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Our Naïve Representation of Time and of the Open Future

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BATOUL HODROJ, ANDREW JAMES LATHAM & KRISTIE MILLER

It's generally thought that we naïvely or pre-theoretically represent the 3 future to be open. While philosophers have modelled future openness in 4 different ways, it's unclear which, if any, captures our naïve sense that 5 the future is open. In this paper, we focus on just one way the future might count as being open: by being nomically open. We empirically 7 investigate whether our naïve representation of the future as open is partly constituted by representing the future as nomically open. We also ¢ investigate the connection between our naïve representation of the future 10 as open and our representation of time. One of the purported advantages of the growing block theory of time is that it captures our naïve sense 12 that the future is open and the past closed. We investigate whether there is an explanatory connection between people representing the future as 14 being nomically open and representing our world as a growing block. 15 We also reflect on the implications of our findings for theorising about 16 future openness and temporal ontology. 17

It's often thought that our intuitive or pre-reflective view of the world is one in which, in some sense or other, the future is open.¹ It has also been thought that our intuitive, pre-reflective, or folk view of the world is one in which the totality of our world grows as new being comes into existence in the present moment and then becomes past as yet more being comes into existence.² This latter view is the view that our world is a *growing block*.³

¹ Callender (2017) takes this to be part of the manifest image; Ismael (2012) likewise.

² See Forbes (2016). Latham, Miller and Norton (2021b) confirmed empirically that, of the ~70% of people who are temporal dynamists, the most popular view is the growing block view.

³ Defenders of this view include Broad (1923, 1938), Forbes (2016), Correia and Rosenkranz (2018), Tooley (1997), and Forrest (2004).

In what follows, rather than talking about pre-reflective or folk views, we 24 will talk of naïve representations of the world. As we will understand them, 25 naïve representations are contentful mental states, i.e., representations of 26 various aspects of our world that are not informed by (or, at least, are largely 27 not the product of engagement with) current science or philosophy. These 28 are folk views, folk theories, or folk models of aspects of the world. These 29 representations may be tacit in the sense that the people whose representa-30 tions they are may not be able to specify the content of the representation 31 when asked. Nevertheless, we take it that these representations guide people's 32 behaviours (linguistic and otherwise) and that we can probe their content by 33 giving people tasks that require them to use those representations. 34

We are interested in two sorts of naïve representations. The first is our 35 naïve representation of the future; the second is our naïve representation of 36 time. Ultimately, we will be interested in whether these representations are 37 connected. 38

We will take the claim that our pre-reflective view of the world is one in 39 which the future is open to be the claim that we naïvely represent the future 40 as open. Philosophers have offered various accounts of the open future. In 41 fact, we can (and should) distinguish at least two rather different projects with 42 which philosophers are engaged. The first of these aims to model the open 43 future. On one natural interpretation of such a project, which we will call the 44 capturing project, the aim is to work out which model of, or theory of, the open 45 future is the one that best captures our intuitive sense that the future is open. 46 As we construe this project, the aim is to offer a model of the open future that 47 best captures our naïve representation of future openness. The second project, 48 which we will call the explanatory project, focuses on explaining various "open 49 future" practices (conceived of very broadly) and attempts to explain why it is 50 that we have such practices and what it is about our world that grounds our 51 having such practices. These practices might include (but not be limited to) 52 practices of deliberating about the future but not the past; taking ourselves to 53 be able to causally intervene on the future but not the past; having a certain 54 kind of phenomenology in which the future feels, or seems, to us to be open 55 in the way the past does not; taking ourselves to have a kind of access to past 56 states that we do not have to future ones: and so on. 57 These two projects might be connected or not. It might be that what explains 58

why we have the open future practices we do is the very thing that, in fact, 59 captures our naïve representation of the future. In that case, we will say that

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our naïve representation of the future is vindicated. Alternatively, it could 61

be that what explains our open future practices does not capture our naïve
 representation of the future as open. To see this, consider several of the views
 philosophers have put forward as models of the open future and suppose
 these are claims about our naïve representation of future openness.

The first view models future openness in terms of alethic openness. On 66 this view, our naïve representation of the open future consists in, or at least 67 includes, our representing that (some or all) future-tensed contingent state-68 ments fail to take a determinate truth-value (see, for instance, Markosian 69 1995; Williams 2008 (unpublished); MacFarlane 2003; and Tooley 1997). The 70 second of these is epistemic openness. On this view, our naïve representation 71 of the future being open consists in, or at least includes, our representing 72 that we have epistemic access to the future only by making predictions and 73 forming intentions and not by having records of what will happen (see, for 74 instance, Lewis 1979). The third is nomic openness. On this view, our naïve 75 representation of the future being open consists in, or at least includes, our 76 representing that future-directed indeterminism is true. There are multiple 77 ways the future could go, consistent with how it has already gone (Belnap 78 1992, 2005; MacFarlane 2003, 2008; and McCall 1994). 79 It could be that our naïve representation of the future as open consists in our 80 representing the future as being open in some or all of these ways.⁴ Suppose 81 it were to turn out that our naïve representation of future openness consists 87

entirely in representing the future to be alethically open. Suppose, however, 83 that our world is not, in fact, alethically open. Still, something explains why 84 we have the open future practices that we do. It might be that the fact that 85 there is an epistemic asymmetry between past and future is what explains 86 our having these practices. It might even be that the world being this way 87 legitimises or makes those practices rationally permissible (or obligatory). 88 Still, it will turn out that what explains our having the open future practices 89 we do does not vindicate our naïve representation of the future as open. 90

This paper will have nothing to say about why we have the open future practices we do. We set aside the explanatory project and focus entirely on the question of what our naïve representation of future openness consists in. This is a vital first step if we are interested in the question of whether what it is that explains our practices (whatever that might be) vindicates our naïve representation of the future as open.

⁴ This is not to say that these are the only such ways. For a discussion of the ways in which we could model openness, see Torre (2011) and Markosian (1995).

Some work in this area has already been undertaken. Previous research by 97 Hodroj et al. (2023) suggests that our naïve representation of the future as 98 open, at least partly, consists in our representing the future to be alethically 90 open. So, in this paper, we focus on nomic openness. We will suppose that a 100 world is nomically open just in case that world is future-wise indeterministic. 101 That is, a world, w, is nomically open just in case for any time t in w, it is 102 not the case that a complete specification of the way the world is at t, in 103 conjunction with the laws of nature of w, logically entails the way the world 104 is at all times later than t. This leaves open that w may or may not be past-wise 105 nomically open: that is, whether the way the world is at t, in conjunction with 106 the laws of nature, logically entails the way the world is at all times earlier 107 than t. Then, we are interested in whether our naïve representation of the 108 future involves our representing the future to be nomically open. 109

We are also interested in the connection between our naïve representation of the future as open and our naïve representation of the temporal dimension. That is because it has been suggested that part of what explains why the growing block theory is intuitively plausible is that we naïvely represent the future as open, and the growing block theory better captures, or better accords with, this (see, for instance, Briggs and Forbes 2012; Forbes 2016; Grandjean 2021, 2022; and Correia and Rosenkranz 2018).

