

Models of Becoming

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I think it will be generally conceded that our normal sensation of the movement of time is that of something unidirectional which proceeds by seeming to push the present moment into the future. I mean ‘sensation’ to be the subjective experience of the flow of time. I think it is also obvious that most people, although certainly not all philosophers, believe that our sensation of the direction and flow of time corresponds to the actual movement of time, whatever is causing its movement. This has been disputed. J.M.E. McTaggart, for example, made himself infamous by claiming that time itself does not exist because any notion of tense which could account for change is meaningless on his analysis. It follows from this that the experience of time must be an illusion. Nevertheless, in this paper, I will be addressing the view that time is an actual entity that relates to causality in a particular way; specifically, that time is a change in states of affairs. I intend to begin the paper by giving a brief overview of the so called ‘Growing Block’ theory of time, which I think most intuitively captures our everyday sensation of temporal flow. I will then elaborate a bit on what I believe to be a good candidate for the cause of our subjective experience of time. Finally, I hope to show that the subjective experience of time can conceivably arise from models of temporal becoming which are dramatically different from the Growing Block model.

I. Temporal Becoming and Growing Block Theory

Perhaps one of the most popular four-dimensional characterizations of time is the Growing Block model. It is a relatively straightforward notion

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of time, and it seems to correspond to our experience. On this view, the universe has both a definite existing past and present but a nonexistent, though perhaps determined, future. States of affairs on this model are thought of as four-dimensional. Objects exist in both space and time. This is not to suggest that objects need to be given a four-dimensional ontology of temporal parts. At the very least, however, objects are thought of as persisting through time.

The *present*, on this account, is the temporal edge of the universe into which the universe is growing. That is, the universe is in a process of *becoming or coming into of existence*. The past and the present constitute a chunk of space-time that is filled with various objects and states of affairs that are in a causal relationship with one another. The future is only potential, but does not exist at all. It will come into existence, or *become* real as it is causally implied by states of affairs in both the past and present. It is just this becoming which is supposed to account for the flow of time and for the ever-changing present.

I think the popularity of Growing Block model among many people is due to the way in which it seems to be in accordance with two aspects of our experience. The first is that we seem to be able to perceive a shift in the whole of reality as our subjective sense of time moves continuously forward. The present moment seems to carry our consciousness inexorably into the future. The age-old metaphor of time being a river derives from just this sensation. Like a river, there is no standing still in time—at least not for human consciousness. If the objective nature of time is one of temporal becoming whereby the future comes into existence and adds itself to the whole of reality, then it is easy to see that our experience will include this fact simply by virtue of our consciousness being something that requires time to emerge and which is capable of reflecting on memories. If the future is causally dependent upon the past, then some of my past mental states (and the information about the world they contain) have a causal relationship with the future insofar as my mind can preserve memories of these mental states which I may reflect upon later. I will show further on that this relationship between memories and the subjective sensation of time is a complex one. For now it need only be recognized that if memories are formed properly, then as long as my mind is working properly, I will have a distinct sensation of the objective movement of time.

The second way in which Growing Block Theory seems to agree with our experience is with regard to the problem of reference. We are used to referring to actually existing things. If I utter the sentence ‘The cat is on the mat’, I mean to refer to a particular cat which exists *now*, where *now* is the moment of utterance. The cat has to exist for me to successfully refer. A view of time like Presentism (the view that only the present moment exists and that both the past and future are equally unreal), suffers from

a certain reference problem which Growing Block does not. Namely, we might ask what the truth conditions are for the statement ‘Aristotle was a philosopher’ or ‘The Holocaust, unfortunately, occurred’. We would like such statements to make sense, but on the Presentist account, they are meaningless by our ordinary theory of reference because the subjects involved no longer exist to be referred to. One might, of course, assert that we can meaningfully refer to non-existent states of affairs. The obvious objection to this is that some account will have to be given of the difference in cognitive value between statements about the past and statements about the future, since the future is equally non-existent. A much easier approach to all of this would be to affirm the existence of the past and present but to deny the existence of the future. In this way, statements about the past can be either true or false but statements about the future can consistently be thought of as lacking a truth value. This is precisely what the Growing Block model allows us to do.

