Chapter 3: Ludlow’s Theory

Ludlow (1999) argues for a tensed reformulation of semantic theory based on his presentist\(^1\) views. He builds a hybrid “semantico-metaphysical” theory around two related concerns: (1) to develop a semantics that accounts for the differences between indexical and non-indexical temporal expressions that the new B-theorists allege are “extra-semantic” differences; and (2) to develop an A-theory metaphysics of time that avoids McTaggart’s paradox.

Before attempting (1) and (2), Ludlow makes two auxiliary arguments which serve to establish a direct (“Kantian”) relationship between semantics and metaphysics. First, he argues, following Kant, that the answers to some, if not all, metaphysical questions, can be found in answers to questions about the nature of human thought. Second, he argues that thought is inherently linguistic in nature, and hence that inquiry into the nature of language will shed light on certain metaphysical questions. If Ludlow’s arguments are sound, then answers to metaphysical questions like that of the relative priority of the A-series and the B-series in a metaphysical account of time can be found in answers to questions about the structure and meaning of the temporal expressions of natural language.

The Kantian Approach and the “Language of Thought”

Setting aside the question of whether it is actually compatible with Kant’s philosophy, let’s look at the first of Ludlow’s auxiliary arguments, namely, the argument for a “Kantian” connection between thought and metaphysics. Ludlow claims that, in general, the nature of reality cannot be discovered without some investigation into the nature of thought:

We can never know things as they are “in themselves,” since the mind is actively involved in organizing our experience. The best we can do is elucidate the categories or structure of reason. For example, according to Kant, time was not itself a property of things in themselves; rather, it was imposed upon our experience by the mind. Of course, from this perspective, it would be futile to begin an investigation into the nature of time apart from a consideration of the nature of thought or reason. And indeed, after an investigation into the nature of time as a category of

\(^1\)Recall the three-way distinction among A-theorists:
1. Eternalism: the past, the present, and the future all exist.
2. Growing-Universe Theory: only the past and the present exist.
3. Presentism: only the present exists.
human reason had taken place, there would be little left to do in the way of metaphysics, save perhaps to dot the i’s and cross the t’s. (p. 4)

In other words, according to Ludlow, most of the substantial metaphysical questions about time, including the question of the relative priority of the A- and B-series, can be resolved simply by examining the nature of human thought.

Ludlow’s second auxiliary argument is an attempt to establish the proposal that “thought is inherently linguistic in nature” and “thus...the proper starting place for [metaphysical] investigation should be the language in which we think” (p. 4). But what exactly is the language of thought, and how is it related to the languages we speak?

Following Chomsky (1986), Ludlow makes the distinction between I-language (or ‘internalized’ language), “an internal computational system that is part of our biological endowment” (p. 19) which we “have co-opted for communication and for other purposes” (p. 17), and E-language (or ‘externalized’ language), one of the social objects we refer to when we talk about English, Spanish, Mandarin, etc. Ludlow argues, following Chomsky, that E-languages cannot be individuated as “natural objects,” and thus all talk of language must be replaced with talk of the internal computational system that explains our linguistic competence (§1.1).

Ludlow then suggests that although the standard view is that language is primarily for communication, given that I-language is a biological endowment like any other, any claims about its purpose are subject to the same controversy that surrounds the “doctrine” of teleological explanation in evolutionary theory—so even if we discover all the details about some function of language, we still can’t know for sure what its other or original purposes are (§1.2). This lays the groundwork for the possibility that one of the functions, perhaps the primary function, of language is to serve as the mechanism of thought.

For the sake of argument, let’s assume that both of Ludlow’s auxiliary arguments are sound; i.e., that there is a direct connection between natural language and metaphysics. It then follows that there is a direct connection between the temporal aspects of natural language and the metaphysics of time. Ludlow assumes that the relevant aspects of language are semantic:

It is only through the theory of meaning that we are able to differentiate the elements of our ontology...[C]oncrete questions about the nature of reality can be illuminated by what we know about semantic theory, and...important questions in semantic theory may be adjudicated by certain of our metaphysical intuitions about the constitution of reality. (p. 5)
In other words, we can reach metaphysical conclusions simply by examining the semantics of natural language. More specifically, we can make metaphysical conclusions about time by examining the meanings of certain types of natural language expressions about time.