According to the growing block model of time, past events and objects exist, 117 but future ones do not. There is a set of events that are objectively present, and 118 these are the events that sit at the end of the block looking out into the non-119 existent future. The temporal passage consists in the coming into existence 120 of a new being on the edge of reality, where that new being becomes the 121 objective present until more being comes to exist (at which point it becomes 122 part of the objective past). Hence, the growing block theory is a version of 123 the A-theory on which there exists robust temporal passage: there is a fact of 124 the matter as to which events are present and which those are changes. By 125 contrast, the block universe theory is a version of the B-theory. On this view, 126 past, present, and future events/objects exist on a four-dimensional manifold 127 and bear unchanging relations of earlier-than, later-than, and simultaneous-128 with to one another.⁵ None of these events is singled out as objectively present, 120 and so time does not robustly pass since there is no change in which events 130 are objectively present. 131

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⁵ This, of course, is also true of the moving spotlight theory, which is a version of dynamism. However, on that view, unlike the block universe view, there is a single set of events singled out as objectively present.

Unlike other models of time, the growing block theory has a built-in asym-132 metry between the past and the future. The past exists and is located some-133 where in space-time, whereas the future is yet to happen and does not exist. 134 By contrast, presentism holds that neither the future nor the past exists, and 135 the block universe theory holds that both the future and the past exist. The 136 moving spotlight theory also holds that both future and past exist but holds 137 that some events are objectively present (namely, those on which the spotlight 138 of presentness shines, as it were) and that which events those are changes as 139 the present moves.⁶ 140

This asymmetry has been hypothesised to better capture people's intuitive sense that the future is open and the past is closed than do views that lack this asymmetry.⁷

Following Latham, Miller and Norton (2021b), we take a naïve representation of time to be a (probably tacit) representation of time and temporal ontology in our world. People's naïve representation of time might be closer to one or another of the models of time that philosophers engage with.

Following Hodroj et al. (2023), we can distinguish three aspects of the idea that the growing block theory better accommodates people's intuitive sense that the future is open.

First, according to the *vindication claim*, our naïve representation of future openness has a content that is vindicated if our world is a growing block. The narrow version of the vindication claim that will be of interest to us in this paper is the claim that our naïve representation of future openness has a content that is vindicated if our world is a growing block and is not vindicated if our world is a block universe. Henceforth, we will call this the *narrow vindication claim*.

One might be particularly interested in the narrow vindication claim if one thinks that if the growing block vindicates our naïve representation of the open future and the block universe view does not, this gives us a reason (albeit defeasible) to prefer the former over the latter.

Second, according to the *reason claim*, people believe, perhaps tacitly, that
 the fact that a world has an open future is a reason to think that that world is
 a growing block world rather than a block universe world.

⁶ For empirical research into people's naïve views of time, see Latham, Miller and Norton (2021a).

⁷ Something that Grandjean (2021, 2022) and Correia and Rosenkranz (2018) point to.

Third, according to the *explanation claim*, people naïvely represent our world to be a growing block because they naïvely represent the future to be open.

Our aim is not to investigate all these claims in their full generality but rather to investigate certain aspects of these claims as they pertain to nomic openness.

Consider, first, the narrow vindication claim. In order to evaluate the narrow vindication claim, we would need to know the content of our naïve representation of future openness. This paper will speak to the issue of whether our naïve representation of future openness is partly constituted by our representing it to be nomically open. So, it will provide the beginnings of the sort of account we would need to determine whether the narrow vindication claim (and indeed the vindication claim itself) is true.

Next, consider the reason claim. We investigate whether people take the fact 178 that a world is nomically open to be a reason to think that it is a growing block 179 world rather than a block universe world. We also investigate a particular view 180 about what this reasoning might consist in. According to this view, people 181 reason from their ability to deliberate and to act freely to the idea that the 182 future is nomically open. They then reason from the nomic openness of the 183 future to the idea that future events do not exist because they think that if 184 future events did exist "out there in spacetime," then those events must be 185 determined because facts about them already obtain. But in representing 186 that future events do not exist and will later come to exist, one represents 187 one crucial element of the growing block view. Thus, it might be that by 188 representing the world as nomically open, people come to represent it as a 189 growing block. 190

Now, to be clear, we are not endorsing either stage of this reasoning from 191 freedom/deliberation to nomic openness or from nomic openness to the non-192 existence of future events (indeed, this last inference is clearly invalid). We 193 are merely hypothesising that people (likely tacitly) reason in something like 194 this manner, and so they take the presence of nomic openness in a world to 195 be a reason to think that the world is a growing block world rather than a 196 block universe world. We will call the claim that people reason in this way 107 the deliberative reasoning claim. 198

Finally, according to the version of the explanation claim that we investigate
here, the fact that people naïvely represent the future as nomically open is
part of what explains why they represent our world to be a growing block.
Notice that the reason claim and the explanation claim can come apart. It

could be that people naïvely represent our world as a growing block because 203 they represent it as nomically open, even though they do not tacitly suppose 204 that the latter is a reason to think our world is a growing block (perhaps there 205 is a common cause of both representations). Equally, it could be that people 206 do think that a world being nomically open is a reason to think it is a growing 207 block rather than a block universe, but this does not, in fact, explain why 208 people think our world is a growing block world (either because they don't 209 think it is a growing block, or because they don't think our world is nomically 210 open, or because other factors completely swamp this reason and do all the 211 explanatory work). 212

In experiment 1, we seek to determine whether people's naïve represen-213 tation of the future involves nomic openness. We present participants with 214 two nomic vignettes: one that describes a nomically open world and one that 215 describes a nomically closed world. Having seen the two vignettes, partici-216 pants are then asked which world is most like our world (nomically open 217 or closed). Our first hypothesis (H1) is that more people will judge that the 218 nomically open world is more like our world than the nomically closed world. 219 If most people naïvely represent the future as nomically open, then it seems 220 reasonable to say that their naïve representation of the future as open consists, 221 at least in part, in them representing the future in this matter. 222

Participants are then presented with two *time vignettes*, one describing a growing block world and one describing a block universe world. They are then asked which world is most like our world. We predicted (H2) that more people would judge that our world is like the growing block world than the block universe world. This hypothesis is motivated by previous work on the way that people naïvely represent time, including that of Latham, Miller and Norton (2021a, 2021b, 2023), and, if vindicated, would replicate these findings.

