

## Tense and Intension (2003)

The radical philosopher of flux, Cratylus of Athens, is said to have spurned the use of language altogether in part because, like everything else, our words' meanings are continually changing, making it impossible to convey what we intend. Scholars in the age of 'publish or perish' know that language has uses that do not require successful communication, but this seems a weak answer to Cratylus. Whereas diachronic change is inevitable, change in lexical meaning usually takes place over a long enough period that we manage during the interim, now and then, to get our thoughts across. I have come to believe, however, that any viable theory of the semantic content of language—whether Fregean, Russellian, or neither, or both—must accommodate the fact that, in a significant sense, the content or sense of most terms ('red', 'table', 'tree', 'walk') is indeed different at different times. I present here an account of semantic content that is philosophically neutral with respect to the sorts of issues that dominated twentieth-century philosophy of semantics, but that entails this kind of content shiftiness and other interesting consequences concerning the relationship between content and the empire of Time.

## SEMANTIC CONTENT

The primary presupposition of any philosophical theory of semantic content is that the (or at least one) semantic function of declarative sentences is to express a proposition.<sup>1</sup> A declarative sentence may be said to *contain* the proposition it

Portions of my book *Frege's Puzzle* (Atascadero, Calif.: Ridgeview, 1986, 1991) and of my chapter 'Tense and Singular Propositions,' in J. Almog, J. Perry, and H. Wettstein, eds., *Themes from Kaplan* (Oxford: Oxford University Press, 1989), pp. 331–392, have been incorporated into the present chapter. Where those presentations presuppose a Millian (or neo-Russellian) semantic theory, this presentation, by contrast, is deliberately neutral regarding all such issues. I am grateful to Steven Humphrey, Aleksandar Jokic, Takashi Yagisawa, and my audience at the Santa Barbara City College conference 'Time, Tense, and Reference' for their comments.

<sup>1</sup> Throughout this chapter, I am concerned with discrete units of information that are specifiable by means of a 'that'-clause—for example, that Socrates is wise. These discrete units are *propositions*. Following the usual practice, I use the verb 'express' in such a way that an unambiguous declarative sentence expresses (with respect to a given possible context *c*) a single proposition, which is referred to (with respect to *c*) by the result of prefixing 'the proposition that' to the sentence. A declarative sentence may express two or more propositions, but if it does so, it is ambiguous. Propositions expressed by the proper logical consequences of an unambiguous sentence are not themselves expressed, in this sense, by the sentence. The proposition that snow is white and grass is green is

semantically expresses, and that proposition may be described as the *semantic content*, or more simply as the *content*, of the sentence. Propositions are, like the sentences that express them, abstract entities. Many of their properties can be ‘read off’ from the containing sentences. Thus, for instance, it is evident that propositions are not ontologically simple but complex. The proposition that Frege is ingenious and the proposition that Frege is ingenuous are both, in the same way, propositions directly about Frege; hence, they must have some component in common. Likewise, the proposition that Frege is ingenious has some component in common with the proposition that Russell is ingenious, and that component is different from what it has in common with the proposition that Frege is ingenuous. Correspondingly, the declarative sentence ‘Frege is ingenious’ shares certain syntactic components with the sentences ‘Frege is ingenuous’ and ‘Russell is ingenious’. These syntactic components—the name ‘Frege’ and the predicate ‘is ingenious’—are separately semantically correlated with the corresponding component of the proposition contained by the sentence. Let us call the proposition-component semantically correlated with an expression the *semantic content* of the expression. The semantic content of the name ‘Frege’ is that which the name contributes to the proposition contained by such sentences as ‘Frege is ingenious’ and ‘Frege is ingenuous’; similarly, the semantic content of the predicate ‘is ingenious’ is that entity which the predicate contributes to the proposition contained by such sentences as ‘Frege is ingenious’ and ‘Russell is ingenious’. As a limiting case, the semantic content of a declarative sentence is the proposition it contains, its proposition content.

Within the framework of so-called possible-worlds semantics, the *extension* of a singular term with respect to a possible world  $w$  is simply its *referent* with respect to  $w$ , that is, the object or individual to which the term refers with respect to  $w$ . The extension of a sentence with respect to  $w$  is its truth value with respect to  $w$ —either truth or falsehood. The extension of an  $n$ -place predicate with respect to  $w$  is the class of  $n$ -tuples to which the predicate applies with respect to  $w$ , or rather the characteristic function of the class, that is, the function that assigns either truth or falsehood to an  $n$ -tuple of individuals, according as the predicate or its negation applies with respect to  $w$  to the  $n$ -tuple. (Assuming bivalence, the extension of an  $n$ -place predicate may simply be identified instead with the class of  $n$ -tuples to which the predicate applies.) The content of an expression determines the *intension* of the expression. The intension of a singular term, sentence, or predicate is a function that assigns to any possible world  $w$  the extension that the expression takes on with respect to  $w$ .

Since ordinary language includes so-called indexical expressions (such context-sensitive expression as ‘I’, ‘here’, ‘now’, ‘this’, ‘she’), the semantic content of an expression, and hence also the semantic intension, may vary with the context in which the expression is uttered. This means that content must in general be ‘indexed’ (i.e., relativized) to context. That is, strictly one should speak of the semantic content of an expression *with respect to* this or that context of utterance, and similarly for the

different from the proposition that snow is white, though intuitively the latter is included as part of the former. The sentence ‘Snow is white and grass is green’ expresses only the former, not the latter.

corresponding semantic intension of an expression. This generates a higher-level, nonrelativized semantic value for expressions, which Kaplan calls the *character* of an expression. The character of an expression is a function or rule that determines for any possible context of utterance  $c$ , the semantic content that the expression takes on with respect to  $c$ .<sup>2</sup> An indexical expression is then definable as one whose character is not a constant function.

The systematic method by which it is secured which proposition is semantically expressed by which sentence (with respect to a context) is, roughly, that a sentence semantically contains that proposition whose components are the semantic contents of the sentence-parts, with these semantic contents combined as the sentence-parts are themselves combined to form the sentence.<sup>3</sup> In order to analyze

<sup>2</sup> Whereas Kaplan introduces his notion of character in connection with his version of a direct reference theory, the general idea of relativizing content to context, and the resulting notion of the character of an expression, can easily fit within a Fregean (or 'anti-direct reference') conception of content.

Throughout this chapter, I use a quasi-technical notion of the *context* of an utterance which is such that for any particular actual utterance of an expression, if any facts had been different, even if only facts entirely independent of and isolated from the utterance itself, then the context of the utterance would, ipso facto, be a different context—even if the utterance is made by the very same speaker in the very same way to the very same audience at the very same time in the very same place. To put it another way, although a single utterance occurs in indefinitely many different possible worlds, in every possible world in which the same utterance occurs it occurs in a new and different context—even if the speakers, his or her manner of uttering, the time of the utterance, the location of the speaker, the audience being addressed, and all other such features and aspects of the utterance remain exactly the same. Suppose, for example, that it will come to pass that a Democrat is elected to the US presidency in the year 2000, and consider a possible world  $w$  that is exactly like the actual world in every detail up to January 1, 1999, but in which a Republican is elected to the US presidency in 2000. Suppose I here and now utter the sentence

- (i) Actually, a Republican will be elected to the US presidency in 2000 AD.

In the actual world, I thereby assert a proposition that is necessarily false. In  $w$ , on the other hand, I thereby assert a necessary truth. In uttering the very same sequence of words of English with the very same English meanings in both possible worlds, I assert different things. If we were to use the term 'context' in such a way that the context of my utterance remains the same in both worlds, we would be forced to say, quite mysteriously, that the sentence I uttered is such that it would have expressed a different proposition with respect to the context in which I uttered it if  $w$  had obtained, even though both its meaning and its context of utterance would remain exactly the same. The content of the sentence would emerge as a function not only of the meaning of the sentence and the context of utterance but also of the apparently irrelevant question of which political party wins the US presidency in the year 2000. Using the term 'context' as I do, we may say instead that although I make the very same utterance both in  $w$  and in the actual world, the context of the utterance is different in the two worlds. This allows us to say that the sentence I utter takes on different information contents with respect to *different* contexts of utterance, thereby assimilating this phenomenon to the sort of context sensitivity that is familiar in cases of such sentences as 'A Republican is presently US president'.