**Resolution of McTaggart’s Paradox**

As a philosopher, Ludlow’s most fundamental allegiance is with the A-theory of time. Thus, among his primary concerns is establishing the consistency of the A-theory position. This task is two-fold: first, incompatibilities with special relativity need to be addressed (as mentioned, Ludlow simply accepts the relativization of existence; his theory may thus be interpreted as a “relativistic” theory), and second, McTaggart’s paradox needs to be resolved.

Like many other presentists (e.g., Prior), Ludlow’s primary strategy is semantic. But unique among them, Ludlow, appeals directly to contemporary linguistics, adopting aspects of its scientific methodology and constructing syntactic and semantic theories on a par with others in linguistics. Before getting into the details of his syntax and semantics, let’s briefly review the overall structure of Ludlow’s resolution of McTaggart’s paradox.

Having established a connection between the semantics of temporal language and the metaphysics of time, Ludlow reformulates the apparently contradictory proposition of McTaggart’s paradox as a conjunction of natural language utterances:

\[ X \text{ is past and } X \text{ is present and } X \text{ is future.} \]

Taking \( X \) to be some event, e.g. Queen Anne’s death:

Queen Anne’s death is past and Queen Anne’s death is present and Queen Anne’s death is future.

McTaggart noted that this is problematic because the properties *past*, *present*, and *future* are incompatible, but Queen Anne’s death (like every other event) seems to have them all. Pointing out that Queen Anne’s death has these properties at different times won’t do, McTaggart’s argument goes, because such a move presupposes time and launches an infinite regress. But Ludlow claims he can avoid the regress, first, by denying the existence of past and future times, and second, by rendering all tensed sentences true or false in virtue of present facts alone, without reference to past or future times—so a claim like "Queen Anne’s death
was present" is a general claim about the present state of the world, verifiable or falsifiable by examination of the current state of affairs alone. (This approach is similar but not identical to Prior’s “taking tense seriously.”) For this reason, according to Ludlow, reformulating the sentence as follows fails to launch the infinite regress because the past tense verbs refer not to past times but only to the present state of affairs:

Queen Anne’s death is past and Queen Anne’s death was present and Queen Anne’s death was future.

(According to Ludlow, “Queen Anne’s death is past” will be evaluated by looking to see, e.g., whether Queen Anne’s body is in a graveyard somewhere, “Queen Anne’s death was present” by looking to see whether there exists now some general truth about, e.g., every dead person’s having undergone death at some point, and “Queen Anne’s death was future” by looking to see whether there likewise is some general truth about, e.g., the finite duration of death events.)

While some A-theorists have been satisfied to stop at this point in the analysis (e.g., Prior), Ludlow isn’t satisfied—what’s the difference between, for example, “Queen Anne’s death was present” and “Queen Anne’s death was future”? Something else appears to be necessary to establish that it was present at a different time than it was future—but without reference to times. To this end, Ludlow develops a syntax according to which each natural language utterance is accompanied by an implicit (unpronounced) “temporal adjunct clause,” introduced by ‘when,’ which, according to his semantics, serves to nonreferentially describe the circumstances of its truth:

Queen Anne’s death is past [when I am writing this] and Queen Anne’s death was present [when Queen Anne’s heart stopped beating] and Queen Anne’s death was future [when Queen Anne was born].

Crucially, such clauses are general claims about the world (claims like “properties x, y and z are satisfied” and unlike “time t has properties x, y and z”) which denote, rather than refer. In other words, they are more like definite descriptions—complexes of properties which are uniquely satisfied—than directly referring expressions. According to Ludlow’s semantics, the truth conditions for each of the simply tensed sentences  

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2 Ludlow emphasizes these two distinctions in establishing the non-referentiality of temporal adjunct clauses (pp. 112-114):  

**Singular vs. general propositions.** Singular propositions are propositions about some particular object, e.g., “Bill is tall.” General propositions aren’t about anything in particular, but are rather general claims about the world, e.g., “No one lives forever.” Ludlow’s temporal adjunct clauses are supposed to be general propositions (or proposition-like objects).

**Reference vs. denotation.** In cases of genuine reference, expressions refer directly to individuals: “Fred,” “Jane.” Denoting expressions instead uniquely determine their referents via description: “the the man who walked into the room,” “the king of France.” Denoting expressions may refer to a collection of properties that the some entity uniquely satisfies. Ludlow’s temporal adjunct clauses are supposed to be denoting and not referring expressions.