If the explanation claim is true, then we should find an association between people judging that the nomically open world is most like our world and judging that the growing block world is most like our world, and between people judging that the nomically closed world is most like our world and judging that the block universe world is most like our world. This was H₃.

In order to investigate the reason claim, we present participants with just one of the nomic vignettes. Those who see the nomically open vignette are told that Katie is in a world just like that and then asked whether she is more likely to be in the growing block or the block universe world. Those who see the nomically closed vignette are told that Katie is in a world just like that and then asked whether she is more likely to be in the growing block or the ²⁴¹ block universe world. If the reason claim is true, then people should judge
²⁴² that if Katie is in a nomically open world, then she is more likely to be in a
²⁴³ growing block world as opposed to a block universe world, and if Katie is in a
²⁴⁴ nomically closed world, then they should judge that she is more likely to be
²⁴⁵ in a block universe world as opposed to a growing block world. This was our
²⁴⁶ H4.

Experiment 2 tests the deliberative reason claim. Here, participants are 247 presented with a single vignette that describes an interaction between two 248 characters (George and Helena). George reasons from the fact that our world 249 is deliberatively open to the conclusion that it is nomically open and, from 250 there, to the conclusion that future events do not exist. Helena rejects George's 251 reasoning and explains where she thinks it goes awry. Participants are asked 252 which character is correct. If the deliberative reason claim is true, then we 253 should find that more people will judge that George is correct. This is H₅. The 254 final part of this experiment focuses on whether people can see the inferential 255 connection between accepting or rejecting this reasoning. Participants are 256 asked which world (growing block or block universe) the two characters 257 will take themselves to be in. We predicted that participants would judge that 258 Helena would take herself to be in a block universe world while George would 259 take himself to be in a growing block world (H6). 260

We begin, in section 1, by outlining our methodology and results. Then, in section 2, we consider the upshot of those results for understanding our pre-reflective views of the world and the connection between them.

264 Methodology and Results

1651 Experiment 1 Methodology

1.1.61 Participants

- ²⁶⁷ 856 people participated in the study. Participants were recruited and tested
 ²⁶⁸ online using Amazon Mechanical Turk and compensated \$2 for their time.
 ²⁶⁹ 732 participants had to be excluded from the analyses. That is because they
- failed to answer all the questions (n = 80), failed one of the attentional check
- questions (n = 73), or failed to answer two out of three comprehension ques-
- tions correctly for the openness vignettes or three out of four comprehension
- questions correctly for both time vignettes (n = 579). The remaining sample
- was composed of 124 participants (46 female; aged 21–72, mean age 38.98

- $_{275}$ (SD = 9.95)). Ethics approval for these studies was obtained from the Univer-
- ²⁷⁶ sity of Sydney Human Research Ethics Committee. Informed consent was

²⁷⁷ obtained from all participants prior to testing. The survey was conducted

²⁷⁸ online using Qualtrics.⁸

1.1-2 Materials and Procedure

- ²⁸⁰ Participants first see *both* of the following openness vignettes. The first vignette
- describes a world in which the universe is Nomically Open—which we called
- ²⁸² Universe A. The second vignette describes a world in which the universe is
- 283 Nomically Closed—which we called Universe B.
- ²⁸⁴ NOMICALLY OPEN (UNIVERSE A):
- Imagine a universe (Universe A) in which not everything that hap-
- pens is completely caused by whatever happened before it. In Uni-
- verse A, there are multiple different ways the future could go, given
 that the past and present are as they are. Given the past, every event *does not have to happen* the way that it does. So, if we "ran" Universe A over again from its very first moment, events might unfold
 differently to the way they did unfold.
- For example, one day, Katie decided she wanted to have a cup of coffee with her breakfast. Like everything else, this decision is not completely caused by whatever happened before it. So, if everything in the universe was exactly the same up until Katie made her decision, it *did not have to happen* that Katie would decide to have a cup of coffee.
- NOMICALLY CLOSED (UNIVERSE B): 298 Imagine a universe (Universe B) in which everything that happens 299 is completely caused by whatever happened before it. In Universe 300 B, there are not multiple different ways the future could go, given 301 that the past and present are as they are. Given the past, every event 302 has to happen the way that it does. So, if we "ran" Universe B over 303 again from its very first moment, events would unfold exactly the 304 same way that they did unfold. 305
- For example, one day, Katie decided she wanted to have a cup of coffee with her breakfast. Like everything else, this decision was
 - $8\ 22\%$ of the remaining sample got every comprehension question correct.

completely caused by whatever happened before it. So, if everything
 in this universe was exactly the same up until Katie made her decision, then it *had to happen* that Katie would decide to have a cup of
 coffee.

After reading both vignettes, participants responded to three comprehension questions to which they could either respond (a) true or (b) false.

- If we "reran" Universe [A/B] over and over again, we would always get the very same events occurring in the very same order.
- In Universe [A/B], the way things are now could not have been any different from how they are unless the past had been different from how it is.
- 319 3. In Universe [A/B], there is only one way the future can unfold, given that the past and present are the way they are.
- Participants who did not correctly answer two out of three of these questions
 for each vignette were excluded from the analyses.
- Participants are then asked, "Which universe do you think is most like our universe?" and given two options: (a) UNIVERSE A or (b) UNIVERSE B.
- Participants then see both of the following time vignettes. The first vignette describes a universe that is a growing block world—which we called Universe
- C. The second vignette describes a block universe world—which we called
 Universe D.