<sup>3</sup> The latter clause is needed in order to distinguish 'Bill loves Mary' from 'Mary loves Bill', where the sequential order of composition is crucial. This succinct statement of the rule connecting sentences and their contents is only an approximation to the truth. A complicated difficulty arises in connection with the latter clause of the rule and with quantificational locutions. Grammatically the sentence 'Someone is wise' is analogous to 'Socrates is wise', though logically and semantically they are disanalogous. In 'Socrates is wise', the predicate 'is wise' attaches to the singular term 'Socrates'. As Russell showed, this situation is reversed in 'Someone is wise', wherein the restricted quantifier 'someone' attaches to the predicate 'is wise'. Thus, whereas grammatically 'someone' is combined with 'is wise' to form the first sentence in just the same way that 'Socrates' is combined

the proposition contained by a sentence into its components, one simply decomposes the sentence into its contentful parts, and the semantic contents thereof are the components of the contained proposition. In this way, declarative sentences not only contain but also codify propositions. One may take it as a sort of general rule or principle that the semantic content of any compound expression, with respect to a given context of utterance, is made up of the semantic contents, with respect to the given context, of the contentful components of the compound. This general rule is subject to certain important qualifications, however, and must be construed more as a general guide or rule of thumb. Exceptions arise in connection with quotation marks and similar devices. The numeral '9' is, in an ordinary sense, a component part of the sentence 'The numeral "9" is a singular term', though the semantic content of the former is no part of the proposition content of the latter. I shall argue below that, in addition to quotation marks, there is another important though often neglected class of operators that yield exceptions to the general rule in something like the way quotation marks do. Still, it may be correctly said of any English sentence free of any operators other than truth-functional connectives (e.g., 'If Frege is ingenious, then so is Russell') that its proposition content is a complex made up of the semantic contents of its contentful components.

### THE SIMPLE THEORY

The *simple theory* is a theory of the semantic contents of some, but not all, sorts of expressions. Specifically, the simple theory is tacit on the controversial question of the semantic contents of proper names and similar sorts of singular terms. According to the simple theory, the semantic content of a predicate (or common noun or verb), as used in a particular context, is something like the attribute or concept semantically associated with the predicate with respect to that context. For example, the content of a monadic predicate may be identified with the corresponding property, while the content of an  $n$ -adic predicate,  $n > 1$ , may be identified with the corresponding  $n$ -ary relation. On the simple theory, the content of the sentence 'Frege is ingenious' is to be the proposition consisting of the semantic content of 'Frege'—whatever that may be (man, representational concept, or whatever)—and ingenuity (the property of being ingenious). More generally, an atomic sentence consisting of an  $n$ -place predicate  $\pi$  attached to an  $n$ -ary sequence of singular terms,  $\alpha_1, \alpha_2, \dots, \alpha_n$ , when evaluated with respect to a particular possible context, is held to express the proposition consisting of the attribute or concept referred to by  $\pi$  and the sequence of semantic contents of the attached singular terms. A sentential connective may be construed on the model of a predicate. The semantic content of a sentential connective would thus be an attribute—not an attribute of individuals like Frege,

with 'is wise' to form the second sentence, the semantic contents of 'someone' and 'is wise' are combined very differently from the way the contents of 'Socrates' and 'is wise' are combined. A perhaps more important qualification to the general rule is noted in the next paragraph of the text. Yet another important qualification concerns overlaid quantifiers. For details, see *Frege's Puzzle*, pp. 155–157.

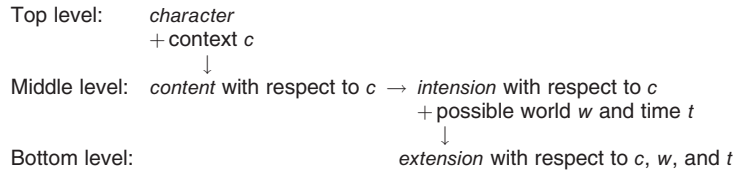


Figure 18.1 Semantic values on the simple theory

but an attribute of propositions. Similarly, the semantic content of a quantifier might be identified with a property of properties of individuals, and so on.

One may be tempted to hold that a sentence is a means for referring to its proposition content by specifying the components that make it up. However, a familiar argument due primarily to Alonzo Church and independently to Kurt Gödel establishes that the closest theoretical analogue of singular-term reference for any expression is its extension.<sup>4</sup> Accordingly, the simple theory will be understood to make room for the thesis that any expression refers to its extension, and for a resulting distinction between reference and semantic content.

The simple theory thus recognizes three distinct levels of semantic value. The three primary semantic values are *extension*, *content*, and *character*. On the same level as, and fully determined by, content is *intension*. Semantic values on the simple theory, and their levels and interrelations, are diagrammed in Figure 18.1. (Of course, these are not the only semantic values available on the simple theory, but they are the significant ones.) Within the framework of the simple theory, the *meaning* of an expression might be identified with the expression's character, that is, the semantically correlated function from possible contexts of utterance to semantic contents. For example, the meaning of the sentence

- (1) I am writing

may be thought of as a function that assigns to any context of utterance *c* the proposition composed of the semantic content of 'I' with respect to *c* (whether that content may be the agent of *c*, a Fregean sense, or something else) and the property of writing.

## PROPOSITIONS AND PROPOSITION MATRICES

Compelling though it is, the simple theory is fundamentally defective and must be modified if it is to yield a viable theory of semantic content. The flaw is illustrated by the following example: Suppose that at some time in 1890 Frege utters sentence

<sup>4</sup> See A. Church, 'Review of Carnap's *Introduction to Semantics*,' *The Philosophical Review*, 52 (1943), pp. 298–304, at pp. 299–301; K. Gödel, 'Russell's Mathematical Logic,' in P. A. Schilpp, ed., *The Philosophy of Bertrand Russell*, (New York: Tudor, 1944), pp. 125–153, at pp. 128–129. The general argument is applied to the special case of monadic predicates in my *Frege's Puzzle*, pp. 22–23, and in greater detail to the special case of common nouns in my *Reference and Essence* (Princeton, N.J.: Princeton University Press, and Oxford: Basil Blackwell, 1981), pp. 48–52.

(1) (or its German equivalent). Consider the proposition that Frege asserts in uttering this sentence. This is the proposition content of the sentence with respect to the context of Frege's uttering it. Let us call this proposition ' $p^*$ ' and the context in which Frege asserts it ' $c^*$ '. The proposition  $p^*$  is made up of the semantic content of the indexical term 'I' with respect to  $c^*$  and the semantic content of the predicate 'writing' with respect to  $c^*$ . According to the simple theory, the latter semantic content is the property of writing. Thus,  $p^*$  (the semantic content of the whole sentence with respect to  $c^*$ ) is a complex abstract entity made up of the semantic content of 'Frege' and the property of writing. Let us call this complex 'Frege writing', or ' $fw$ ' for short. Thus, according to the simple theory,  $p^* = fw$ . But this cannot be correct. If  $fw$  is thought of as having a truth value, then it is true if and when Frege is writing and false if and when he is not writing. Thus,  $fw$  vacillated in truth value over time, becoming true whenever Frege began writing and false whenever he ceased writing.<sup>5</sup> But  $p^*$ , being a proposition, has in any possible world (or at least in any possible world in which something is determined by the semantic content of 'Frege') a fixed and unchanging truth value throughout its existence, and never takes on the opposite truth value. In effect, a present-tensed sentence like (1) expresses the same eternal proposition on any occasion of utterance as does its temporally modified cousin

(2) I am writing now.

In this sense, propositions are *eternal*.

Not just some; all propositions are eternal. The eternalness of a proposition is central and fundamental to the very idea of a proposition, and is part and parcel of a philosophically entrenched conception of proposition content. For example, Frege, identifying the cognitive proposition content (*Erkenntniswerte*) of a sentence with what he called the 'thought' (*Gedanke*) expressed by the sentence, wrote:

Now is a thought changeable or is it timeless? The thought we express by the Pythagorean Theorem is surely timeless, eternal, unvarying. 'But are there not thoughts which are true today but false in six months' time? The thought, for example, that the tree there is covered with green leaves, will surely be false in six months' time.' No, for it is not the same thought at all. The words 'This tree is covered with green leaves' are not sufficient by themselves to constitute the expression of thought, for the time of utterance is involved as well. Without the time-specification thus given we have not a complete thought, i.e., we have no thought at all. Only a sentence with the time-specification filled out, a sentence complete in every respect, expresses a thought. But this thought, if it is true, is true not only today or tomorrow but timelessly. ('Thoughts,' in Frege's *Logical Investigations*, P. T. Geach, ed., New Haven, Conn.: Yale University Press, 1977, pp. 1–30, at pp. 27–28)

The same sort of consideration is used by Richard Cartwright to show that the meaning of a present-tensed sentence is not its proposition content when uttered with assertive intent, or what is asserted by someone who utters the sentence.

<sup>5</sup> This forces a misconstrual of the intension of sentence (1) with respect to Frege's context  $c^*$  as a two-place function that assigns to the ordered pair of both a possible world  $w$  and a time  $t$  a truth value, either truth or falsehood, according as the individual determined by the semantic content of 'Frege' is writing in  $w$  at  $t$  or not.