II. The Feeling of Time: a Subjective Hierarchy of Memories

The experience of time as moving in one direction seems mystifying upon any serious reflection. Why, after all, should we experience the world in the order we do? Earlier I pointed to memories as a contributing cause of our experience of the flow of time. But memory alone will not do the trick. Just possessing memories of the past does not guarantee the sense of the progression of time. It is not logically impossible that memories could be tagged¹ out of order (in fact, in some ordinary circumstances they seem to be). At any rate, we seem to be able to remember events out of sequence.

I hold that there are two factors which allow us to mentally view memories of our past in various sequences without disrupting our sense of time. The first is so obvious it hardly needs mentioning; certain memories are related to others in a corroborative way, where one memory contains information which can be verified or denied by others. I may think, for example, that the birthday cake I ate on my fourth birthday was the one with dinosaurs on it and that the one I ate on my fifth birthday was the one with the monster trucks, but I also know from what I am told by my parents that I was living in the brick house when I was five and not the blue one. And since I distinctly remember eating a cake with dinosaurs while living in the brick house, I infer that the memory of eating the dinosaur cake occurred when I was five. Since some of my memories hold data concerning the world, I can infer the temporal structure of the world from them, and I can try to fit my subjective experience to this knowledge accordingly.

The more important thing, however, is that memories are *experienced*

¹Almost undoubtedly, information has to enter our minds in a certain order. But nothing prevents the information from being arranged out of order.

in some linear way no matter what order they are recalled in. This is due to what is almost certainly a brute fact of our biological brains: that our memories depend upon one another in a very visceral way. I do not mean to imply that our memories logically imply one another, although it seems obvious that memories could, in almost all ordinary circumstances, be placed in the correct order corresponding to the fashion by which they entered the mind, as mentioned above. What I mean is that our memories *seem* to be different depending on how long we have had them, and this is what I think provides us with the appearance of temporal flow. Something in our mind places memories on a kind of scale of importance so that some memories seem closer to the present experience than others. Normally, memories of the immediate past seem the closest and memories of the distant past taper off in psychological importance. It is this effect which, if disrupted, would significantly impact our sense of time.

There is some empirical evidence that the way in which we process memories impacts our understanding of the flow of time. Two that come to mind immediately are *déjà vu* and awaking abruptly from sleep. Probably everyone has had the experience of *déjà vu*. This sensation usually consists in feeling that the present is an object of the distant past. Normally, we seem to place memories in a certain order, and the feeling of the immediate past normally corresponds to the memory of the immediate past, while the feeling of the distant past corresponds to its memory. When we have *déjà vu* it seems the *feeling* of the distant past attaches itself to the *memory* of the immediate past and confusion sets in. There is, in fact, an unfortunate psychological ailment called chronic *déjà vu*, the victims of which viscerally feel that they know what is going to happen in the future because they believe the present is in the past (and hence, they feel like the future is already happening).

Another example is that of awaking abruptly from sleep. Many people have probably had the experience of taking a short nap in a very dark place only to awake and find that several hours have passed. Likewise, it sometimes happens that one goes to sleep for what feels like a very long time, and it turns out only a few minutes have gone by. Normally, in this latter case, it is because one is dreaming that more seems to have gone on in such a short span of time. What seems to be happening in these cases is that, upon waking, the brain makes inductions based on experiences before sleep, during sleep (if there are dreams), and after waking up. Memories are arranged, not just by sequence, but by importance. If no dreams take place and the room is bright upon waking, the brain tags the memories of the moments just before sleep as having occurred several hours ago. If the room is dark, the brain assumes that less time has passed, so the memories of the moments before sleep get tagged as having occurred only a few minutes ago. If dreams were involved (and if they are remembered at

all) then the amount of time assumed to have passed between the onset of sleep and awaking is greater. This accounts for why some naps feel several hours long while some entire nights seem to go by in only a few minutes.