GROWING BLOCK (UNIVERSE C): 329 Imagine a universe (Universe C) where new events—such as the 330 extinction of the dinosaurs, the launching of a ship, or the cutting 331 of a birthday cake—and objects—such as the birth of a baby or the 332 creation of a new car-constantly come into existence. The events 333 and objects that come into existence remain in existence, so the 334 sum total of reality grows as new events and objects come to exist. 335 In this universe, the events and objects that have just come into 336 existence are those that are in the objective present. As new events 337 and objects come into existence, already existing events and objects 338 become part of the past. No future events or objects exist. So, there 339 is a real, objective fact of the matter about which events are present 340 and which are past. 341

For example, in Universe C, there is the event of Suzy throwing 342 the ball at the window and the event of Billy throwing the ball at 343 the window. When Suzy throws her ball, Billy is still holding his 344 ball; he has yet to throw it. When the event of Suzy's ball hitting 345 the window comes into existence, it is in the objective present, and 340 the event of Billy's ball hitting the window does not yet exist. It is 34 still in the future. When the event of Billy's ball hitting the window 348 comes into existence, it is in the objective present, and the event 349 of Suzy's ball hitting the window exists in the objective past. So, in 350 this universe, first, Suzy throws the ball, and it hits the window; 35 then, later, the event of Billy's ball hitting the window comes into 352 existence, at which time Suzy's throwing the ball at the window still 353 exists but is in the past. 354

355 BLOCK UNIVERSE (UNIVERSE D):

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Imagine a universe (Universe D) where a single set of events-such 356 as the extinction of the dinosaurs, the launching of a ship, or the 35 cutting of a birthday cake—and objects—such as the birth of a baby 358 or the creation of a new car-exist. All these events are equally real. 359 The sum total of reality never grows or shrinks, so the totality of 360 events that exist never changes. In this world, past, present, and 36 future events all exist. If dinosaurs have ever existed, then dinosaurs 362 exist somewhere in the universe. If there will ever exist sentient 363 robots, then there exist sentient robots somewhere in the universe. 364 In Universe D, other *times* are much like other *places*. Just as in our 365 world, Singapore, Sydney, and Seattle all exist, even though they 366 do not exist in the same place; in Universe D, dinosaurs and robots 36 exist, even though they do not exist at the same time. So, in Universe 368 D, every time is present from the perspective of those located in it, 369 just as every place is "here" from the perspective of those located in 370 it. 37

For example, in Universe D, there is the event of Suzy throwing the ball at the window and the event of Billy throwing the ball at the window. When Suzy throws her ball, Billy is still holding his ball; he has yet to throw it. In Universe D, the event of Suzy throwing her ball and the event of Billy throwing his ball both exist. But they do not exist at the same place in space-time: the event of Suzy's ball hitting the window is earlier than the event of Billy's ball hitting the

window. So, in Universe D, there is a fact of the matter about which 379 ball hits the window first, namely, Suzy's, and so there is a fact of 380 the matter about in which order the two events occur. But there 20. is no fact about which event *really* is present and which is past or 382 future. The event of Suzy's ball hitting the window is past relative to 383 people who are located at the time that Billy's ball hits the window, 384 while the event of Billy's ball hitting the window is future relative to 385 people who are located at the time that Suzy's ball hits the window. 380

- After reading both time vignettes, participants responded to four comprehension questions to which they could respond (a) true or (b) false.
- ³⁸⁹ 1. In Universe [C/D], the past and present exist, but the future does not.
- ³⁹⁰ 2. In Universe [C/D], the past, present, and future exist.
- 391 3. In Universe [C/D], there is an objective fact as to which events are present.
- 4. In Universe [C/D], events are always past or future relative to other events.
- Participants who failed to correctly answer three out of four of these questions
 for each vignette were excluded from the analyses.
- Participants are then asked, "Which universe do you think is most like our
 ³⁹⁷ universe?" and are given two options: (a) UNIVERSE C or (b) UNIVERSE D.
- ³⁹⁹ Finally, participants then see either the nomically open or nomically closed
- vignette again, along with both time vignettes, and respond to the following
- 401 question: "Katie is in a universe just like A/B. Do you think that Katie is more
- $_{402}$ likely to be in Universe C or more likely to be in Universe D?" and are given
- $_{\rm 403}$ two options: (a) UNIVERSE C or (b) UNIVERSE D.

1.1.43 Results

Before presenting the statistical analysis, we will start by summarising our 405 main findings. We first hypothesised that (H1) more people would judge that 406 the nomically open world is more like our world than the nomically closed 407 world. This hypothesis was supported. Participants were more likely to judge 408 that our world is more like a nomically open world compared to a nomically 409 closed world. We then hypothesised that (H2) most people would judge that 410 our world is a growing block world rather than a block universe world. This 411 hypothesis was not supported. 412

Next, we hypothesised (H₃) that there would be an association between 413 people judging that the nomically open world is most like our world and 414 judging that the growing block world is most like our world and between 415 people judging that the nomically closed world is most like our world and 416 judging that the block universe world is most like our world. This hypothesis 417 was not supported. While there was a significant association between people's 418 judgements about nomic openness and time, the association we found was not 419 the one we hypothesised. Instead, there was an association between judging 420 that our world is nomically closed and judging it to be a growing block world. 421 Participants who judged our world to be nomically open were roughly divided 422 in their likelihood to judge our world to be a growing block world or a block 423 universe world. 424

Finally, we hypothesised (H4) that participants who are told that a character (Katie) is in a nomically open world would be more likely to judge that she is in a growing block world than a block universe world (and participants who are told that she is in a nomically closed world would be more likely to judge that she is in a block universe world than a growing block world). We found evidence for this.

Separate one-way chi-square tests were performed to test whether 431 (a) most participants judged that the nomically open world was more 432 like our world compared to the nomically closed world and whether (b) 433 most participants judged that our world is a growing block world rather 434 than a block universe world. The results of those tests showed that the 435 first hypothesis was vindicated. This means that participants are more 436 likely to judge the world as nomically open (76, 61.3%) as opposed to 437 being nomically closed (48, 38.7%; $\chi^2(1, N = 124) = 6.323, p = .012$). 438 Our hypothesis that participants will judge that our world is more like 439 a growing block world (69, 55.9%) as opposed to a block universe world 440 $(55, 44.4\%; \chi^2(1, N = 124) = 1.582, p = .209)$ was not statistically significant, 441 indicating that participants are equally likely to judge our world as being 442 either a growing block world or a block universe world. 443

Table 1 below summarises the descriptive data of participants' judgements regarding which nomic vignette (NOMICALLY OPEN; NOMICALLY CLOSED) is most like our world and which time vignette (GROWING BLOCK world; BLOCK UNIVERSE world) is most like our world. To test whether there was an association between participants who judged our world to be nomically open and their judging of our world to be a growing block world, we performed a chisquare test of independence. This hypothesis was not supported. Instead, there

was an association between participants judging our world to be nomically closed and judging it to be a growing block world ($\chi^2(1, N = 124) = 5.449, p =$

453 .020). Participants who judged our world to be nomically open were divided

⁴⁵⁴ between judging it to be a growing block world and a block universe world.

Table 1: Participants' judgements of which nomic universe and time vignette are most like the actual world.