Cartwright's argument exploits the further fact that the truth value of a proposition is constant over space as well as time:

Consider, for this purpose, the words 'It's raining'. These are words, in the uttering of which, people often (though not always) assert something. But of course *what* is asserted varies from one occasion of their utterance to another. A person who utters them one day does not (normally) make the same statement as one who utters them the next; and one who utters them in Oberlin does not usually assert what is asserted by one who utters them in Detroit. But these variations in what is asserted are *not* accompanied by corresponding changes in meaning. The words 'It's raining' retain the same meaning throughout . . . [One] who utters [these words] speaks correctly only if he [talks about] the weather at the time of his utterance and in his (more or less) immediate vicinity. It is this general fact about what the words mean which makes it possible for distinct utterances of them to vary as to statement made . . . They are used, without any alteration in meaning, to assert now one thing, now another. ('Propositions,' in R. Butler, ed., *Analytical Philosophy*, Oxford: Basil Blackwell, 1968, pp. 81–103, at pp. 92–94)

Similar remarks by G. E. Moore make essentially the same point about propositions expressed using the past tense:

As a general rule, whenever we use a past tense to express a proposition, the fact that we use it is a sign that the proposition expressed is *about* the time at which we use it; so that if I say twice over 'Caesar was murdered,' the proposition which I express on each occasion is a different one—the first being a proposition with regard to the earlier of the two times at which I use the words, to the effect that Caesar was murdered before *that* time, and the second a proposition with regard to the latter of the two, to the effect that he was murdered before *that* time. So much seems to me hardly open to question. ('Facts and Propositions,' in *Philosophical Papers*, New York: Collier, 1966, pp. 60–88, at p. 71)

Consider again Frege's 'thought' that a particular tree is covered with green leaves. Six months from now, when the tree in question is no longer covered with green leaves, the sentence

(3) This tree is covered with green leaves,

uttered with reference to the tree in question, will express the proposition that the tree is *then* covered with green leaves. This will be false. But that proposition is false even now. What is true now is the proposition that the tree *is* covered with green leaves, in other words, the proposition that the tree is *now* covered with green leaves. This is the proposition that one would currently express by uttering sentence (3). It is eternally true—or at least true throughout the entire lifetime of the tree and never false. There is no proposition concerning the tree's foliage that is true now but will be false in six months. Similarly, if the proposition  $p^*$  that Frege asserts in  $c^*$  is true, it is eternally true. There is no noneternal proposition concerning Frege that vacillates in truth value as he shifts from writing to not writing. The complex  $fw$  is noneternal, neutral with respect to time. Hence, it is not a complete proposition; that is, it is no proposition at all, properly so-called.

The truths truthsayers say and the sooths soothsayers soothsay—these all are propositions fixed, eternal, and unvarying. Eternal are the things asserters assert, the

things believers believe, the things dreamers dream. Eternal also are the principles we defend, the doctrines we abhor, the things we doubt, the things we cannot doubt. The truths that are necessarily true and those that are not, the falsehoods that are necessarily false and those that are not—these are one and all eternal propositions. None of this is to say that the noneternal complex *fw* is not a semantic value of the sentence Frege utters, or that *fw* has nothing to do with proposition content. Indeed, *fw* is directly obtained from the sentence Frege utters in the context  $c^*$  by taking the semantic content of 'I' with respect to  $c^*$  and the property associated with 'writing' with respect to  $c^*$ . Moreover, *fw* can be converted into a proposition simply by *eternalizing* it, that is, by infusing a particular time (moment or interval)  $t$  into the complex to get a new abstract entity consisting of the semantic content of 'Frege', the property of writing, and the particular time  $t$ . One may think of the noneternal complex *fw* as the matrix of the proposition  $p^*$  that Frege asserts in  $c^*$ . Each time he utters sentence (1), Frege asserts a different proposition, expresses a different 'thought,' but always one having the same matrix *fw*. Similarly, in some cases it may be necessary to incorporate a location as well as a time in order to obtain a genuine proposition, for example, 'It is raining' or 'It is noon'. A proposition does not have different truth values at different locations in the universe, any more than it has different truth values at different times. A proposition is fixed, eternal, and unvarying in truth value over both time and space.

To each proposition matrix there corresponds a particular property of times (or, where necessary, a binary relation between times and places). For example, the time property corresponding to the proposition matrix *fw* is the property of being a time at which Frege is writing. It is often helpful in considering the role of proposition matrices in the semantics of sentences to think of a proposition matrix as if it were its corresponding property of times.

It has been noted by William and Martha Kneale, and more recently and in more detail by Mark Richard, that this traditional conception of semantic content is reflected in our ordinary ascriptions of belief and other propositional attitudes.<sup>6</sup> As Richard points out, if what is asserted or believed were something temporally neutral or noneternal, then from the conjunction

- (4) In 1990, Mary believed that Bush was president, and she has not changed her mind about that,

it would be legitimate to infer

- (5) Mary still believes that Bush is president.

Such an inference is an insult not only to Mary but also to the logic of English, as it is ordinarily spoken. Rather, what we might infer is

- (6) There is some time  $t$  in 1990 such that Mary still believes that Bush was president at  $t$ .

<sup>6</sup> See W. Kneale and M. Kneale, 'Propositions and Time,' in A. Ambrose and M. Lazerowitz, eds., G. E. Moore: *Essays in Retrospect* (New York: Humanities Press, 1970), pp. 228–241, at p. 235; Mark Richard, 'Temporalism and Eternalism,' *Philosophical Studies* 39 (1981), pp. 1–13.



The reason for this is that what Mary is said by sentence (4) to have believed in 1990 is not the noneternal proposition matrix, Bush being president, but the eternal proposition that Bush is president throughout a particular time period. The point is bolstered if 'know' is substituted for 'believe'.

The length of the time period is a vague matter. For many purposes, it may be taken to be the entire year of 1990. When the time interval involved in a proposition is significantly long, the proposition may mimic its noneternal matrix—for example, in contexts like 'Mary once believed that Bush was a Republican, and she still believes that'—as long as one stays within the boundaries of the time interval in question. Relatively stable properties (like being a Republican, as opposed to being US president) tend to lengthen the time interval in question.<sup>7</sup> (They need not invariably do so.) This point is crucial to the proper analysis of inferences that seem to tell against the argument just considered. Mark Aronszajn, for example, objects to the argument by citing formally similar but evidently valid inferences like the following:

- (7) In 1976, experts doubted that AIDS was transmitted through unprotected heterosexual intercourse, but no experts doubt that today.  
Therefore, today no experts doubt that AIDS is transmitted through unprotected heterosexual intercourse.
- (8) In 1990, Mary believed that Bush was president, and in 1992, she still believed that.  
Therefore, in 1992, Mary still believed that Bush was president.<sup>8</sup>

The modes by which AIDS is transmitted among humans are presumed to be invariant over a very long period of time (perhaps for eternity). Likewise, a natural interpretation of the second inference has its author ascribing to Mary the belief that

<sup>7</sup> This is similar to a point made by Kneale and Kneale, 'Propositions and Time,' pp. 232–233. Compare my *Frege's Puzzle*, p. 157 n. 3. On the most natural interpretation of past-tensed belief attribution sentences ' $\alpha$  believed that  $\phi$ ', such a sentence is true with respect to a particular time  $t$  if and only if there is a salient time  $t'$  earlier than  $t$  and a salient interval  $t''$  including  $t'$  such that the referent of  $\alpha$  with respect to  $t'$  believed at  $t'$  the proposition expressed by  $\phi$  with respect to  $t''$ . (This semantics involves a slight departure from that proposed by Richard.)

<sup>8</sup> See M. Aronszajn, 'A Defense of Temporalism,' *Philosophical Studies*, 81 (1996), pp. 71–95. Aronszajn's actual examples invoke the past progressive in place of the simple past tense (specifically, 'AIDS was spreading among heterosexuals' in place of 'AIDS was transmitted through unprotected heterosexual intercourse'), and the attribute of being up to no good as president in place of merely being president. Aronszajn's examples strike me as significantly less plausible than the ones provided here. If experts in 1976 believed that AIDS was not spreading among heterosexuals, but they have since changed their minds about that, then what they no longer believe is that AIDS was not spreading in 1976 among heterosexuals. It is logically possible, and even consistent (albeit irrational), for such experts to believe that AIDS was spreading among heterosexuals in 1976 (having changed their minds in exactly the manner described) and at the same time to believe that as a result of recent educational efforts AIDS is no longer spreading among heterosexuals. Likewise, though Mary in 1990 believed Bush to be up to no good, and though she held fast about that two years later, she may well have believed by then that Bush was no longer up to no good. Imagine, for example, Mary saying the following: 'In 1990, I believed on the basis of reliable sources that Bush was abusing the power of his office through illegal wiretaps, directing the IRS to persecute his enemies, and more. Two years later, I received confirmation of that very same abuse in the 1990 White House and so continued to believe that, though I also believed that Bush had cleaned up his act by then and was finally behaving properly. I have just received evidence that such abuse in fact continued through 1992.'