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are sufficiently distinct to establish the compatibility of the three conjuncts as a result of the differing contents of the metalanguage *when*-clauses. Crucially, “*when* cannot mean ‘at the same time’; it must be taken as a kind of primitive…[it] must be understood as being more fundamental than the B-series conception of simultaneity” (p. 112).

“Queen Anne’s death is past [when I am writing this]” is true iff Queen Anne’s death is past *when* I am writing this.

“Queen Anne’s death was present [when Queen Anne’s heart stopped beating]” is true iff Queen Anne’s death was present *when* Queen Anne’s heart stopped beating.

“Queen Anne’s death was future [when Queen Anne was born]” is true iff Queen Anne’s death was future *when* Queen Anne was born.

Thus the truth conditions for the whole sentence would be the following according to Ludlow’s theory:

“Queen Anne’s death is past [when I am writing this] and Queen Anne’s death was present [when Queen Anne’s heart stopped beating] and Queen Anne’s death was future [when Queen Anne was born]” is true iff Queen Anne’s death is past *when* I am writing this and Queen Anne’s death was present *when* Queen Anne’s heart stopped beating and Queen Anne’s death was future *when* Queen Anne was born.

According to Ludlow, then, the differing contents of the hidden temporal adjunct clauses perform the differentiating function that reference to specific times did in the response McTaggart anticipated, but without reference to past or future times. Whether this resolves the contradiction and escapes the paradox, however, depends both on the soundness of his auxiliary arguments and the consistency and plausibility of his syntax and semantics and their application to the paradox.

**A Foundational Fragment**

Before getting into the more technical details of Ludlow’s theory, it will help to be familiar with his particular style of syntactic and semantic axiomatization. Let’s introduce, in that style, the syntax and semantics for a very basic fragment of English to which we can later add, and then perform an example derivation.
Syntax

S → S1 and S2
S → S1 or S2
S → it is not the case that S1
S → NP VP
NP → Dick, Sally
VP → leaps, walks

Semantics

Val(x, “Dick”) iff x = Dick (where ‘Val(x, y)’ means ‘x is the semantic value of y’)
Val(x, “Sally”) iff x = Sally
Val(e, “leaps”) iff e is a leaping
Val(e, “walks”) iff e is a walking

Val(True, [s NP VP]) iff, for some e, Val(e, VP) and for some x, Val(x, NP) and x is the agent of e
Val(x, [α, β]) iff Val(x, β), where α ranges over categories and β ranges over categories and lexical items
Val(True, [s S1 and S2]) iff Val(True, S1) and Val(True, S2)
Val(True, [s S1 or S2]) iff Val(True, S1) or Val(True, S2)
Val(True, [s it is not the case that S1]) iff it is not the case that Val(True, S1)

Example derivation

“Dick walks and it is not the case that Sally leaps.”
1. “Dick walks and it is not the case that Sally leaps” is true iff Val(True, [S1 [NP Dick] [VP walks]]) and Val(True, [S2 it is not the case that [S22 [NP Sally] [VP leaps]])

2. . . . iff for some e, Val(e, [VP walks]) and for some x, Val(x, [NP Dick]) and x is the agent of e

3. . . . iff for some e, Val(e, [VP walks]) and for some x, Val(x, “Dick”) and x is the agent of e and it is not the case that for some f, Val(f, [VP leaps]) and for some y, Val(y, [NP Sally]) and y is the agent of f

4. . . . iff for some e, e is a walking and Dick is the agent of e and it is not the case that for some f, Val(f, “leaps”) and for some x, Val(x, “Sally”) and x is the agent of f

The Syntax and Semantics of Temporal Adjunct Clauses

Ludlow’s proposal involves a significant modification to the structure of the typical sentence: according to his theory, there are no single-clause sentences—every sentence comes either with an explicit or implicit temporal adjunct clause, introduced by a primitive temporal connective like ‘when’ (he later expands his account to include two more primitive temporal connectives which will be introduced shortly). Ludlow observes that explicit temporal adjunct clauses are always tensed (“I got home before it started raining”) and that their tense is always “coordinated with the tense of the matrix clause” (never “I got home before it will start raining”), and then hypothesizes that implicit temporal adjunct clauses follow precisely the same rules as explicit ones—in other words, Ludlow’s “tense system merely recapitulates the structures made available by the system of explicit temporal conjunctions, and inherits the constraints on that system” (p. 124).