World	Growing Block World	Block Universe
Nomically Open	(36) 29.0%	(40) 32.3%
Nomically Closed	(33) 26.6%	(15) 12.1%

Finally, we performed a chi-square test of homogeneity to test whether 455 participants who are told that Katie is in a nomically open world would be 456 more likely to judge that she is in a growing block world (and whether people 457 who are told that she is in a nomically closed world would be more likely to 458 judge that she is in a block universe world). There was a significant association, 459 $\chi^2(1, N = 124) = 6.613, p = .010$. Participants who were told that Katie was 460 in a nomically open world were more likely to judge that she was also in a 461 growing block world. Meanwhile, participants who were told that Katie was 462 in a nomically closed world were more likely to judge that she was also in a 463 block universe world (see table 2). 464

Table 2: Participants' judgements of which universe Katie is more likely to be in based on associations between nomic openness and time.

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World	Growing Block World	Block Universe
Nomically Open	(38) 65.5%	(20) 34.5%
Nomically Closed	(28) 42.4%	(38) 57.6%

1.52 Experiment 2 Methodology

1.261 Participants

⁴⁶⁷ 856 people participated in the study. Participants were recruited and tested

⁴⁶⁸ online using Amazon Mechanical Turk and compensated \$2 for their time.

- ⁴⁶⁹ 732 participants had to be excluded from the analyses. That is because they ⁴⁷⁰ failed to answer all the questions (n = 124), failed one of the attentional ⁴⁷¹ check questions (n = 54), or failed to answer three out of four comprehension
- questions correctly for the discussion vignette or failed to answer three out of
- four comprehension questions correctly for the time vignettes (n = 554). The
- ⁴⁷⁴ remaining sample was composed of 124 participants (49 female, 2 trans/non-
- binary; aged 20–78, mean age 36.58 (SD = 99.716)). Ethics approval for these
- studies was obtained from the University of Sydney Human Research Ethics
- 477 Committee. Informed consent was obtained from all participants prior to
- testing. The survey was conducted online using Qualtrics.⁹

1.232 Materials and Procedure

- ⁴⁸⁰ In this study, participants first see a single vignette—the nomic discussion
- 481 vignette—in which Helena and George present different views about the
- 482 connection between nomic openness and the existence of the future.

483 NOMIC DISCUSSION:

Helena and George are standing outside a philosophy room having 484 a heated discussion about the reasons there are to think that the 485 future either exists or does not exist. If the future does not exist, 486 then future events, such as the existence of a colony on Mars or the 48 robot uprising, do not exist, although perhaps one day they will. If 488 the future does exist, then if there will be a colony on Mars in the 489 future, it is true right now that the colony exists out there in the 490 universe somewhere. If the future exists, then future events (and 49 places) are much like other places here and now. While Helena and 492 George are located in Singapore, it's still the case that Sydney and 493 London exist; they just don't exist in Singapore. In the same way, if 494 the future exists, then the colony on Mars exists; it just doesn't exist 495 here and now. 496

According to George, one reason to think that the future does
 not exist is that if the future did exist, then there are not multiple
 different ways the future could go, given that the past and present are
 as they are. If the future exists, then given the past and present, every
 future event *has to happen* the way that it does. So if the future exists,
 then if we re-ran the universe over again from its very first moment,

^{9 16%} of the remaining sample got every comprehension question correct.

112

events would unfold exactly the same way. But then Helena cannot
 be free to *choose* what to eat for breakfast tomorrow, since whatever
 she eats for breakfast tomorrow, it *had* to be that she would eat that
 thing.

Helena tells George that he is mistaken. That kind of reasoning, 50 she says, gives us no reason to think that the future does not exist. 502 Just because the event of my (Helena's) eating cereal exists out there 509 in the future, it doesn't mean that my eating cereal was determined 510 by the past and present. It doesn't mean that the future could not 511 have gone some other way. It could be that if we reran the universe 512 over again, then I would instead eat toast instead of cereal for break-513 fast. The mere fact that the event of my eating cereal is out there 514 in the universe doesn't tell us that that event had to be out there. 515 You, George, are located here in this office. But the fact that you are 516 located here doesn't tell us that if the past and present had been the 517 same, you had to be located in this office. Perhaps you could have 518 been somewhere different! So, the fact that the event of my eating 519 cereal is out there in the universe does not mean that I had to eat 520 cereal. It just means that, in fact, I do eat cereal. 52

Participants then answered four comprehension questions to which they could answer either (a) true or (b) false.

- (a) If Helena is right, then if the future exists, it can still be true that there
 are multiple ways the future could go, given that the past and present
 are as they are.
- (b) If George is right, then if the future exists, it can still be true that there are multiple ways the future could go, given that the past and present are as they are.
- (c) According to Helena, if the event of her eating cereal tomorrow exists,
 then it could still be that the past and present did not determine that
 she would decide to eat cereal.
- (d) According to George, if the event of her eating cereal tomorrow exists,
 then it must be that the past and present determined that she would
 decide to eat cereal.
- Participants who failed to correctly answer three out of four of these questions
 were excluded from the analyses.

Participants are then asked, "Which of the two parties, Helena or George,
 do you think is right?" and are given two options: (a) George or (b) Helena.
 Participants then see both the time vignettes and associated comprehension

questions (see experiment 1). Participants who failed to correctly answer
 three out of four of these questions for each vignette were excluded from the
 analyses.

Finally, participants then saw the NOMIC DISCUSSION vignette again, along
 with both time vignettes. They were then presented with two questions:

(1) "Which universe do you think *Helena* will think is most like the universe she is in?"

1.253 Results

As in experiment 1, we also tested H2 by asking participants which world they believed was most like our world (i.e., growing block world or block universe world) and predicted that most people would judge that our world is a growing block world rather than a block universe world. Again, H2 was not supported. People were divided between judging that our world is most like a growing block world and a block universe world.

We hypothesised that (H5) if the deliberative reasoning claim is right, then
 most people should judge that George, rather than Helena, is right in the
 NOMIC DISCUSSION vignette. This hypothesis was not supported. Instead,
 contrary to our prediction, we found that most participants judged that Helena,
 rather than George, was right.

Finally, we hypothesised that (H6) people will judge that Helena will take herself to be in a block universe world and that George will take himself to be in a growing block world. This hypothesis was supported.

Separate one-way chi-square tests were performed to test whether (a) most participants will judge that our world is more like a growing block world, (b) most participants will judge that George was right in the nomic openness discussion, (c) most participants will judge that Helena will take herself to be in a block universe world, and (d) most participants will judge that George will take himself to be in a growing block world. The results of those tests

 ^{(2) &}quot;Which universe do you think *George* will think is most like the universe he is in?"