Bush was president during the presidential term encompassing the years 1990–1992 (as he in fact was). Indeed, if the attributed belief is presumed instead to be merely that Bush was president throughout some shorter period of time (e.g., the year 1990), the inference becomes obviously invalid. In each case, insofar as the inference receives an interpretation on which it is clearly valid, the proposition attributed incorporates a time interval encompassing the indicated passage of time.

### CONTENT AND CONTENT BASE

Let us call the proposition matrix that a sentence like (1) takes on with respect to a particular context *c* the *content base* of the sentence with respect to *c*. More generally, we may speak of the *content base* with respect to a context of any meaningful expression (a singular term, a predicate, a connective, a quantifier, etc.). The content base of an expression is the entity that the expression contributes to the proposition matrix taken on by (i.e., the content base of) typical sentences containing the expression (where a ‘typical’ sentence containing an expression does not include additional occurrences of such devices as quotation marks or the ‘that’-operator).

The content base of a simple predicate, such as ‘writes’, with respect to a context *c*, is the attribute semantically associated with the predicate with respect to *c* (the property of writing). The content base of a compound expression, like a sentence, is (typically) a complex made up of the content bases of the simple parts of the compound expression. In particular, the content base of a definite description is a complex made up partly of the property associated with the description’s constitutive predicate. Since ordinary language includes indexical expressions such as ‘this tree’, not only the semantic content but also the content base of an expression is to be relativized to the context of utterance. An expression may take on one content base with respect to one context, and another content base with respect to a different context. An indexical expression is properly defined as one that takes on different content bases with respect to different possible contexts.

The simple theory is at odds with the eternalness of propositions. There remains a question of how best to accommodate this feature of propositions within a framework like that of the simple theory. While alternative accounts are available, what is perhaps the path of minimal mutilation from the simple theory centers on its notion of *character*.<sup>9</sup> As defined by Kaplan, the character of an expression is the function or

It should be noted that the anaphoric pronoun ‘that’ in examples like those under consideration here need not always refer to the proposition referred to by its antecedent. In some uses, it may refer instead to another proposition related to the antecedently referred to proposition by having the same matrix. Analogously, the conjunction ‘Johnny believes that he is the strongest boy in the class and so does Billy’ may be used to report agreement between Johnny and Billy concerning who is strongest, or alternatively to report a disagreement between them. On the latter reading, the anaphoric pronoun ‘so’ does not refer to the act of believing the particular proposition referred to in the first disjunct, but to the act of believing the proposition expressed by ‘I am strongest’. (Compare ‘Naturally, Johnny believes that he is the strongest boy in the class. At that age, nearly every boy believes that’.)

<sup>9</sup> A somewhat different approach is adopted in my *Frege’s Puzzle*, pp. 24–43, and in ‘Tense and Singular Propositions.’ Compare M. Richard, ‘Tense, Propositions, and Meanings,’ *Philosophical*

rule that takes one from an arbitrary context of utterance to the expression's semantic content with respect to that context. This may be identified with the expression's *meaning* only insofar as the content is misidentified with its noneternal matrix. Let us now reconstrue character as the function or rule that determines for any possible context  $c$  the content base (rather than the content) that the expression takes on with respect to  $c$ . This transmutation of the old notion of character forms the heart of a corrected version of the simple theory. An indexical expression is now redefined as one whose character, as here reconstrued, is not a constant function; it is one whose content base varies with context.

The content base of an expression with respect to a context  $c$  determines a corresponding function that assigns to any time  $t$  (and location  $l$ , if necessary) an appropriate content for the expression. (In fact, the function also determines the corresponding content base.) For example, the proposition matrix *fw* (the content base of 'Frege is writing') determines a function that assigns to any time  $t$  the proposition that Frege is writing at  $t$ . (This is the propositional function corresponding to the property of being a time at which Frege is writing.) Let us call the function from times (and locations) to contents thus determined by the content base of an expression with respect to a given context  $c$  the *schedule* of the expression with respect to  $c$ . Since the semantic content of an expression determines its intension, the content base of an expression with respect to a context  $c$  also determines a corresponding function that assigns to any time  $t$  (and location  $l$ , if necessary) the resulting intension for the expression. Let us call this function from times (and locations) to intensions the *superintension* of the expression with respect to  $c$ . Accordingly, we should speak of the semantic content, and the corresponding intension, of an expression *with respect to a context  $c$  and a time  $t$  (and a location  $l$ , if necessary)*. The simple theory must be modified accordingly. Specifically, the notion of semantic content, by contrast with that of content base, is doubly relativized (in some cases, triply relativized). Significantly, the time to which the content of an expression is relativized need not be the time of the context, although of course it can be. Thus, for example, the expression 'my car' refers with respect to my present context and the year 1989 to the Honda that is formerly mine. The same expression refers with respect to my present context and the year 1996 to the Toyota that is presently mine.

We should also like to speak (as we already have) of the content of an expression (e.g., of the proposition expressed by a sentence) with respect to a context *simpliciter*, without having to speak of the content with respect to *both* a context and a time.

*Studies*, 41 (1982), pp. 337–351. The burden of this chapter is to show that one can consistently hold that propositions are eternal while temporal sentential operators operate on noneternal semantic values of sentences, by holding that temporal sentential operators operate on two-place functions from contexts and times to eternal propositions. These two-place functions are similar to (and determined by) sentence characters. Indeed, Richard calls his two-place functions the 'meanings' of sentences. The claim that temporal operators operate on the 'meanings' of expressions, however, is at best misleading. When each of Richard's two-place functions is replaced by its corresponding one-place function from contexts to one-place functions from times to eternal propositions, it emerges that temporal operators operate on something at a level other than that of character.

This is implicit in the notion of the character of an expression, as defined earlier. How do we get from the content base of an expression with respect to a given context to the content with respect to the same context *simpliciter* without further indexing, or relativization, to a time (and location)?

In the passage quoted above, Frege seems to suggest that the words making up a tensed but otherwise temporally unmodified sentence, taken together with contextual factors that secure contents for indexical expressions such as ‘this tree’, at most yield only something like what we are calling a ‘proposition matrix’, that is, the content base of the sentence with respect to the context of utterance, which is ‘not a complete thought, i.e., . . . no thought at all.’ He suggests further that we must rely on the very time of the context of utterance to provide a ‘time-specification’ or ‘time-indication’—presumably a specification or indication of the very time itself—which supplements the words to eternalize their content base, thereby yielding a genuine proposition or ‘thought.’ Earlier in the same article, Frege writes:

[It often happens that] the mere wording, which can be made permanent by writing or the gramophone, does not suffice for the expression of the thought. The present tense is [typically] used . . . in order to indicate a time. . . . If a time-indication is conveyed by the present tense one must know when the sentence was uttered in order to grasp the thought correctly. Therefore the time of utterance is part of the expression of the thought (‘Thoughts,’ in *Logical Investigations*, p. 10)

On Frege’s view, strictly speaking, the sequence of words making up a tensed but otherwise temporally unmodified sentence like (3), even when taken together with a contextual indication of which tree is intended, does not yet bear genuine cognitive content. Its content is incomplete. Presumably, on Frege’s view, the sequence of words together with a contextual indication of which tree is intended has the logicosemantic status of a predicate true of certain times—something like the predicate ‘is a time at which this tree is covered with green leaves’ accompanied by a pointing to the tree in question—except that (3) thus accompanied may be completed by a time, serving as a specification or indication of itself, rather than by something syntactic, like the term ‘now’. Accordingly, on Frege’s theory, the content, or ‘sense’ (*Sinn*), of (3) together with an indication of the intended tree but in abstraction from any time would be a function whose values are propositions, or ‘thoughts’ (*Gedanken*).<sup>10</sup> Only the sequence of words making up the sentence together with an

Richard also apparently misconstrues to some extent what Kaplan (and others) mean in saying that an operator ‘operates on’ such-and-such’s. In general, to say that a given operator operates on the such-and-such of its operand is to say that an appropriate extension for the operator would be a function from such-and-such’s appropriate to expressions that may serve as its operand to extensions appropriate to the compounds formed from the operator together with the operand. For example, to say that a modal sentential operator operates on the content or on the intension of its operand sentence is to say that an appropriate extension for a modal operator would be a function from propositions or from sentence intensions (functions from possible worlds to truth values) to truth values.

<sup>10</sup> On Frege’s theory, the domain of this function would consist of senses that determine times, rather than the times themselves.