For example, a sentence with an explicit temporal adjunct clauses might be given the following structure:\(^3\):

\(^3\)Ludlow presents his theory with ternary branching trees, but notes that it can be converted to a system of exclusive binary
The same sentence with the temporal adjunct clause instead implicit would be given precisely the same structure, but with the added information that the clause is unpronounced.

The basic semantics for Ludlow's temporal adjunct clauses is simple, first because tense is preserved by the semantic evaluation function $Val(x,y)$ (as in (1) below), and second because the temporal connective is supposed to be primitive and unanalyzable (as in (2)):

(1) $Val(\text{True}, \text{"Queen Anne's death was future"}) \iff \text{"Queen Anne's death is future" was true}$

(2) $Val(\text{True}, \text{"Queen Anne's death was future when Queen Anne was born"}) \iff Val(\text{True}, \text{"Queen Anne's death was future"}) \text{ when } Val(\text{True}, \text{"Queen Anne was born"})$

This second point is especially crucial to Ludlow's proposal. 'When' can’t mean anything like ‘at the same time’ or ‘overlapping in a temporal series’ otherwise Ludlow’s argument would be subject to McTaggart’s objection (it would presuppose time and launch an infinite regress).

branching if necessary:
E-type Temporal Anaphora

Also crucial to Ludlow’s proposal is the nonreferentiality of his temporal adjunct clauses. Motivated in part by apparent inadequacies in a simple operator account of tense, Ludlow acknowledges the need for something like temporal anaphora. But since straightforward temporal anaphora requires reference to past and future events, Ludlow adopts the paradigm of E-type (nonreferential) anaphora from previous linguistic work on the semantics of pronouns.

In the E-type approach to pronominal anaphora, a pronoun, rather than referring directly to the referent of the noun with which it is coindexed, is treated as “standing proxy for” a definite description. The E-type approach was developed in response to so-called “donkey sentences,” the meanings of which appear impossible to give under a traditional coreference account of pronouns. Take the original donkey sentence, for example:

Every man who owns a donkey beats it.

Taking “every man” as a universally quantified noun phrase and “a donkey” as an existentially quantified one, we get the following logical form:

\[ \forall x \exists y [(x \text{ is a man } \& \ y \text{ is a donkey } \& \ x \text{ owns } y) \rightarrow x \text{ beats } y] \]

But the meaning of this is something like ‘for every man there is some object y which satisfies the conditional if \( y \text{ is a donkey and } x \text{ owns } y \) then the man beats y’. If there is an object in the world which is neither a donkey nor owned by the man, then it will satisfy the conditional. This clearly doesn’t capture the intended meaning of the sentence.

(SECOND SOLUTION & FAILURE]

The solution proposed by Evans (1977), called the E-type approach, is to treat "a donkey" above not as an existential quantifier but rather as a definite description in disguise. The logical form of the donkey sentence above would on this treatment be something like the following:

\[ \forall x [(x \text{ is a man } \& \ x \text{ owns a donkey}) \rightarrow x \text{ beats the donkey he owns}] \]

The meaning of an E-type anaphoric pronoun is not the individual which it eventually picks out, but rather a set of properties which the intended individual uniquely satisfies. Thus “the donkey he owns” refers not
directly to the donkey, but to the set of properties being a donkey and being owned by the man. If a given individual satisfies these properties, then it becomes the referent of the E-type anaphoric pronoun.

Ludlow adopts this general framework for semantic contexts in which temporal anaphora appear to be necessary. Take an example from Partee (1986), uttered by someone halfway down the turnpike on their way to work:

I didn’t turn off the stove.

On a typical approach in which both the tense and the negation are taken as operators that can have scope over one another and the past tense operator is taken as an existential quantifier over past times, the sentence has two interpretations, depending on which operator takes wider scope. If the past tense takes scope over the negation, the sentence means something like There is a time in the past at which I did not turn off the stove. This sentence is true in almost all circumstances—no one spends their entire life turning off a stove—but “I didn’t turn off the stove” seems to be informative under only certain circumstances, e.g., while the utterer is halfway down the turnpike driving to work. If the negation takes scope over the past tense, the sentence means instead something like It is not the case that at some time in the past I turned off the stove. But most if not all people who can use this sentence informatively have turned off a stove at least once in their lives. Again, the quantifier approach gives this sentence too general a meaning.