For each question, they were given two options: (a) UNIVERSE C or (b) UNI-VERSE D.

showed that (a) participants were divided between judging that our world 573 is more like a growing block world (64, 51.6%) and a block universe world 574 $(60, 48.4\%; \chi^2(1, N = 124) = .124, p = .129)$, which does not support H₂. 676 Further, (b) contrary to H₅, more participants judged that Helena (87, 70.2%), 576 rather than George (37, 29.8%), was right in the nomic openness discussion, 577 $\chi^2(1, N = 124) = 20.161, p < .001$. H6 was vindicated: most participants 578 (c) judged that Helena would take herself to be in the block universe world 579 $(80, 64.5\%; \chi^2(1, N = 124) = 10.452, p < .001)$, and that (d) George would 580 take himself to be in the growing block world (80, 64.5%; $\chi^2(1, N = 124) =$ 581 10.452, p < .001). 582

582 Discussion

There are several notable aspects of our results. First, as predicted, we found that a majority of people judged our world to be nomically open rather than closed. These results are of interest to those aiming to model our naïve representation of future openness. Taken in conjunction with previous work in this area, they begin to paint a picture of people's naïve representation of the future.

Hodroj et al. (2023) found that a majority of people (66%) judged our world 590 to be one in which the future is *alethically* open rather than closed. Latham 591 and Miller (2023) report that a majority of people (87%) judged our world to be 592 deliberatively open rather than deliberatively closed: that is, they judged the 593 future to be one in which what we do in the future is the product of our earlier 594 deliberations, so that had we deliberated differently, we would have made 595 different choices and subsequently done different things. These results, taken 596 together with our current results, suggest that people's naïve representation 597 of the future probably involves at least a combination of representing the 598 future to be deliberatively, alethically, and nomically open. It also suggests 599 that it may be deliberative openness that is most important when it comes to 600 capturing people's naïve representation of the open future (something Torre 601 2011 gestures towards). 602

These results may also suggest that there are several naïve representations of future openness, all or almost all of which include representing the future as deliberatively open but only some of which include representing it as nomically and/or alethically open. Perhaps this is not surprising, given the evidence regarding people's naïve representation of time. Baron, Miller and Tallant (2022) cite a range of experiments that they take jointly to show that there is no single, shared, naïve representation of time. What is true of time
 might also be true of naïve representations of the open future.

Our results also have implications for the narrow vindication claim. Ac-611 cording to that claim, recall, the growing block theory vindicates our naïve 612 representation of the future as open, and the block universe theory does not. 613 There is some support for this claim, given the results of this study, alongside 614 those of Hodroj et al. (2023) and Latham et al., despite the fact that these 615 studies jointly suggest that most aspects of our naïve representation of future 616 openness (and the most important of these) are consistent with our world 617 being a block universe world. 618

The study by Latham et al. suggests that a vast majority of people have naïve representations of the future according to which the future is deliberatively open. But the presence of deliberative openness is clearly consistent with our world being either a block universe or a growing block world. So, arguably, the most powerful aspect of our naïve representation of the future is one that can be vindicated by either view of time.

The current study found that a majority of people represent the future as nomically open, not closed. But, again, the future being nomically open is consistent with our world being either a block universe or a growing block. So, either view can vindicate this aspect of our naïve representation.

The only good news for the growing block theorist lies in the Hodroj et al. (2023) study, which found that a majority of people represent the future as alethically open. On standard (i.e., nonbranching) versions of the block universe, the future is not alethically open, while on standard versions of the growing block theory, it is. So, the growing block theory does vindicate *this* aspect of openness, while the block universe view does not.

Still, it's worth bearing in mind that according to the study by Hodroj et 635 al. (2023), \sim 34% of people did not judge the future to be alethically open. So, 636 it may be that a substantial minority of people have a naïve representation 637 of the future that is equally vindicated by both the growing block and block 638 universe theories. And, of course, even if the narrow vindication claim is true, 639 it remains open to dispute whether it gives us much, if any, reason to prefer 640 the growing block view to the block universe view. Still, these studies suggest 641 that, insofar as growing block theorists want to try and argue for their view 642 via something like the (narrow) vindication claim, they might do well to focus 643 more on alethic openness than other forms of openness. 644

Moving on, we did not find that a majority of people represent our world as a growing block rather than a block universe. Instead, across both experiments,

people were evenly split between the two models. This should, perhaps, not 647 be such a surprise. Latham, Miller and Norton (2021a) found that across 648 two experiments, ~70% of people judged our world to be dynamical (either 649 growing block, moving spotlight, or presentist), and of those, between $\sim 35\%$ 650 and \sim 50% judged it to be a growing block. Even though in these studies only 651 \sim 25% and \sim 35% of all people judged our world to be most like a growing block 652 world, we expected that, given a forced choice between a growing block and a 653 block universe world, most people would judge it to be more like a growing 654 block world than a block universe world, given that most people judge our 655 world to be temporally dynamical. 656

Our results suggest that although people are drawn to dynamical theories of time, their naïve representation of time might be less *strongly* dynamical than has otherwise been thought. This might explain why, given that the block universe and growing block views are very similar in a number of ways, when given a forced choice between the two, people tended to be roughly evenly divided in which world they thought was most like ours.

This brings us to the explanation and reason claims. Our results here are 663 both startling and puzzling. Consider, first, the explanation claim. Our hy-664 pothesis here (H3) was not vindicated. While we did find an association, it 665 was the opposite of the one we predicted. We found an association between 666 judging a world to be nomically *closed* and judging it to be a growing block 667 world. Amongst people who judged our world to be nomically open, people 668 were evenly split between judging it to be a growing block or a block universe. 669 While the latter absence of an association is not such a surprise (given that, 670 in fact, nomically open words are no more likely to be growing block worlds 671 as opposed to block universe worlds, it is perhaps heartening to see people's 672 judgements in this regard), the presence of the converse association is very 673 puzzling. It's hard to see why people who judge the future to be nomically 674 closed would tend to judge it to be a growing block. The best we can come 675 up with is that perhaps some people think that the laws of nature "push" the 676 world along and cause it to grow, and they imagine this growth process must 677 be deterministic (else the world would not know what to grow into). If this is 678 the reason why (some) people judge our world to be nomically closed, then 679 we would expect those people to judge that our world is a growing block. All 680 we can really say is that further investigation of the association here would be 681 useful. 682

Certainly, though, the lack of any association between people judging our
 world to be nomically open and judging it to be a growing block world suggests

that it is unlikely that the fact that people naïvely represent the future as 685 nomically open is what even partially explains why they represent it to be 686 a growing block. This finding is interesting, given our results regarding the 687 reason claim. Our hypothesis in this regard was vindicated: participants judged 688 that Katie was more likely to be in a growing block world than a block universe 689 world if she was in a nomically open world and to be in a block universe 690 rather than a growing block world if she was in a nomically closed world. 691 Thus, people do seem to think that the fact that a world is nomically open is a 692 reason to think it is a growing block world rather than a block universe world. 693 The reason claim seems to be vindicated. 694