III. Non-standard Models of Temporal Becoming

What I now want to show is that even though we generally assume that time moves in the forward direction of our experience, it is possible to construct models of temporal becoming which could, in principle, give rise to the same type of subjective experiences as we ordinarily have. That is, while the Growing Block model seems to most intuitively capture our experience of time, these experiences might conceivably arise from different models. It is generally assumed that our memories provide us with a subjective experience of the flow of time which corresponds to the actual becoming of the universe, where the actual becoming is characterized by the Growing Block model. What I want to show is that, without any empirical investigation of physics, it is just as plausible, though much less intuitive, that the becoming of the universe might unfold in a different way without affecting our subjective sense of the flow of time.

Suppose, first of all, that the universe actually undergoes a process of becoming the way we generally assume that it does, according to the Growing Block model. Time is moving objectively forward, where ‘forward’ means that the present moment is causally dependent upon the past and that ‘slices’ of reality are being added at every instant to create an ever richer and ontologically denser four-dimensional world. The movement of time may be characterized as the process whereby a new present moment comes into being. The future, on this account does not exist at all, but it is causally dependent upon the past and present.

On this account, it is possible for a person to have an experience of time which is subjectively different than the objective movement of time. The mind gives priority to some memories such that they seem to have occurred later than others. Normally, the mind gives priority to whatever memories are most recent. These feel the most vivid, whereas memories of the distant past seem further away and less vivid. But suppose that a person, Marty, has subjective experiences which are reversed from normal. Time would still progress in the natural fashion, but his experience of time would be subjectively reversed. Marty’s mind would always give priority to the very first thing he could remember, and he would feel as if that moment had just happened, even though the event corresponding to that experience lies in the objective past. From Marty’s perspective, the motion of time *seems* to be reversed, albeit in a very strange way. The present does not seem to move for Marty. Instead, the present remains fixed in his awareness, and as objective events unfold, he seems to acquire new memories of his past.

Now Marty, if he is clever, may come to discover that objective time is really moving opposite of the way he experiences it, but if he does so, it will only be through careful reasoning about causality. He may wonder, for instance, what is causing him to remember events in his past, and why he seemed to have a role to play in determining those memories, despite the fact that he feels as if he could not change it. Psychological disorders such as chronic *déjà vu* make situations like this one believable, if unlikely. So I am inclined to think it at least possible that there could be someone like Marty in our own world.

That someone like Marty could exist, in principle, motivates the possibility that the Growing Block theory may be compatible with *subjective* experiences of time differing greatly from what is normal. Now let us explore whether or not different *objective* structures of time could possibly give rise to subjective experiences of time similar to what is normal.

Suppose there is a world qualitatively identical to ours in all respects save for the fact that temporal becoming progresses backwards. What would this structure look like? There are two clear possibilities. The first is that the universe began at what we consider to be its ending (the big crunch, heat death, or something else) and the process of becoming moved in reverse such that the future existed before the past². This would seem to require some sort of backwards causation, because for some effect in the future, it seems there could be many causes. There may be various ways of accounting for this, but all that matters is that it could happen in principle. I call this theory the ‘Backwards Block’ account of time. The second possibility is what I shall call the ‘Diminishing Block’ account. On this account, the universe starts out as a four-dimensionally complete entity from past to future. The process of becoming is replaced by ‘unbecoming’ so that slices of the universe are whittled away and the total block shrinks out of existence from the future into the past.

In the upcoming paragraphs, it will be important to be able to track the difference between subjective and objective pasts and futures. Keep in mind that ‘the objective past’ on all of the upcoming examples always refers to states of affairs which already exist or have come into being, whereas ‘the objective future’ refers to states of affairs which have not yet come into existence. The ‘subjective past’ is the memory hierarchy possessed by a person at the present (the leading edge of the process of becoming or unbecoming). The ‘subjective future’ is the state of affairs toward which a person feels he or she is headed based on the information provided by the memory hierarchy.