Partee’s solution is to replace the existential quantification over past times with a mechanism for picking out a specific reference time from context or previous discourse, much as pronouns pick out a specific individual from context or previous discourse (the reference time in this case would be the relevant moment or interval before the utterer left his or her home and started driving to work). Ludlow follows Partee in adopting an anaphoric strategy to solve this problem, but in order to make it consistent with his presentist metaphysics, adds the stipulation that all temporal anaphora must be E-type—that is, general, descriptive, and nonreferential. Ludlow doesn’t offer any details about the logical structure of his temporal adjunct clauses, but assuming the mechanism to be the same as or similar to that of E-type pronominal anaphora, the meaning of a clause like “when Queen Anne was born” would then be the set of properties that are uniquely satisfied by some aspect of the current state of affairs pertaining specifically to the truth of the tensed matrix clause.
Before and After and Complex Tenses

According to Ludlow’s theory, hidden when-clauses account for the meanings of simply tensed sentences like “I didn’t turn off the stove.” But what about sentences with so-called complex tenses, like “I had left the house [when it started raining]” or “She will have left [by the time I get there]”? Ludlow discusses Reichenbach’s (1947) proposal at length\(^4\), and notes that the proposal, thoroughly B-theoretical, has been adopted by “legions of linguists in various traditions” (p. 78), but rejects it because it inescapably involves reference to past and future times. Ludlow instead introduces two more “primitive and unanalyzable” temporal connectives: before and after. In complexly-tensed sentences, he claims, the temporal adjunct clauses are not when-clauses, but before- and after-clauses:

\[\text{“I had left the house [when it started raining],”}\]

\[\begin{array}{c}
S \\
\text{before} \\
\text{NP} \\
\text{VP} \\
I \\
\text{left the house} \\
\end{array} \quad \begin{array}{c}
S \\
\text{NP} \\
\text{VP} \\
I \\
\text{it} \\
\text{started raining} \\
\end{array}\]

\[\text{“She will have left [by the time I get there].”}\]

\(^4\)To account for complex tenses like past perfect and future perfect, the Reichenbach incorporated a context-supplied reference time, \(R\) (using Reichenbach’s notation, \(S = \text{speech time}, \ E = \text{event time}\)). The following formulation is Ludlow’s (§5.1) but captures Reichenbach’s proposal adequately:

- **Present**: \(\text{Val(True, “Fred is hungry”, } S, R, E)\) iff \(S = R\) and \(E\) overlaps with \(S/R\) and Fred is hungry at \(E\)
- **Simple past**: \(\text{Val(True, “Fred was hungry”, } S, R, E)\) iff \(R = E\) and \(R/E\) is before \(S\) and Fred is hungry at \(R/E\)
- **Present perfect**: \(\text{Val(True, “Fred has been hungry”, } S, R, E)\) iff \(S = R\) and \(E\) is before \(S/R\) and Fred is hungry at \(E\)
- **Future**: \(\text{Val(True, “Fred will be hungry”, } S, R, E)\) iff \(R = E\) and \(E\) is after \(S\) and Fred is hungry at \(R/E\)
- **Past perfect**: \(\text{Val(True, “Fred had been hungry”, } S, R, E)\) iff \(E\) is before \(R\) and \(R\) is before \(S\) and Fred is hungry at \(E\)
- **Future perfect**: \(\text{Val(True, “Fred will have been hungry”, } S, R, E)\) iff \(E\) is after \(R\) and \(R\) is after \(S\) and Fred is hungry at \(E\)

\(^5\)Complex tenses requiring the use of the temporal connective after, like so-called future-in-future or future-in-past, arguably don’t appear grammatically in English, but would look something like the following if they did:

“\(I\) was (going to be) leaving town the next day when she called.”\(^4\)
The Full Theory

Adding Tense

Ludlow’s next step is to add tense to the existing syntax and semantics. He proposes that tenses are “semantic predicates” which take untensed proposition-like objects (the ‘x’s below) as their arguments:

New semantics:

Val(x, PAST) iff x was true

Val(x, PRES) iff x is true

Val(x, FUT) iff x will be true

6He actually proposes that the appropriate proposition-like objects are interpreted logical forms (ILFs), which he developed extensively in Larson & Ludlow (1993) and discussion of which he also attributes to Higginbotham (1986 & 1991), Segal (1989), and Larson & Segal (1995). According to Ludlow, ILFs are syntactic trees with, instead of a syntactic category label at each node, an ordered pair of that syntactic category label and its semantic value. Each node represents the entire sub-tree which it dominates; thus the syntactic category in the ordered pair is the category of that sub-tree, and the semantic value is the semantic value of the entire sub-tree:

For reasons detailed in Larson & Ludlow (1993) and also in chapter 3 of Ludlow (1999), tensed ILFs are most useful for dealing with problems arising in intensional contexts, but he adopts them as the arguments of tense predicates for reasons that are unclear. Since swapping them out for simple untensed sentences (minus the semantic values) has no relevant consequences on the resulting theory, I will replace ILFs with simple untensed sentences in my presentation of the theory.
Val(True, [TP TNS TP]) iff, for some \(x\), Val(x, TNS) and \(x = TP\)

**New syntax:**

\(TP \rightarrow TNS \ TP\)

\(TNS \rightarrow \text{PAST, PRES, FUT}\)

\(S \rightarrow TP \text{ when/before/after } TP\)

**Example derivation:**

“Sally leapt [when Dick walked].”

1. \(\text{Val(True, “Sally leapt [when Dick walked]”) }\) iff \(\text{Val(True, [TP [TNS PAST] [TP Sally] ])}\) when \(\text{Val(True, [TP [TNS PAST] [TP Dick walk]]})\)

2. \(\ldots \text{iff, for some } x, \text{Val}(x, \text{PAST}) \text{ and } x = “Sally leap” \text{ when, for some } y, \text{Val}(y, \text{PAST}) \text{ and } y = “Dick walk”\)

3. \(\ldots \text{iff “Sally leap” was true when “Dick walk” was true}\)

This will ultimately be reduced to:

\(\ldots \text{iff there is some evidence in the world right now that is consistent with the past existence of a leaping performed by Sally, and there is some evidence in the world right now that is consistent with the past existence of a walking performed by Dick, and there is also some evidence in the world right now that is consistent with the past leaping having existed \text{when}\) the past walking existed
The Full Theory\textsuperscript{7}

**Syntax**

\[ S \rightarrow S1 \text{ and } S2 \]

\[ S \rightarrow S1 \text{ or } S2 \]

\[ S \rightarrow \text{it is not the case that } S1 \]

\[ S \rightarrow TP \text{ when/before/after } TP \]

\[ TP \rightarrow TNS TP\textsuperscript{8} \]

\[ TP \rightarrow NP \text{ VP} \]

\[ TNS \rightarrow \text{PAST, PRES, FUT} \]

\[ NP \rightarrow \text{Dick, Sally, Queen Anne, Queen Anne's death, Queen Anne's heart, I} \]

\[ VP \rightarrow \text{leap, walk, be present, be past, be future, be born, stop beating, be writing this} \]

**Semantics**

\[ \text{Val}(x, \text{"Dick"}) \text{ iff } x = \text{Dick} \]

\[ \text{Val}(x, \text{"Sally"}) \text{ iff } x = \text{Sally} \]

\[ \text{Val}(x, \text{"Queen Anne"}) \text{ iff } x = \text{Queen Anne} \]

\[ \text{Val}(x, \text{"Queen Anne's death"}) \text{ iff } x = \text{Queen Anne's death} \]

\[ \text{Val}(x, \text{"Queen Anne's heart"}) \text{ iff } x = \text{Queen Anne's heart} \]

\[ \text{Val}(x, \text{"T"}) \text{ iff } x = \text{I} \]

\[ \text{Val}(e, \text{"leap"}) \text{ iff } e \text{ is a leaping} \]

\[ \text{Val}(e, \text{"walk"}) \text{ iff } e \text{ is a walking} \]

\[ \text{Val}(e, \text{"be present"}) \text{ iff } e \text{ is a being present} \]

\[ \text{Val}(e, \text{"be past"}) \text{ iff } e \text{ is a being past} \]

\[ \text{Val}(e, \text{"be future"}) \text{ iff } e \text{ is a being future} \]

\[ \text{Val}(e, \text{"be born"}) \text{ iff } e \text{ is a being born} \]

\textsuperscript{7}I’m adding some rules not given in Ludlow (1999), but constructed in parallel with the ones that are, to deal with sentences about Queen Anne’s death. I’m also leaving out Ludlow’s syntax and semantics for prepositional phrases, temporal adverbs, and aspect because they are only significant inasmuch as they demonstrate that Ludlow’s theory is capable of handling these phenomena. Whether this is the case or not is unimportant for the present discussion.