There is no reason on Frege’s theory why the time-indication or time-specification that supplements the incomplete present-tensed sentence could not be verbal, as in ‘At 12:00 noon on

indication of which tree is intended and *together with* a time-indication or time-specification, as may be provided by the time of utterance itself, is 'a sentence complete in every respect' and has cognitive content.

It is not necessary to view the situation by Frege's lights. Whereas Frege speaks of the cognitive thought content (or *Erkenntniswerte*) of the words *supplemented* by both a contextual indication of which tree is intended and a 'time-indication,' one may speak instead (as I already have) of the content of the sequence of words themselves *with respect to* a context of utterance and a time. The content of sentence (3) with respect to a context *c* and a time *t* is simply the result of applying the schedule, with respect to *c*, of the sequence of words to *t*. This is a proposition about the tree contextually indicated in *c*, to the effect that it is covered with green leaves at *t*. In the general case, instead of speaking of the content of an expression supplemented by both a contextual indication of the referents of the demonstratives or other indexicals contained therein and a 'time-indication,' as may be provided by the time of utterance, one may speak of the content of the expression *with respect to* a context and a time (and a location, if necessary). Still, Frege's conception strongly suggests a way of constructing a singly indexed notion of the content of an expression with respect to (or supplemented by) a context of utterance *c simpliciter*, without further relativization to (or supplementation by) a time, in terms of the doubly indexed locution: we may define the singly relativized notion of the content of an expression with respect to a context *c* as the content with respect both to *c* and the very time of *c* (and with respect to the very location of *c*, if necessary).

In particular, then, the semantic content of a sentence with respect to a given context *c* is its content with respect to *c* and the time of *c* (and the location of *c*, if necessary). Consequently, any temporally unmodified sentence or clause expresses different propositions with respect to different contexts of utterance (*simpliciter*). For example, sentence (3) (more accurately, the untensed clause 'this tree be covered

July 4, 1983, this tree is covered with green leaves'. This aspect of Frege's theory allows for a solution to the problem of failure of substitutivity of coreferential singular terms in temporal contexts—a solution very different from Frege's solution to the parallel problem of failure of substitutivity in propositional attitude contexts. Consider the following example. The expressions 'the US president' and 'Bill Clinton' refer to the same individual with respect to the time of my writing these words, but the former cannot be substituted *salva veritate* for the latter in the true sentence 'In 1991, Bill Clinton was a Democrat'. The result of such substitution is 'In 1991, the US president was a Democrat', which is false on the relevant reading (the Russellian secondary occurrence or narrow scope reading). Frege may solve this problem, not implausibly, by noting that the expression 'the US president' is incomplete and requires supplementation by a time-specification, such as may be provided by the time of utterance, before it can refer to an individual. The description 'the US president', supplemented by the time of my writing these words, refers to the same individual as the name 'Bill Clinton'. Supplemented by the year 1991, or by a verbal specification thereof, it refers to George Bush. The result of the substitution includes a verbal time-specification, 'in 1991', which, we may assume, supersedes the time of utterance in completing any expression occurring within its scope in need of completion by a time-specification. Compare Frege's treatment of substitutivity failure in propositional attitude contexts. On Frege's theory, a propositional attitude operator such as 'Jones believes that' creates an oblique context in which expressions refer to their customary contents ('senses') instead of their customary referents. On the Fregean solution to substitutivity failure in temporal contexts presented here, by contrast, the referent of 'the US president', as occurring within the context 'in 1991, \_\_', is just its customary referent.

with green leaves') contains different propositions with respect to different times of utterance even though the speaker is pointing to the same tree. Uttered six months from now, it expresses the proposition about the tree in question that it is then covered with green leaves. Uttered today, it contains the proposition that the tree is covered with green leaves, that is, that it is now covered with green leaves. The existence of this linguistic phenomenon is precisely the point made by Frege and echoed by Moore and Cartwright in the passages quoted in the section on Propositions and Proposition Matrices.

Let us call this adjusted version of the simple theory the *corrected theory*. The corrected theory is the simple theory adjusted to accommodate the eternalness of semantic content. The adjustment involves only the temporal nature of content. The corrected theory remains neutral with respect to the dispute among Fregeans, Millians, and others concerning the question of what constitutes the semantic content of indexicals and similar expressions.

Within the framework of the corrected theory, the meaning of an expression is identified with its character, now construed as a function from contexts to content bases. This allows one to distinguish pairs of expressions like 'the US president' and 'the present US president' as having different meanings, even though they take on the same contents (or at least trivially equivalent contents) with respect to the same contexts. Their difference in meaning is highlighted by the fact that the latter is indexical while the former is not. More accurately, the character of an expression is the primary component of what is ordinarily called the 'meaning' of the expression, though an expression's meaning may have additional components that supplement the character.<sup>11</sup>

The corrected theory's notion of the content base of an expression with respect to a given context, and the resulting reconstrual of the character of an expression, impose a fourth level of semantic value, intermediate between the level of character and the level of content. The four primary semantic values, from the bottom up, are *extension*, *content* (construed now as necessarily eternal), *content base*, and *character*. There are also two additional subordinate semantic values. Besides intension (construed now as a one-place function from possible worlds) there are *schedule* and *superintension*, both of which are on the same level as, and fully determined by, the content base. Semantic values on the corrected theory, and their levels and interrelations, are diagrammed in Figure 18.2. (Notice that character now takes one from a context  $c$  to a content base, which still needs a time  $t$  in order to generate a content.)

The referent of a complex definite description like 'the wife of the present US president' with respect to a context of utterance  $c$ , a time  $t$ , and a possible world  $w$  is semantically determined in a sequence of steps. First, the character of the expression is applied to the context  $c$  to yield the content base of the expression with respect to  $c$ .

<sup>11</sup> For example, the meaning of the term 'table' might include, in addition to its character, some sort of conceptual content, such as a specification of the function of a table. If so, it does not follow that this sort of conceptual entity is any part of the semantic content of the term. Nor does it follow that it is *analytic*, in the classical sense, that tables have such and such a function. What does follow is that in order to know fully the meaning of 'table', one would have to know that the things called 'tables' are conventionally believed to have such and such a function.

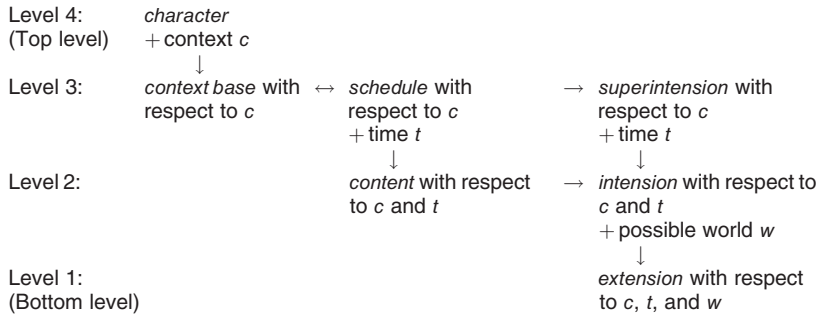


Figure 18.2 Semantic values on the corrected theory

The latter is something like the time-neutral concept of uniquely being a wife of whoever is uniquely US president at  $c_T$ , where  $c_T$  is the particular time of the context  $c$ . (The temporal indexing to  $c_T$  is provided for by the term ‘present’, which is interpreted here in its indexical sense.) This yields the schedule of the expression with respect to  $c$ , which assigns to any time  $t'$  the concept of uniquely being at  $t'$  a wife of whoever is uniquely US president at  $c_T$ . This schedule is applied to the particular time  $t$  to give the eternal semantic content of the expression with respect to both  $c$  and  $t$ . This semantic content, in turn, yields the expression’s intension with respect to  $c$  and  $t$ , which assigns to any possible world  $w'$  the individual who is uniquely a wife at  $t$  in  $w'$  of whoever is uniquely US president at  $c_T$  in  $w'$ . (Since this is not a constant function, the description is not a rigid designator.) Finally, this intension is applied to the particular world  $w$  to yield the wife at  $t$  in  $w$  of the US president at  $c_T$  in  $w$ . On the corrected theory, the extension of an expression with respect simply to a given context of utterance, without further relativization to a time or a possible world, is the result of applying the intension of the expression with respect to that context (which in turn is the result of applying the super-intension of the expression with respect to that context to the very time of the context) to the very possible world of the context. Thus, where  $c_W$  is the possible world of  $c$ , the referent of ‘the wife of the present US president’ with respect to  $c$  itself is none other than the wife at  $c_T$  in  $c_W$  of the US president at  $c_T$  in  $c_W$ .

## TENSE VERSUS INDEXICALITY

It may appear that I have been spinning out semantic values in excess of what is needed. We need a singly indexed notion of the semantic content of an expression with respect to a context and, as a special case, a notion of the content of a sentence with respect to a context. This led to the simple theory’s identification of meaning with a function from contexts to contents. But we have just seen that this function has no special role to play in determining the semantics for an expression like ‘the wife of the actual US president’. In getting to the content, and ultimately to the extension, we are now going by way of the content base instead of the content.