²Of course, the ‘future’ is really the past of this world because it comes into existence first. But it corresponds to the future of our world.

a. The Backwards Block Model

Consider the first example, the ‘Backwards Block’ account. On this account, we define the present just as we did on the Growing Block account. The present is just that ‘slice’ of reality which is having new slices added to it. States of affairs are obtaining in sequence. The difference is that on this view the future already exists and the past is coming into existence³. What would the subjective experience of time be like in this world? Suppose that Marty has an acquaintance, Biff, who lives in this world, call it W_B . Biff has none of the brain abnormalities from which Marty suffers. His experience of the world will be similar to ours. Consider any moment in Biff’s life, m . At that moment, his brain will possess memories of the objective future of his world. He will not possess any memories of the objective past, because those memories exist in his subjective future and so, are not part of Biff’s experience at m . They have been formed objectively⁴, (in the sense that they are encoded in brain structures in his subjective future, his world’s objective past), but the Biff of time m has no experience of them. What he does experience are memories of his distant and immediate objective future. In W_B time progresses in such a way that, at the end of time, it will seem identical to our world on a four-dimensional Eternalist view. That is, events in the objective future of W_B (which are qualitatively identical to the events of the past of our world) would seem to us to imply events in the past of W_B . So in order for the two to be qualitatively identical, Biff will have to have memories of his entire objective future but none of his objective past, even though his objective future will be his subjective past. He will feel as if the very next future objective moment (his subjective past) has just happened and he will be anticipating the immediate objective past (his subjective future). This happens because Biff believes that his subjective experience captures the objective nature of becoming. It follows that, as the universe partakes in becoming, Biff will feel at every moment that he is progressing into his subjective future, although in reality he is losing memories. He mistakes the objective future for the objective past because his subjective past corresponds to the objective future.

Notice that Biff’s qualitative experience of the progression of time at any moment in W_B is identical to our experience of our own world at the corresponding moment. Maybe this seems like a stretch since backwards causation will have to be allowed for. It might be objected that Biff could thereby acquire memories of the objective past as well (which, for him,

³The past is coming into existence in the sense that it is future of this hypothetical world but is qualitatively identical to the past of our world. The same goes for its futures. See previous footnote.

⁴I use ‘objective’ and ‘mind-independent’ interchangeably in this paper.

would feel like glimpsing the future). True, some account of causation will have to be considered. A random universe would probably do the trick. But let's move on.

b. The Diminishing Block Model

Now I'll take the second example. Suppose there is a world which began as a complete four-dimensional whole and from there lost parts. Call it W_D . Here, the process of becoming is replaced with what I call unbecoming. That is, the future of W_D is undergoing a process of deletion, whereby future instants cease to exist in consecutive order on backward, starting with the moment corresponding to the end of our universe. Let us suppose that the four-dimensionally complete W_D is qualitatively identical to the way our universe will be at its very end, and that from here it loses existence from the future on back. What will be the subjective experience of time as experienced by Biff's doctor⁵, who goes by 'Doc'? Just like Biff, all of Doc's memories are ordered and they create for him a subjective past. The difference between the two is that whereas Biff's subjective past corresponds to his objective future, Doc's objective future does not exist in the present. At any present moment m for Doc (where present is here defined as the edge of temporal unbecoming) his objective future is literally nonexistent. Only his past and present are objectively real. At m Doc experiences his immediate past very strongly and his distant past weakly, and he infers what his future will be. At m he anticipates $m+1$. But in reality, his future does not exist, and in a moment of objective time, $m-1$, he will be anticipating m and $m-1$ will be his present. So at every moment of objective time, Doc feels as if he's moving into his future, but all the while he (along with the rest of the universe) is losing existence. Notice, once again, that Doc's subjective experience of time is exactly like the way we experience time in our world, if the Growing Block model is correct. At every moment of experience we are aware of our past and anticipate our future, which is non-existent.

