i$ and for all $w' \in W$, if $w' \in N_{w,t}$, $[\![\phi]\!]^{\mathcal{M},i,w'} = 1$

(vii) $[\![\mathcal{K} \phi]\!]^{\mathcal{M},t,w} = 1$ iff for all $w' \in W$, if $w' \in R(w, t)$, $[\![\phi]\!]^{\mathcal{M},w',t} = 1$

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