

# The Ontology of Many-Worlds

## Modality and Time

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### Introduction

There are two types of theories regarding many-worlds: one is modal, while the other is temporal. The former regards reality as consisting of many possible worlds, while the latter holds that reality consists of many momentary worlds which are usually called ‘moments’.<sup>1</sup> I compare these two theories, paying close attention to the concept of transworld identity and so comparing trans-possible-world identity with trans-momentary-world identity (or trans-moment identity).<sup>2</sup> Through such comparison, I characterize time from the point of many-worlds view, believing this to be one of the best ways to grasp the reality of time.

First, I show that there is reason to adopt many-worlds view on modality and time, because transworld identity is meaningful for both of them, while it is not for space; in this sense time is closer to modality than to space. Second, I argue however that trans-moment identity is different from trans-possible-world identity concerning reality. The former is a realistic relation, while the latter is not. Thus I find that the reality of time is in the relation of trans-moment identity. Such a view, I contend, has merit on the basis that it recognizes the reality of time in a sense that is not true of space.

### 1

First, let’s compare the following six sentences:

(a) : ‘Actually (now, here) D. K. is meeting Prof. M.’

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<sup>1</sup>Their logics have been investigated chiefly by modal logicians and tense logicians. The works which explored their ontology most thoroughly may be D.Lewis’s *On the Plurality of Worlds* and S.McCall’s *A Model of the Universe* respectively. They resemble in many ways; for example, both the keynotes of their works are realism and their justification for (realistic) many-worlds is equally ‘the inference to the best explanation’.

McCall’s ‘Model’ is a four-dimensional world and he uses the name ‘Many-Worlds Model’ to refer to Everett’s interpretation of quantum mechanics, which should be distinguished from his ‘Tree Model’. However what I mean by a temporal theory of many-worlds is rather closer to McCall’s, since his model is dynamic and implies that the Model (or World) itself changes with time.

<sup>2</sup>I use the term ‘trans-moment identity’ to mean transtemporal identity presupposing (temporal) many-worlds view. The term ‘transworld identity’ is used to include both trans-moment identity and trans-possible-world identity.

(a') : 'In another possible world (now, here) D. K. is meeting Prof. M.'

(b) : 'Now (actually, here) D. K. is meeting Prof. M.'

(b') : 'Someday (actually, here) D. K. is meeting Prof. M.'

(c) : 'Here(now, actually) D. K. is meeting Prof. M.'

(c') : 'Overthere(now, actually) D. K. is meeting Prof. M.'

Each sentence above includes three indexical adverbs explicitly or implicitly: a modal one, a temporal one and a spatial one. Two of them being fixed, the other one is changed.

Among them, (a) and (a') are compatible and so are (b) and (b'), while (c) and (c') are not. It means that transworld identity is meaningful for modality and time, while it is not for space. From this it results that we can take many-worlds view on modality and time, while we can not on space.

Of course, this argument is too weak to justify the many-worlds view on modality and time. However, it sheds some light to many-worlds view to consider what makes such difference among those six sentences.

My answer is as follows; it is because each possible world and each moment has completeness or independence as a world. So both an individual in a possible world and one in a moment can stand as an 'individual' even if they have the relation of (transworld) identity with other individuals in other worlds.

On the contrary each place is neither complete nor independent as a world. So if an individual in some place is identical with an individual in other places, this identity cannot be 'transworld' identity. It will be either numerical identity or belonging to the same individual as parts.

Thus the meaningfulness of transworld identity is a 'raison d'etre' of many-worlds view on time and modality. To reconfirm it, let's see the following two sentences:

(d) : 'Here(now, actually) it is raining.'

(d') : 'Overthere(now, actually) it is raining.'

Contrary to (c) and (c'), they are compatible. It is because they do not refer to any individual. We can say that the significance of many-worlds view appears better in predicate logic than in propositional logic.

## 2

Though modality and time are allied in that transworld identity is meaningful for both of them, difference appears when we examine the concept of transworld identity in each case closely. In the following I show that we cannot apply most theories of trans-possible-world identity for explaining trans-moment identity.

I examine three theories: (1) S. Kripke's theory of rigid designator, (2) D. Kaplan's theory of direct reference and (3) D. Lewis's counterpart theory.<sup>3</sup>

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<sup>3</sup>I exclude the theories which explain transworld identity by assuming trans-world entity and making each individual belong to it through part-whole relation, since it makes each world similar to a place and virtually reduces many worlds to one world.(cf. section 1)

(1)Kripke's theory has two pillars: the causal theory of reference and the stipulationism or conceptualism about possible worlds. They sustain each other and lead to the actualism about individuals; we can only refer to actual individuals, since references are made through the causal chains leading to us. Then how can we talk about individuals in other possible worlds? Stipulationism offers the answer; talking about them is nothing but stipulating on actual individuals.