With regard to ‘the wife of the actual US president’, and similarly with regard to an entire sentence like (1) or (3), the content base with respect to a context is neutral with respect to time whereas the, content with respect to the same context is eternal, somehow incorporating the time (and location, if necessary) of the context. If the rule of content composition is that the content of a complex expression, like a sentence, is constructed from the contents of the simple contentful components *together with* the time (and location, if necessary) of utterance, then why bother mentioning those partially constructed propositions I am calling ‘proposition matrices’? Singling out content bases as separate semantic values generates the doubly indexed notion of the content of a sentence with respect to both a context *c* and a time *t*, and thereby the new construal of character. What is the point of this doubly indexed notion, and of the resulting reconstrual of character? Are we not interested only in the case where the time *t* is the time of the context of utterance *c*? Why separate out the time as an independent semantic parameter that may differ from the time of utterance?

Semantic theorists heretofore have gotten along fine by indexing the notion of content once, and only once, to the context of utterance, without relativizing further and independently to times. For example, in discussing the phenomenon of tense, Frege also considers various indexicals—‘today’, ‘yesterday’, ‘here’, ‘there’, and ‘I’—and suggests a uniform treatment for sentences involving either tense or indexicals:

In all such cases the mere wording, as it can be preserved in writing, is not the complete expression of the thought; the knowledge of certain conditions accompanying the utterance, which are used as a means of expressing the thought, is needed for us to grasp the thought correctly. Pointing the finger, hand gestures, glances may belong here too. (‘Thoughts,’ in *Logical Investigations*, pp. 10–11)

Following Frege, it would seem that we can handle the phenomena of tense and indexicality together in one fell swoop, with tense as a special case of indexicality, by simply relativizing the notion of semantic content once and for all to the complete context of utterance—including the time and location of the utterance as well as the speaker and his or her accompanying pointings, hand gestures, and glances. Any aspect of the complete context of utterance may conceivably form ‘part of the expression of the thought’ or contribute to the content. Once content is relativized to the complete context, including the time of utterance, gestures, and so on, there seems to be no need to relativize further and independently to times.

It has been known since the mid-1970s that the phenomenon of tense cannot be fully assimilated to temporal indexicality and that the presence of indexical temporal operators necessitates ‘double indexing,’ that is, relativization of the extensions of expressions—the reference of a singular term, the truth value of a sentence, the class of application of a predicate—to utterance times independently of the relativization to times already required by the presence of tense or other temporal operators.<sup>12</sup> (Something similar is true in the presence of an indexical modal operator such as ‘actually’ and in the presence of indexical locational operators such as ‘it is the case

<sup>12</sup> The need for double indexing was apparently first noted in 1967 by Hans Kamp in unpublished material distributed to a graduate seminar while Kamp was a graduate student at UCLA. See his ‘Formal Properties of “Now”,’ *Theoria* 37 (1972), pp. 227–273. Kamp’s results were reported in A. N. Prior, ‘“Now”,’ *Noûs* 2 (1968), pp. 101–119.



here that'.) Here is an illustration: The present perfect tense operator functions in such a way that for any untensed clause  $S$  (e.g., 'Frege be writing'), the result of applying the present perfect tense operator to  $S$  ('Frege has been writing') is true with respect to a time  $t$  (roughly) if and only if  $S$  is true with respect to some time  $t'$  earlier than  $t$ . Similarly, the nonindexical operator 'on the next day' + future tense functions in such a way that the result of applying this operator to any untensed clause  $S$  is true with respect to a time  $t$  if and only if  $S$  is true with respect to the day next after the day of  $t$ . For example, suppose that instead of uttering sentence (1), Frege speaks the following words (perhaps as part of a larger utterance) in his context  $c^*$ :

(9) I will be writing on the next day.

This sentence, in Frege's mouth, is true with respect to a time  $t$  if and only if Frege writes on the day after the day of  $t$ —whether or not  $t$  is the time of  $c^*$ . Indeed, our primary interest may be in some time  $t$  other than that of  $c^*$ —for example, if Frege's complete utterance in  $c^*$  is of the sentence

(10) Regarding December 24, 1891, I will be writing on the next day.

On the other hand, the indexical operator 'tomorrow' + future tense functions in such a way that the result of applying it to any untensed clause  $S$  is true with respect to a context  $c$  and a time  $t$  if and only if  $S$  is true with respect to  $c$  and the day after  $c$ , forgetting about the time  $t$  altogether. If in  $c^*$  Frege had uttered the sentence

(11) I will be writing tomorrow,

the sentence, in Frege's mouth, would be true with respect to any time if and only if Frege writes on the day after  $c^*$ .

To illustrate the need for double indexing, consider how one might attempt to accommodate 'on the next day' + future tense using relativization only to possible contexts of utterance, without independent relativization to times. Let us try this: Say that the result of applying this operator to  $S$  is true with respect to a context  $c$  if and only if  $S$  is true with respect to some possible context  $c'$  just like  $c$  in every respect (agent, location, etc.) except that the time of  $c'$  is one day later than that of  $c$ . For example, 'I will be writing on the next day' will be regarded as being true with respect to a context  $c$  if and only if its untensed operand

(1') I be writing

is true with respect to a possible context  $c'$  whose day is the day after  $c$ , but which involves the same agent as  $c$  to preserve the referent of 'I'. (We assume for the time being that an untensed clause such as (1') is a mere surface grammar variation of its present-tensed counterpart, so that (1) and (1') share the same semantics.) This singly indexed account seems to yield the correct results until we consider sentences that embed one temporal operator within the scope of another. Consider the following sentences:

- (12) The US president is a Republican,
- (13) The present US president is a Republican,
- (14) Sometimes, the US president is a Republican,
- (15) Sometimes, the present US president is a Republican.

Sentences (14) and (15) result from applying the temporal operator ‘sometimes’ to sentences (12) and (13), respectively. According to the singly relativized account, (15) is true with respect to a context of utterance  $c$  (roughly) if and only if there is some time  $t'$ , which need not be  $c_T$  (the time of  $c$ ), such that the US president at  $t'$  is a Republican at  $t'$  (in the possible world of  $c$ ). But this is the wrong truth condition for the sentence. In fact, it is the correct truth condition for the wrong sentence, to wit, the *nonindexical* sentence (14).

Sentences (14) and (15) differ in their truth conditions. Suppose both sentences are uttered in 1996, when the US president is a lifelong Democrat though previously the presidency had been held by the Republicans. Sentence (14) is then true whereas sentence (15) is false. Sentence (15) is true with respect to a context of utterance  $c$  (roughly) if and only if there is some time  $t'$  such that the US president at  $c_T$  (the time of the context  $c$ ) is a Republican at  $t'$  (in the possible world of  $c$ ). The temporal operator ‘sometimes’ directs us to evaluate its operand clause with respect to all times  $t'$ . The operand clause (13) is true with respect to the same context  $c$  and a time  $t'$  if and only if the description ‘the present US president’ refers to something with respect to  $c$  and  $t'$  to which the predicate ‘is a Republican’ applies with respect to  $c$  and  $t'$ . In computing the referent of the description with respect to  $c$  and  $t'$ , the indexical operator ‘present’ directs us to seek an object to which its operand phrase ‘US president’ applies with respect to  $c_T$ , the very time of the context of utterance itself, forgetting about the time  $t'$ . Thus, in evaluating sentence (15) with respect to a time of utterance  $c_T$ , we are concerned simultaneously with the extension of ‘US president’ with respect to  $c_T$  and the extension of ‘is a Republican’ with respect to a second time  $t'$ . The truth value of the whole depends entirely and solely on whether the unique object to which the phrase ‘US president’ applies with respect to  $c_T$  is something to which the predicate ‘is a Republican’ applies with respect to  $t'$ . It is for this reason that a systematic theory of the extensions of the expressions of a language containing indexical temporal operators requires double indexing; that is, in general the notion of the extension of an expression (e.g., the truth value of a sentence) is relativized to both a context and a time, treated as independent semantic parameters.

