

Ontological Parsimony and the Open Past

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Abstract

A history is a complete possible temporal evolution of the universe. There are two main conceptions of histories: Lewis's divergence, in which distinct histories are all disjoint, and the standard branching time (BT) conception, in which histories overlap and branch towards the future ('open future'). As Greg Restall noted, if a realist conception of histories is adopted, considerations of ontological parsimony favor the standard BT conception over Lewis's divergence. In this note, I observe that perfectly analogous considerations can be raised against the standard BT conception and in favor of a non-standard, 'open past' BT conception, in which histories are allowed to branch both towards the future and the past.

Keywords: Branching time, Indeterminism, Divergence, No backward branching, Open past.

1. Divergence and the Branching Time Conception

Let a history be a maximal temporal chain of spatially unlimited events called moments (see Belnap et al. 2001: 7A.1). Intuitively, a history is a complete, physically possible evolution of the universe. There are two main conceptions of histories and their mutual connections in the philosophical market:

- (1) Lewis's (1986) divergence, in which distinct histories are all disjoint and causally independent of one another (Fig. 1, left).
- (2) Prior's (e.g., 1960) standard branching-time (BT) conception, in which histories can overlap up to a certain time and then *divide* or *branch* (Fig. 1, right).

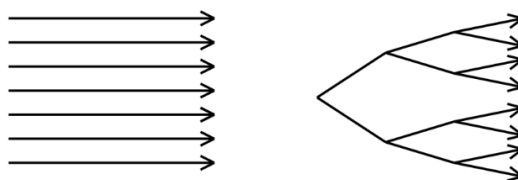


Figure 1: Two conceptions of histories

Advocates of the BT conception generally presuppose some form of indeterminism. In favor of their view, they contend that it captures the intuitive idea that *the very same* individuals and events can evolve in different possible ways, whereas divergence requires that alternative histories always involve numerically distinct entities. By the same token, they insist, it is the only view that accounts for the metaphysical significance of indeterminism: the question whether our world is indeterministic matters because, and insofar as, alternative physical possibilities are open to *us* (see, e.g., Belnap et al. 2001: Ch. 6).

2. Restall’s Argument from Parsimony

In this note, I shall focus on a less familiar argument, provided by Greg Restall (2011), for preferring the standard BT conception over divergence. Restall’s discussion concerns *modally realist* interpretations of both pictures, according to which merely possible histories are as concrete and real as the one we happen to inhabit.¹ When modal realism is assumed, according to Restall, Lewis’s divergence “suffers from massive ontological inflation” as compared to the BT conception (Restall 2011: 230). To see how, consider the two histories partially depicted in the following table.

	h_1	h_2
t_1	Big Bang	<i>Ditto</i>
$\vdots$	$\vdots$	$\vdots$
t_{n-1}	Restall pondering what tie to wear	<i>Ditto</i>
t_n	Restall chooses a green tie	Restall chooses a brown tie

Table 1: Two histories

Here, histories h_1 and h_2 are perfectly indiscernible until time t_n , when Restall makes a difference by choosing, after reflection, a green tie on h_1 and a brown tie on h_2 . If we adopt the standard BT conception, we can assume that h_1 and h_2 share all their moments up to t_{n-1} . Only at t_n must we count their moments as distinct. Thus, we can account for both histories (up to t_n) with a commitment to $n+1$ moments. If instead we adopt Lewis’s divergence, the simple fact that incompatible events obtain at t_n entails that h_1 and h_2 are disjoint right from the start. Thus, to account for both histories, we need to countenance $2n$ distinct moments. Here are Restall’s comments on this result:

If we are to think of [moments] as real events, then we have ontological inflation on a truly immense scale, for now, we not only have two different choice situations involving me standing in front of my wardrobe, contemplating ties, but we have innumerable many of these, for they proliferate with every subsequent choice or

¹ See Lewis 1986 for a modally realist interpretation of divergence, and Belnap et al. 2001, 2021 for a realist interpretation of the standard BT conception. What both views share is an indexical notion of actuality: each history is actual relative to itself, and actuality marks no purely objective, non-perspectival feature of reality. In the context of BT, this view entails that we, as agents and observers, literally inhabit more than one history, and there is no “thin red line” selecting any of them as the history that is *truly* ours.

chance event throughout time. It is one thing to have ontological profligacy by admitting a circumstance in which I choose a green tie, and another in which I choose brown. It is another to “backdate” such choice, to require that each choice brings with it a duplication of history to that point. It is for this reason that many find the picture of branching time compelling (Restall 2011: 230).

To summarize, the problem is not merely that Lewis’s divergence requires vastly more events than the standard BT conception; these additional items also appear to do little or no theoretical work. Why multiply indiscernible events without necessity?

My point in this note is that, if you are among those philosophers who “find the picture of branching time compelling” because of its parsimony, then you should look beyond the standard BT conception. Let the *open past* BT conception be the view that histories branch towards both the future *and* the past (see Fig. 2). The open past BT conception departs from the standard BT conception by dropping the so-called *no backward branching* principle, which requires that the past of any moment be linear.²

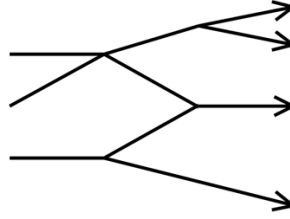


Figure 2: The open past BT conception

The open past BT conception can deal with the above histories h_1 – h_2 as parsimoniously as the standard one, but it comes with a bonus of its own. Consider the following table, where histories h_3 and h_4 are always indiscernible after t_1 .

	h_3	h_4
t_1	Cosmic hiccup	Cosmic quiver
t_2	Big Bang	<i>Ditto</i>
$\vdots$	$\vdots$	$\vdots$
t_n	Restall chooses a green tie	<i>Ditto</i>

Table 2: Two other histories

If we adopt the open past BT conception, we can assume that h_3 and h_4 overlap from t_2 to t_n . So, we can account for both histories (up to t_n) with a commitment to $n + 1$ moments. If instead we adopt the standard BT conception, the simple

² An important reason to prefer the open past BT conception over the standard one is that virtually all laws of physics are time reversal invariant; thus, if they are indeterministic toward the future, they must also be indeterministic toward the past (see Earman 2008: 191–192, Farr 2012: 108–114; see Belnap et al. 2021 for replies and Spolaore & Zanardo 2025: §4.2 for an overview; see also Łukasiewicz 1968: 61 for an earlier argument to the same conclusion).

fact that incompatible events obtain at t_1 entails that h_3 and h_4 are disjoint at any subsequent stage, thus forcing us to admit $2n$ moments. Therefore, the difference in ontological parsimony between the standard and the open past BT conception is the same as the one between Lewis's divergence and the standard BT conception.

3. Parsimony and the Open Past

I conclude that whatever reasons ontological parsimony gives us to prefer the standard BT conception over Lewis's divergence, it gives us equally good reasons to prefer the open past BT conception over the standard BT conception. Of course, as often in philosophy, one person's *modus ponens* is another's *modus tollens*. If you are an advocate of divergence and find the idea of an open past especially unattractive, you can regard the argument presented in this note as a *reductio* of Restall's argument. If, on the other hand, you are sympathetic to a modally realist interpretation of the BT conception, this note may give you further reason to delve into the relatively unexplored idea of an open past.

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