On the other hand, we can use neither pillar for the theory of trans-moment identity. First we cannot adopt the stipulationism nor conceptualism about moments, unless we become anti-realists about time, especially about the past.<sup>4</sup> Moreover the causal theory of reference and whose consequence, the actualism about individuals, does not sustain but rejects the conceptualism about moments for the following reason. In the case of modality every world is causally independent from other worlds. So the causal chains which lead to us lie in only one world, which means that only one world is actual for us, other possible worlds being given only by our stipulations. In the case of time, on the other hand, moments are not causally independent from other moments and so the causal chains to us extend over plural moments. So we have to say that plural moments are actual or real for us. Thus it is not the conceptualism but the actualism or realism about moments that results from the causal theory of reference.

(2)Kaplan's theory of direct reference explains transworld identity in terms of linguistic rules which prescribe the use of demonstratives, such as indexicals and proper names.<sup>5</sup> In short he takes transworld identity as a semantic property which linguistic rules bring about.

My conclusion is, to say in advance, that ontologically his theory does not explain transworld identity but presupposes its explication. First let's see the following two sentences:

'This poet (,who actually has been plagiarized,) might have plagiarized.'<sup>6</sup>  
'This dish(,which belongs to Prof. M. now,) belonged to D. K. yesterday. '

If we take 'this poet' and 'this dish' as demonstratives, we can make it explicit by using Kaplan's rigidifying operator, [dthat]:

(e-) '[dthat] {This poet(, who actually has been plagiarized,) } might have plagiarized.'

(f) '[dthat] {This dish(, which belongs to Prof. M. now,) } belonged to D. K. yesterday. '

And we can reform (e-) using possible world semantics into:

(e) '[dthat] {This poet(, who actually has been plagiarized,) } has plagiarized in another possible world.'

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<sup>4</sup>Some may think that we can adopt the conceptualism about the future moments (and others even about the past moments). I adopt here the realism only about the past and present moments, which is enough for the present argument.

<sup>5</sup>Kaplan's theory of direct reference does not necessarily presuppose the ontology of many-worlds. So my criticism is not directed for his theory itself but for its application to the ontological explanation of trans-moment identity.

<sup>6</sup>This sentence is a slight modification of the example which Kaplan himself used. (Kaplan, D., 1989, p. 577, n.21)

Let's notice here that the sentences (e) and (f) are true iff the next two sentences are true respectively:

- (e') '[dthat] {That poet(, who has plagiarized in another possible world,) } has been plagiarized in the actual world.'
- (f') '[dthat] {That dish(, which belonged to D. K. yesterday,)} belongs to Prof. M. now. '

Then the following question arises; in what sense is the referent of the demonstrative 'this poet' in (e) identical with that of 'that poet' in (e'), and similarly for 'this dish' in (f) and 'that dish' in (f') ?

I believe that Kaplan's theory cannot, and need not, answer it, since it does not commit to the identity of the referents of two demonstratives but only of those referred with one demonstrative. It is because his theory is not ontological but linguistic.

And it is ontology that answers the question above. As for (e'), we can exclude it if we adopt the causal theory of reference, since in that case we cannot make direct reference into another possible world and so we cannot take 'that poet' in (e') as a demonstrative. Moreover even if we accept 'that poet' in (e') as a demonstrative, there is a way which can explain the identity of its referent with the referent of 'this poet' in (e); it is adopting Kripke's stipulationism or conceptualism about possible worlds, because in that case direct reference to a poet in another possible world means nothing but our stipulation about an actual poet.

On the other hand we cannot take neither way for the sentence (f'). To exclude it we have to argue that we cannot make direct reference to the individuals in the past, which seems clearly wrong. Neither can we adopt the stipulationism nor conceptualism about moments, since it again implies the anti-realism about the past.

### 3

The arguments in the preceded section have made it clear that the ontological explanation of trans-possible-world identity rests on the stipulationism or conceptualism about possible worlds. It is why such explication cannot be applied to trans-moment identity, since moments, especially past moments, are real.

(3)So I think that Lewis's counterpart theory, which insists on full-blooded realism, works better for explaining trans-moment identity than those two theories above. However it also includes some respects which cannot be applied to trans-moment identity. For example, he presupposes the causal independence among possible worlds, while we cannot among moments. Moreover it is questionable that we can use his similarity relation as the criterion for trans-moment identity; how can an baby in a moment and an old man in another moment be most similar, even if they have the relation of trans-moment identity?

Maybe we'll have to look for another realistic relation than a counterpart relation in order to explain trans-moment identity. I guess that it might be the relation called 'becoming'. True or not, I believe that at least we have found that trans-moment identity is a significant relation which can characterize time realistically. If so, the many-worlds view on time has merit, because it grasps

the reality of time in a way which has no correspondent in space, since ‘trans-place identity’, as it were, is meaningless. In retrospect it was such reality that McTaggart sought from time in vain.

## REFERENCES

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