A systematic singly indexed theory gives the wrong results. Frege’s theory, for example, must regard the indexical description ‘the present US president’ as extensionally semantically equivalent to the non-indexical ‘the US president’. Both would be regarded as expressions that are incomplete by themselves (hence, refer by themselves, in abstraction from any context, to functions), but that when completed by a ‘time-specification’ or ‘time-indication’ (as may be provided by the time of utterance) refer to the individual who is US president at the specified or indicated time. Using extensional semantic considerations alone, Frege’s theory is unable to find any difference with respect to truth or even with respect to truth conditions between the indexical sentence (15), taken as uttered at a certain time, and the nonindexical (14), taken as uttered at the very same time.<sup>13</sup>

<sup>13</sup> This is partly a result of Frege’s principle of compositionality (or interchange) for reference. (See note 1.) On Frege’s theory of tense and indexicality, both ‘the US president’ and ‘the present US president’ refer, in abstraction from context, to the function that assigns to any time  $t$  the individual who is US president at  $t$ —like the functor ‘the US president at time\_\_’—except that the

This example illustrates that where an indexical temporal operator occurs within the scope of another temporal operator within a single sentence, the extensions of expressions are to be indexed both to the time of utterance and to a second time parameter, which may be other than the time of utterance and not even significantly related to the time of utterance. Temporal operators determine which time or times the extension of their operands are determined with respect to. In the special case of indexical temporal operators, the time so determined is a function of the time of the context of utterance. What is distinctive about indexical expressions ('I', 'this tree', or 'the present US president') is not merely that the extension with respect to a context  $c$  varies with the context  $c$ , or even that the intension or semantic content with respect to a context  $c$  varies with  $c$ . That much may be true of even a non-indexical expression, such as 'the US president' or 'Frege is writing'. What makes an expression indexical is that its extension with respect to a context  $c$  and a time  $t$  and a possible world  $w$  varies with the context  $c$  even when the other parameters are held fixed. This is to say that its superintension, and hence its content base, with respect to a context  $c$  varies with  $c$ . It is precisely this that separates 'the present US president' from its non-indexical cousin 'the US president'.

Though it is less often noted,<sup>14</sup> it is equally important that double indexing to contexts and times (or triple indexing to contexts, times, and locations, if necessary) is required at the level of semantic content as well as at the level of extension. For illustration, consider first the sentence

(16) At  $t^*$ , I believed that Frege was writing.

By the ordinary laws of temporal semantics, this sentence is true with respect to a context of utterance  $c$  if and only if the sentence

(17) I believe that Frege is writing

is true with respect to both  $c$  and the time  $t^*$ . This, in turn, is so if and only if the binary predicate 'believe' applies with respect to  $c$  and  $t^*$  to the ordered pair of the referent of 'I' with respect to  $c$  and  $t^*$  and the referent of the 'that'-clause 'that Frege is writing' with respect to  $c$  and  $t^*$ . Hence, sentence (16) is true with respect to  $c$  if and only if the agent of  $c$  believes at  $t^*$  the proposition referred to by the 'that'-clause with respect to  $c$  and  $t^*$ . The 'that'-clause in (16) refers with respect to  $c$  and  $t^*$  to the proposition that is the content of the operand sentence 'Frege is writing'. But which proposition is that?

If content is to be singly indexed to context alone, it would seem that the 'that'-clause 'that Frege is writing' refers with respect to  $c$  and  $t^*$  to the content of 'Frege is writing' *with respect to  $c$* , forgetting about  $t^*$  altogether. This is the proposition that

expression may be completed by a time rather than by a verbal time-specification (the time of utterance acting as a self-referential singular term). By Frege's compositionality principle for reference, it follows that any complete sentence built from 'the US president', without using oblique devices (e.g., 'In 1996, the US president was a Republican'), has the same truth conditions, and therefore the same truth value, as the corresponding sentence built from 'the present US president'.

<sup>14</sup> But see Richard, 'Tense, Propositions, and Meanings,' pp. 346–349. The idea of double indexing content to both contexts and times is Richard's.

Frege is writing at  $c_T$ , where  $c_T$  is the time of  $c$ . However, this yields the wrong truth condition for (16). This would be the correct truth condition for the sentence

(18) At  $t^*$ , I believed that Frege would be writing now.

Sentence (16) ascribes a belief at  $t^*$  that Frege is writing *at  $t^*$* . Assuming that content is singly indexed to context alone, we are apparently forced to construe the 'that'-operator in such a way that a 'that'-clause 'that  $S$ ' refers with respect to a context  $c$  and a time  $t'$  not to the content of  $S$  with respect to  $c$  but to the content of  $S$  with respect to a (typically different) context  $c'$  exactly like  $c$  in every respect (agent, location, etc.) except that its time is  $t'$ . (The contexts  $c$  and  $c'$  would be the same if and only if  $t'$  were the time of  $c$ .)

This account appears to yield exactly the right results until we consider a sentence that embeds an indexical temporal operator within the 'that'-operator and embeds the result within another temporal operator. Consider the following:

(19) In 2001, Jones will believe that the present US president is the best of all the former US presidents.

This sentence is true with respect to a context  $c$  if and only if Jones believes in 2001 the proposition referred to by the words 'that the present US president is the best of all the former US presidents' with respect to  $c$  and the year 2001. On the singly indexed account of content, sentence (19) comes out true if and only if Jones believes in 2001 that the US president in 2001 is the best of all the US presidents before 2001. But this is the truth condition for the wrong sentence, namely,

(20) In 2001, Jones will believe that the then US president is the best of all the former US presidents.

Sentence (19) ascribes, with respect to  $c$ , a belief that the US president at  $c_T$  is the best of all the US presidents before 2001. In order to obtain this result, the 'that'-clause in (19) must be taken as referring with respect to  $c$  and the year 2001 to the proposition that the US president at  $c_T$  is the best of all the US presidents prior to 2001 (or to some proposition trivially equivalent to this). This cannot be accommodated by a singly indexed account. It requires seeing content as doubly indexed: to the original context  $c$  and to the year 2001.

## TEMPORAL OPERATORS

Two sorts of operators are familiar to philosophers of language. An *extensional* operator is one that operates on the extensions of its operands, in the sense that an appropriate extension for the operator itself would be a function from *extensions* appropriate to the operands (as opposed to some other aspect of the operands) to extensions appropriate to the compounds formed by attaching the operator to an appropriate operand. An extensional sentential connective (such as 'not' or 'if... , then...') is truth functional; an appropriate extension would be a function from

( $n$ -tuples of) truth values to truth values, and hence an appropriate semantic content would be an attribute of truth values. An *intensional* or *modal* operator is one that operates, on the intensions of its operands. An appropriate extension for a modal connective like ‘it is necessarily the case that’ would be a function from ( $n$ -tuples of) sentence intensions (functions from possible worlds to truth values) or propositions to truth values, and an appropriate semantic content would be an attribute of intensions or propositions—for example, the property of being a necessary truth.

David Kaplan forcefully raises an objection to the conventional conception of propositions as eternal in connection with the applicability of intensional operators. He writes:

Operators of the familiar kind treated in intensional logic (modal, temporal, etc.) operate on contents. . . . A modal operator when applied to an intension will look at the behavior of the intension with respect to [possible worlds]. A temporal operator will, similarly, be concerned with the time. . . . If we build the time of evaluation into the contents (thus . . . making contents *specific* as to time), it would make no sense to have temporal operators. To put the point another way, if *what is said* [i.e., if the proposition asserted by a speaker] is thought of as incorporating reference to a specific time, . . . it is otiose to ask whether what is said [the proposition] would have been true at another time. . . . (‘Demonstratives,’ pp. 502–503)

He elaborates in a footnote:

Technically, we must note that [temporal] operators must, if they are not to be vacuous, operate on contents which are neutral with respect to [time]. Thus, for example, if we take the content of [(1)] to be [an eternal, time-specific proposition rather than its noneternal, temporally neutral matrix], the application of a temporal operator to such a content would have no effect; the operator would be vacuous. (‘Demonstratives,’ pp.503–504 n.)

Continuing this line of thought in the text, he writes:

This functional notion of the content of a sentence in a context may not, because of the neutrality of content with respect to time and place, say, exactly correspond to the classical conception of a proposition. But the classical conception can be introduced by adding the demonstratives ‘now’ and ‘here’ to the sentence and taking the content of the result. (‘Demonstratives,’ p. 504)

It is not otiose in the least to modify a sentence like (1) by applying a temporal operator, like ‘yesterday’ + past tense. The attached operator is anything but vacuous. It does not follow, however, that the content of (1), with respect to a given context, is something temporally neutral. Claiming that temporal operators operate on contents, and having defined the content of a sentence as the proposition asserted by someone in uttering the sentence, or *what is said*, Kaplan is forced to construe the proposition expressed by a sentence like (1) as something that may change in truth value at different times and in some cases even at different places. But this yields an incorrect account of propositions. Propositions, qua objects of assertion and belief, are eternal. As Frege, Moore, and Cartwright pointed out—and as Kaplan seems to acknowledge—propositions do not vacillate in truth value over time or space.