The vindication of the reason claim does suggest that there is some sense 695 in which the growing block view of time better accords with our naïve repre-696 sentation of the future as nomically open. It accords in at least this sense: if 697 the only thing someone knows about a world is that it is nomically open, they 698 will think it more likely that the world is a growing block rather than a block 699 universe world. So, there is some important connection between people's 700 naïve representation of the future and their naïve representation of time. The 70 former, we might say, predisposes them to thinking that our world is a growing 702 block world, since if all they know about our world is that it is nomically open, 703 people will tend to judge that it is a growing block world. 704

But of course, this is not all that people know about our world, and presum-705 ably, this explains why we found no association between people judging that 706 our world is nomically open and that it's a growing block world. One thought 707 about what might be going on here is that contemporary scientific knowledge 708 is pushing people who judge that our world is nomically open to judge that it 709 is a block universe world rather than a growing block world. If so, that could 710 tend to eliminate the predicted association. But, first, we know from previous 711 research by Latham, Miller and Norton (2021a) that levels of education and 712 levels of scientific knowledge, especially in physics, have no effect on people's 713 judgements about which view of time they think is true of our world. Second, 714 in this study, we found that \sim 50% of people judged our world to be a growing 715 block. So, it seems unlikely that this explains why we found no association. 716

Another possibility is that the reason at least some people judge our world to be nomically open is that they are aware of quantum mechanics rather than on the basis of their judgement on their naïve representation of the future. If so, it may be that those who *naïvely* represent the future as nomically open *are* more inclined to represent it as a growing block, but that many of those who represent the future as nomically open are employing a scientifically informed representation of the future, and, perhaps, those people also tend
to represent the world as a block universe. If so, that could eliminate the
association. It would be useful to do follow-up work here that attempts to
determine to what extent people's representation of the future as nomically
open is naïve, as opposed to scientifically informed.

⁷²⁸ What we can say, though, is that at best, people are predisposed to represent ⁷²⁹ our world to be a growing block in virtue of representing it to be nomically ⁷³⁰ open, but that as a matter of fact, what explains why people represent the ⁷³¹ world to be a growing block is not that they represent it to be nomically open. ⁷³² This is further suggested by the results of our second experiment, in which ⁷³³ only \sim 30% of people judged that George's reasoning was correct. Most people, ⁷³⁴ then, do not endorse the deliberative reasoning claim we investigated. ⁷³⁵ In all, then, we think there is little evidence for the idea that part of what

735 explains why people naïvely represent our world as a growing block is that they 736 naïvely represent the future as nomically open. This will be of interest to A- and 737 B-theorists alike. B-theorists have recently resisted what has become known as 738 the argument from temporal phenomenology (Baron et al. 2015)—according 739 to which we have reason to think our world is temporally dynamical because 740 this is how it seems to us to be in perceptual experience—by denying that 741 it does seem this way to us in experience (Hoerl 2014; Prosser 2016; Deng 740 2013, 2018; Bardon 2013; Miller, Holcombe and Latham 2020; Miller 2019, 743 2023; Latham, Miller and Norton 2020). Such views have often been deemed 744 deflationist. 745

We know, however, that people naïvely represent our world as temporally
dynamical (Latham, Miller and Norton 2021a, 2021b, 2023). If, as deflationists
suppose, it does not seem to us, in experience, as though time is dynamical
(and there is some suggestion from Latham, Miller and Norton 2020 that this
might be right), then the question arises as to why we naïvely represent it that
way. Deflationists, it seems, owe us some kind of explanation here.

One possibility, alluded to by Prosser (2016), is that part of what explains
why we represent time as dynamical is that we represent the future as open.
This study had the potential to show that part of what explains why we
represent time as dynamical (by representing it as a growing block) is that we
represent it as nomically open. Unfortunately for deflationists, we found no
evidence of this.

Having said that, Prosser's suggestion is rather different from the one we
 investigated here. He hypothesises that because people represent the future
 as being objectively open (as opposed to merely perspectivally or subjectively

⁷⁶¹ open), and because we represent that this openness moves (as what was once open becomes closed and part of the past), we must represent that there is a privileged and moving moment in time that is the border between the closed past and the open future. Further work, taking up the specific details of Prosser's view, would be welcome, given that we found no evidence in favour of the hypotheses we tested in this regard.

In all, we think that there is much more that can be learned about both our 767 naïve representation of the open future and the ways in which this representa-768 tion connects to our naïve representation of time. That work can shed light on 769 the best way to model future openness (insofar as that modelling is attempting 770 to capture some naïve representation of the future) and on whether what 771 explains our open future practices also vindicates our naïve representation of 772 the open future. It can, we hope, also shed light on the connection between our 773 naïve representation of the future and of time and, hence, on extant debates 774 in the philosophy of time.* 775

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788 References

789	BARDON, Adrian. 2013. A Brief History of the Philosophy of Time. Oxford: Oxford
790	University Press, doi:10.1093/acprof:oso/9780199976454.001.0001.
791	BARON, Sam, CUSBERT, John, FARR, Matt, KON, Maria and MILLER, Kristie. 2015.
792	"Temporal Experience, Temporal Passage and the Cognitive Sciences." Philosophy
793	Compass $10(8)$: 560-571, doi:10.1111/phc3.12244.