IV. Parallels with our World

In sections *a* and *b* above, I have tried to motivate the idea that the physical characteristics of the structure of time in our universe might vary markedly from what common sense tells us without compromising our sensation of time's passing. It is possible for a being in a world like ours in all respects except for the direction of temporal becoming to have just the same subjective experience of time as what we typically have. Consider, for instance, the world Biff lives in. The notion of a block universe which

⁵I admit to taking stylistic liberties here. Obviously Marty, Biff and Doc do not inhabit the same world.

grows backward like Biff's is particularly unbelievable. We are inclined to think that causality simply could not work this way. In 'Bringing About the Past' Michael Dummett characterizes the problem in the following way:

Imagine ourselves observing events in a world just like the actual one, except that the order of events is reversed ... [I]t is clear we should have great difficulty in arriving at causal explanations that accounted for events in terms of the processes which had led up to them. The sapling grows gradually smaller, finally reducing itself to an apple pip; then an apple is gradually constituted around the pip from ingredients found in the soil; at a certain moment the apple rolls along the ground, gradually gaining momentum, bounced a few times, and then suddenly takes off vertically and attaches itself with a snap to the bough of an apple tree. (Dummett)

A world like this is very difficult to imagine because our normal conception of causation seems to rule out the possibility of such seemingly arbitrary events happening in a deterministic way. Probably the most widely accepted interpretation of Growing Block theory is one in which the past plays a role in *causing* the future to come into being. I want to stress that it's not impossible, however, for a universe to come into being in a totally unpredictable fashion. In fact, a universe ruled by statistical mechanics could work this way—the odds are, of course, massively against it. Nevertheless, there is nothing that logically precludes it. The case involving Biff seems a bit more complex, however, because in order for his world to come out looking just like our world on the Eternalist view, he has to possess memories of his objective future, but not his past. This notion is less strange once it is realized that Biff's experience is just one of a unique type of fatalism. Biff's world is objectively fatalistic. We stipulated that its future must end up identical to our world's past. So its future is unavoidable on all accounts. The only thing that makes Biff different from us⁶ is that he possesses memories of his future. He has to because his objectively past actions depended upon what he will have done in the objective future. But from his perspective, the objective future seems to have just happened because he orders his memories in the same fashion as we do. It is not very plausible that fatalistic worlds could exist; nor is it likely that someone in such a world would possess memories of the future but not the past. Nevertheless, we do not know for absolute certain that our world is not fatalistic.

The case with Doc in section *b* is more believable. The notion of the present being the leading edge of the block of space-time would still be

⁶In the cognitive sense; I do not mean to imply that our world is fatalistic.

preserved with the diminishing block account as with the Growing Block. The only difference is the direction of becoming. In the diminishing block model, states of affairs go out of existence in consecutive order according to precise causal relationships already in place. In this case, causality does not actually move in reverse. Everything in the objective past causally implies future moments. The universe is undergoing a process of losing its existence from the future on back. It begins as one complete and eternal whole and shrinks back into its big bang. In this case, there is no problem of memory. Doc's memories are of his objective past. His objective future does not exist, but at every moment he expects it to come into existence the very next moment; he believes this on the basis of his memory and the causal relationship it holds with the world. His experience of time is just like ours. This account seems much more believable than the Backwards Block model precisely because at any moment of time in either the Growing Block universe or the Diminishing Block universe, exactly the same things are in existence. At the time of the death of Caesar in our world, the events leading up to the betrayal of Caesar by Brutus had already transpired and exist in the past, whereas the future of the Roman Empire is uncertain. The same is true for Doc's world. The past exists, but the future is unreal at that moment.

V. Conclusion

I hope I have convincingly shown that non-intuitive versions of temporal becoming could, in principle, give rise to subjective experiences of time indistinguishable from the way we experience time in our normal lives. Maybe this is a point against temporal becoming as presented by Growing Block theory. Perhaps, if we are willing to accept the subjective experience of time as outlined in this paper and also the equal footing that the Diminishing Block model seems to have with Growing Block, we may be inclined to accept the possibility of four-dimensional Eternalism. Or perhaps there are reasons to accept the Growing Block account of becoming on more physical grounds. My real aim was to break down some of our intuitions. As I see it, the highly important role that our subjective experiences play in guiding our intuitions concerning time is all the more reason to continue studying time from an empirical point of view.

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