\textsuperscript{8}This is the rule Ludlow presents in the appendix; elsewhere it is implied to be TP \rightarrow TNS S. It’s unclear which version is the “right” one.
Val(e, “stop beating”) iff e is a stopping beating

Val(e, “be writing this”) iff e is a being writing this

Val(True, [S S1 and S2]) iff Val(True, S1) and Val(True, S2)

Val(True, [S S1 or S2]) iff Val(True, S1) or Val(True, S2)

Val(True, [S it is not the case that S1]) iff it is not the case that Val(True, S1)

Val(True, [S TP1 when TP2]) iff Val(True, TP1) when Val(True, TP2)

Val(True, [S TP1 before TP2]) iff Val(True, TP1) before Val(True, TP2)

Val(True, [S TP1 after TP2]) iff Val(True, TP1) after Val(True, TP2)

Val(True, [TP1 TNS TP2]) iff, for some x, Val(x, TNS) and x = TP2

Val(True, [TP NP VP]) iff, for some e, Val(e, VP) and for some x, Val(x, NP) and x is the agent of e

Val(x, [α β]) iff Val(x, β), where α ranges over categories and β ranges over categories and lexical items

**Formal Analysis of McTaggart’s Paradox**

Now that we have Ludlow’s full theory in place, let’s see what structure and truth conditions it gives to an instance of the contradiction-generating sentence from McTaggart’s argument with his suggested when-clause contents:

“Queen Anne’s death is past [when I am writing this] and Queen Anne’s death was present [when Queen Anne’s heart stopped beating] and Queen Anne’s death was future [when Queen Anne was born].”
1. Val(True, [S [S Queen Anne’s death is past when I am writing this] and [S [S Queen Anne’s death was present when Queen Anne’s heart stopped beating and Queen Anne’s death was future when Queen Anne was born]]) iff Val(True, [S [TP Queen Anne’s death is past] when [TP I am writing this]]) and Val(True, [S [S Queen Anne’s death was present when Queen Anne’s heart stopped beating] and [S Queen Anne’s death was future when Queen Anne was born]])

2. . . . iff Val(True, [S [TNS PRES | [S Queen Anne’s death be past]]) when Val(True, [S [TNS PAST] [S I be writing this]]) and Val(True, [S [TP Queen Anne’s death was present] when [TP Queen Anne’s heart stopped beating]] and Val(True, [S [TP Queen Anne’s death was future] when [TP Queen Anne was born]])

3. . . . iff “[.TP [.NP Queen Anne’s death] [.VP be past]]” is true when “[.TP [.NP I] [.VP be writing this]]” is true and Val(True, [TP [TNSPAST] [S Queen Anne’s death be present]]) when Val(True, [TP [TNS PAST] [S Queen Anne’s heart stop beating]]) and Val(True, [TP [TNS PAST] [S Queen Anne’s death be future]]) when Val(True, [TP [TNS PAST] [S Queen Anne be born]])

4. . . . iff “[.TP [.NP Queen Anne’s death] [.VP be past]]” is true when “[.TP [.NP I] [.VP be writing this]]” is true and “[.TP [.NP Queen Anne’s death] [.VP be present]]” was true when “[.TP [.NP Queen Anne’s heart] [.VP stop beating]]” was true and “[.TP [.NP Queen Anne’s death] [.VP be future]]” was true when “[.TP [.NP Queen Anne] [.VP be born]]” was true

5. . . . iff “for some e, Val(e, [.VP be past]) and for some x, Val(x, [.NP Queen Anne’s death]) and x is the agent of e” is true when “for some f, Val(f, [.VP be writing this]) and for some y, Val(y,
[NP I] and y is the agent of f” is true and “for some g, Val(g, [.VP be present]) and for some z, Val(z, [.NP Queen Anne’s death]) and z is the agent of g” was true when “for some h, Val(h, [.VP stop beating]) and for some w, Val(w, [.NP Queen Anne’s heart]) and w is the agent of h” was true and “for some i, Val(i, [.VP be future]) and for some v, Val(v, [.NP Queen Anne’s death]) and v is the agent of i” was true when “for some j, Val(j, [.VP be born]) and for some u, Val(u, [.NP Queen Anne]) and u is the agent of j” was true