* THANKS

- BARON, Sam, MILLER, Kristie and TALLANT, Jonathan. 2022. Out of Time: A Philo sophical Study of Timelessness. Oxford: Oxford University Press, doi:10.1093/0s0/
 9780192864888.001.0001.
- BELNAP, Nuel D., Jr. 1992. "Branching Space-Time." Synthese 92(3): 385–434, doi:10.1
 007/bf00414289.
- -. 2005. "Agents and Agency in Branching Space-Times." in *Logic, Thought and Action*,
 edited by Daniel VANDERVEKEN, pp. 291–313. Logic, Epistemology, and the Unity
 of Science n. 2. Dordrecht: Springer, doi:10.1007/1-4020-3167-X 14.
- ⁸⁰² BRADDON-MITCHELL, David. 2004. "How Do We Know it is Now Now?" *Analysis* ⁸⁰³ 64(3): 199–203, doi:10.1111/j.0003-2638.2004.00485.x.
- BRIGGS, Rachael A. and FORBES, Graeme A. 2012. "The Real Truth About the Unreal
 Future." in *Oxford Studies in Metaphysics*, volume VII, edited by Karen BENNETT
- and Dean W. ZIMMERMAN, pp. 257–304. New York: Oxford University Press, doi:10.1093/acprof:oso/9780199659081.003.0009.
- BROAD, Charlie Dunbar. 1923. *Scientific Thought*. International Library of Psychology,
 Philosophy and Scientific Method. London: Kegan Paul, Trench, Trübner & Co.
- . 1938. Examination of McTaggart's Philosophy. Volume II, Part I. Cambridge: Cambridge University Press.
- CALLENDER, Craig. 2017. What Makes Time Special? Oxford: Oxford University Press,
 doi:10.1093/oso/9780198797302.001.0001.
- CORREIA, Fabrice and ROSENKRANZ, Sven. 2018. Nothing to Come: A Defence of the
 Growing Block Theory of Time. Synthese Library n. 395. Dordrecht: Springer, doi:10
 .1007/978-3-319-78704-6.
- DENG, Natalja. 2013. "On Explaining Why Time Seems to Pass." *The Southern Journal* of *Philosophy* 51(3): 367–382, doi:10.1111/sjp.12033.
- FORBES, Graeme A. 2016. "The Growing Block's Past Problems." *Philosophical Studies* 173(3): 699–709, doi:10.1007/s11098-015-0514-1.
- FORREST, Peter. 2004. "The Real but Dead Past: A Reply to Braddon-Mitchell (2004)."
 Analysis 64(4): 358–362, doi:10.1111/j.0003-2638.2004.00510.x.
- GRANDJEAN, Vincent. 2021. "How Is the Asymmetry Between the Open Future and the
 Fixed Past to Be Characterized?" Synthese 198(3): 1863–1886, doi:10.1007/s11229 019-02164-2.
- 2022. The Asymmetric Nature of Time: Accounting for the Open Future and the Fixed
 Past. Synthese Library n. 468. Dordrecht: Springer, doi:10.1007/978-3-031-09763-8.
- HODROJ, Batoul, LATHAM, Andrew James, LEE-TORY, Jordan and MILLER, Kristie.
- ⁸³¹ 2023. "Alethic Opennes and the Growing Block Theory of Time." *The Philosophical* ⁸³² *Quarterly* 73(2): 532–556, doi:10.1093/pq/pqac062.
- HOERL, Christoph. 2014. "Do We (Seem To) Perceive Passage?" *Philosophical Explorations* 17(2): 188–202, doi:10.1080/13869795.2013.852615.

- ISMAEL, Jenann. 2012. "Decision and the Open Future." in *The Future of the Philosophy* of *Time*, edited by Adrian BARDON, pp. 149–168. Routledge Studies in Metaphysics
 n. 4. London: Routledge, doi:10.4324/9780203338315.
- LATHAM, Andrew James and MILLER, Kristie. 2023. "Why Do People Represent Time as Dynamical? An Investigation of Temporal Dynamism and the Open Future." *Philosophical Studies* 180(5): 1717–1742, doi:10.1007/s11098-023-01940-8.
- LATHAM, Andrew James, MILLER, Kristie and NORTON, James. 2020. "An Empirical Investigation of Purported Passage Phenomenology." *The Journal of Philosophy* 117(7): 353–386, doi:10.5840/jphil2020117722.
- -. 2021a. "Is Our Naïve Theory of Time Dynamical?" *Synthese* 198(5): 4251–4271,
 doi:10.1007/s11229-019-02340-4.
- -. 2021b. "An Empirical Investigation of the Role of Direction in Our Concept of Time." *Acta Analytica* 36(1): 25–47, doi:10.1007/s12136-020-00435-z.
- -. 2023. "Do the Folk Represent Time as Essentially Dynamical?" *Inquiry* 66(10):
 1882-1913, doi:10.1080/0020174X.2020.1827027.
- LEWIS, David. 1979. "Counterfactual Dependence and Time's Arrow." *Noûs* 13(4):
 455-476. Reprinted, with a postscript (Lewis 1986b), in Lewis (1986a, 32-51),
 doi:10.2307/2215339.
- -. 1986a. *Philosophical Papers, Volume 2*. Oxford: Oxford University Press, doi:10.109
 3/0195036468.001.0001.
- -. 1986b. "Postscript to Lewis (1979)." in *Philosophical Papers, Volume 2*, pp. 52–66.
 Oxford: Oxford University Press, doi:10.1093/0195036468.003.0002.
- MACFARLANE, John. 2003. "Future Contingents and Relative Truth." *The Philosophical Quarterly* 53(212): 321–336, doi:10.1111/1467-9213.00315.
- -. 2008. "Truth in the Garden of Forking Paths." in *Relative Truth*, edited by Manuel
 GARCÍA-CARPINTERO and Max KÖLBEL, pp. 81–102. Oxford: Oxford University
 Press, doi:10.1093/acprof:oso/9780199234950.003.0004.
- MARKOSIAN, Ned. 1995. "The Open Past." *Philosophical Studies* 79(1): 95–105, doi:10 .1007/bf00989786.
- MCCALL, Storrs. 1994. A Model of the Universe: Space-Time, Probability, and Decision.
 Clarendon Library of Logic and Philosophy. Oxford: Oxford University Press,
 doi:10.1093/acprof:0s0/9780198236221.001.0001.

MILLER, Kristie. 2019. "Does It Really Seem to Us as Though Time Passes?" in *The Illusions of Time: Philosophical and Psychological Essays on Timing and Time*

- *Perception*, edited by Valtteri ARSTILA, Adrian BARDON, Sean Enda POWER, and
 Argiro VATAKIS, pp. 17–34. London: Palgrave Macmillan, doi:10.1007/978-3-030 22048-8 2.
- -. 2023. "Against Passage Illusionism." Ergo 9(45): 1233–1263, doi:10.3998/ergo.2914.
- MILLER, Kristie, HOLCOMBE, Alex and LATHAM, Andrew James. 2020. "Temporal
- Phenomenology: Phenomenological Illusion Versus Cognitive Error." *Synthese* 197(2): 751–771, doi:10.1007/s11229-018-1730-y.

- PROSSER, Simon. 2016. *Experiencing Time*. Oxford: Oxford University Press, doi:10.1
 093/acprof:0s0/9780198748946.001.0001.
- TOOLEY, Michael. 1997. *Time, Tense, and Causation*. Oxford: Oxford University Press,
 doi:10.1093/0198250746.001.0001.
- TORRE, Stephan. 2011. "The Open Future." *Philosophy Compass* 6(5): 360–373, doi:10
 .1111/j.1747-9991.2011.00395.x.
- WILLIAMS, J. Robert G. 2008. "Aristotelian Indeterminacy and the Open Future."
- ⁸⁸³ Unpublished manuscript, https://philpapers.org/rec/WILAIA-4.