6. . . . iff “for some e, Val(e, “be past”) and for some x, Val(x, “Queen Anne’s death”) and x is the agent of e” is true when “for some f, Val(f, “be writing this”) and for some y, Val(y, “T”) and y is the agent of f” is true and “for some g, Val(g, “be present”) and for some z, Val(z, “Queen Anne’s death”) and z is the agent of g” was true when “for some h, Val(h, “stop beating”) and for some w, Val(w, “Queen Anne’s heart”) and w is the agent of h” was true and “for some i, Val(i, “be future”) and for some v, Val(v, “Queen Anne’s death”) and v is the agent of i” was true when “for some j, Val(j, “be born”) and for some u, Val(u, “Queen Anne”) and u is the agent of j” was true

7. . . . iff “for some e, e is a being past and Queen Anne’s death is the agent of e” is true when “for some f, f is a writing of this and I am the agent of f” is true and “for some g, g is a being present and Queen Anne’s death is the agent of g” was true when “for some h, h is a stopping beating and Queen Anne’s heart is the agent of h” was true and “for some i, i is a being future and Queen Anne’s death is the agent of i” was true when “for some j, j is a being born and Queen Anne is the agent of j” was true

Again, glossing over the meanings of statements like “. . . .” was true or “. . . .” will be true according to Ludlow’s presentist claims about how we evaluate their truth, we get the following informal gloss of the truth conditions:

8. . . . iff there is some evidence in the world right now that is consistent with the present existence of the event of Queen Anne’s death being past, and there is some evidence that is consistent with the present existence of the event of my writing this, and there is some evidence that the first event exists when the second event exists; and there is some present evidence that is consistent with the past existence of the event of Queen Anne’s death being present, and there is some evidence that is consistent with the event of Queen Anne’s heart stopping beating, and there is some evidence that the first event existed when the second event existed; and there is some present evidence that is consistent with the past existence of the event of Queen Anne’s death
being future, and there is some evidence that is consistent with the event of Queen Anne’s being born, and there is some evidence that the first event existed when the second event existed.\textsuperscript{9}

**Conclusion**

If Ludlow’s syntax and semantics for temporal expressions are plausible and consistent, he has indeed shown that the sentence from which the contradiction giving rise to McTaggart’s paradox was derived is, in fact, not self-contradictory. If his auxiliary arguments (that there is a direct connection between thought and metaphysical reality and that I-language is the language of thought) are sound, and the sentence is a direct reflection of metaphysical reality, then the demonstration is in fact a resolution of the paradox-generating contradiction. If the rest of Ludlow’s metaphysical position is consistent, the resolution provides an escape from McTaggart’s paradox.

But the escape is contingent upon affirmative answers to at least all of the following questions:

- Is Ludlow’s version of the Kantian connection between thought and reality plausible and consistent?
- Is thought “inherently linguistic in nature”? If so, is I-language the language of thought?
- Are Ludlow’s syntax and semantics for temporal expressions internally consistent and empirically adequate?

As we will see, there is some reason to doubt the possibility of affirmative answers to all of these questions. In order to assess the plausibility of Ludlow’s attempt to appeal directly to semantics in his argument for presentism (and all other attempts to directly involve semantics in the dispute over the metaphysics of time), it will be necessary to address some foundational questions about the nature and function of semantic theories in science and philosophy and about the relationship between science and metaphysics in general.

\textsuperscript{9}Compare this with an example of the truth conditions a standard (B-theoretical) linguistic semantic theory would assign to the sentence “Queen Anne’s death is past and Queen Anne’s death was present and Queen Anne’s death was future”:

An utterance of “Queen Anne’s death is past and Queen Anne’s death was present and Queen Anne’s death was future” at time $t_0$ is true iff for some $e$ such that $e$ is the event of Queen Anne’s death being past, $At(t_0, e)$ and for some time $t_1$ such that $t_1$ is before $t_0$ and for some $f$ such that $f$ is the event of Queen Anne’s death being present, $At(t_1, f)$ and for some $t_2$ such that $t_2$ is before $t_1$ and for some $g$ such that $g$ is the event of Queen Anne’s death and $At(t_2, g)$.