Consider the temporal operator ‘sometimes’—or more accurately, ‘sometimes’ + present tense, which applies to an untensed clause  $S$  to form a new sentence. Is this

an extensional operator? Certainly not. With respect to my actual present context, the sentences 'It is cloudy' and ' $2 + 2 = 5$ ' are equally false, though 'Sometimes, it is cloudy' is true whereas 'Sometimes,  $2 + 2 = 5$ ' is false. Nor is the 'sometimes' operator intensional, in the above sense. As with (1) and (2), sentences (12) and (13), uttered simultaneously, have precisely the same intension—indeed, they share the same proposition content (or at least trivially equivalent contents that are very nearly the same). But their temporal existential generalizations, (14) and (15), uttered simultaneously, have different contents, even different truth values. On the relevant reading (the Russellian secondary occurrence or narrow scope reading), (14) is true whereas (15) is false. (In fact, (15) is false on both the narrow scope and wide scope readings.) Thus, 'sometimes' is not a content operator either. As Kaplan points out, a temporal operator, if it is not to be vacuous, must operate on something that is temporally neutral. Contrary to Kaplan, what follows from this is that temporal operators do not operate on propositions. When a temporal operator is applied to (12), it is the matrix of the proposition expressed by (12), not the proposition itself, that is the proper object upon which the operator operates. In short, temporal operators like 'sometimes' are superintensional operators.<sup>15</sup> An appropriate extension for 'sometimes' with respect to a context  $c$ , a time  $t$ , and a possible world  $w$  would be the function that assigns truth to a proposition matrix (or to its corresponding schedule or superintension) if its value for at least one time (the resulting proposition or sentence intension) itself yields truth for the world  $w$ , and that otherwise assigns falsehood to the proposition matrix.

Kaplan comes close to recognizing that the objects of assertion and propositional attitude are eternal propositions when he shows ('Demonstratives,' p. 500) that *what is said* in uttering a temporally indexical sentence like (2) at different times is different. His argument for this is that if such a sentence is uttered by me today and by you tomorrow, then

[if] what we say differs in truth value, that is enough to show that we say different things. But even if the truth values were the same, it is clear that there are possible circumstances in which what I said would be true but what you said would be false. Thus we say different things.

This is indeed correct. But the same argument can be made with equal force for a nonindexical tensed sentence. Thus, it is not surprising to find the following analogous argument given earlier by G. E. Moore:

It seems at first sight obvious that, if you have a number of judgements [i.e., utterances] with the same content, if one is true the rest must be.

But if you take a set of judgements [i.e., utterances] with regard to a given event A, [using words to the effect] either that it is happening, or that it is past, or that it is future, some of each set will be true and some false, which are true and which false depending on the time when the judgement [i.e., utterance] is made.

It seems a sufficient answer to say that a judgement [i.e., an utterance of a sentence of the form] 'A is happening' made at one time never has the same content as the judgement [i.e., an utterance of the sentence] 'A is happening' made at another. ('The Present,' Notebook II.

<sup>15</sup> Modal operators on the so-called branching worlds (or 'unpreventability') interpretation emerge as superintensional operators.

[c. 1926], in *The Commonplace Book 1919–1953*, Casimir Lewy, ed., New York: Macmillan, 1962, p. 89)

Consider again sentence (1). Mimicking Kaplan, and following Moore, one may argue that if Frege utters it at  $t^*$  and again on the next day, and if what he asserted on the two occasions of utterance differ in truth value (across time), as indeed they may, that is enough to show that he asserted different things. This is precisely because it is known that what is asserted is not the sort of thing that can switch back and forth in truth value from one moment to the next. Since what is asserted on the one occasion is different from what is asserted on the other, it is not this content but its matrix,  $fw$ , upon which temporal operators operate.

In order to obtain the correct results, one must regard a sentential temporal operator such as ‘sometimes’ as operating on some aspect of its operand clause that is fixed relative to a context of utterance (in order to give a correct treatment of temporally modified indexical sentences like (15)) but whose truth value typically varies with respect to time (so that it makes sense to say that it is *sometimes* true, or true at such and such time). Once it is acknowledged that content is eternal, there simply is no such semantic value of a sentence on the simple theory’s three-tiered array of semantic values. Nothing that is fixed relative to a context is also time sensitive in the required way. In order to find an appropriate semantic value for temporal operators such as ‘sometimes’ + present tense to operate on, one must posit a fourth level of semantic value.

The result of applying ‘sometimes’ to a sentence  $S$  may be regarded as expressing, with respect to a given context  $c$ , a proposition concerning the content base of the operand sentence  $S$  with respect to  $c$ . For example, the sentence

(21) Sometimes, I am writing

contains, with respect to Frege’s context  $c^*$  (or any other context in which Frege is the agent), the proposition about the proposition matrix  $fw$  that it is sometimes true. Accordingly, an appropriate semantic content for a temporal operator such as ‘sometimes’ would be a property of proposition matrices—in this case, the property of being true at some time(s).

## PREDICATES AND QUANTIFIERS

An important point about predicates, quantifiers, and certain other operators emerges from the four-tiered corrected theory, and from the distinction between semantic content and content base in particular. The content base of a predicate with respect to a given context of utterance  $c$  is a concept or attribute (property or relation). This, together with a time  $t$ , determines the semantic content of the predicate with respect to  $c$  and  $t$ . In turn, the semantic content of a predicate with respect to  $c$  and  $t$ , together with a possible world  $w$ , determines the extension of the predicate with respect to  $c$ ,  $t$ , and  $w$ . It follows that the semantic content of a predicate such as ‘writes’ (or ‘be writing’) with respect to a context  $c$  and a time  $t$  is

not just the concept or property of writing (or anything similar, such as the function that assigns to any individual  $x$  the proposition matrix  $x$  writing). The concept or property of writing, together with a possible world  $w$ , cannot determine the extension of 'writes' with respect to both the world  $w$  and the time  $t$ , that is, the class of possible individuals who are writing at  $t$  in  $w$ . The property of writing, together with a possible world  $w$ , determines only the class of possible individuals who are writing *at some time or other* in  $w$  (or at most, the function that assigns to any time  $t$  the class of possible individuals who are writing at  $t$  in  $w$ ). The semantic content of 'writes' with respect to a time  $t$  must be such as to determine for any possible world  $w$  the class of (possible) individuals who are writing *at the given time  $t$*  in  $w$ . Only some sort of complex consisting of the concept or property of writing *together with the given time  $t$*  will suffice to determine for any possible world  $w$  the extension of 'writes' with respect to both  $w$  and  $t$ . The semantic content of 'writes' with respect to a given time  $t$  is not merely the concept or property of writing but a *temporally indexed* concept or property: the concept or property of *writing at  $t$* .

In general, the semantic content of a predicate with respect to a time  $t$  (and a location  $l$ , if necessary) is not the same attribute as the content base of the predicate but is the temporally indexed attribute that results from taking the content base of the predicate together with the time  $t$  (and location  $l$ , if necessary). Semantic content for predicates like 'writes' thus varies with time. Exactly analogous remarks apply to quantifiers, other second-order predicates, the definite-description operator 'the', and a variety of other operators.

This usually unrecognized fact about predicates allows us to retain, at least as a sort of general guide or rule of thumb, the principle that the semantic content of a compound expression, such as a sentence or phrase, is a complex made up solely and entirely of the semantic contents of the contentful components that make up the compound. In particular, the content of sentence (1) with respect to a context of utterance  $c$  may be thought of as made up of the semantic contents of 'I' and 'am writing' with respect to  $c$ . There is no need to introduce the time of the context as a third and separate component, for it is already built into the semantic content of the predicate (the property or concept of writing-at- $c_T$ , where  $c_T$  is the time of  $c$ ).

Since the semantic content of an expression with respect to a context  $c$  *simpliciter* is the semantic content with respect to both  $c$  and the time of  $c$  (and the location of  $c$ , if necessary), it follows that the semantic content of a typical predicate varies with context—even the content of non-indexicals like 'writes', 'red', 'table', 'tree'. To this extent, Cratylus was right on the money. It is this usually unnoticed feature of predicates that accounts for the fact that the sentence 'Frege is writing' takes on not only different truth values but also different contents when uttered at different times, even though the sentence contains no indexicals and is not itself indexical. It is also this feature of predicates that accounts for the fact that certain noneternal (i.e., temporally nonrigid) definite descriptions, such as 'the US president', take on not only different referents but also different semantic contents when uttered at different times even though the description is not indexical. Recall that the distinctive feature of an indexical like 'I' or 'the present US president' is that it takes on different content bases in different contexts. The semantic contents of the definite description 'the US president', of the word 'writes', and of the sentence 'The US president is



writing' each varies with context. Yet none of these expressions is indexical; each retains the same content base in all contexts.<sup>16</sup>

The account of the semantic contents of temporal operators as properties of proposition matrices (or other content bases) makes for an important but usually unrecognized class of exceptions to the general principle that the semantic content of a compound expression is made up of the contents of its contentful components. Where  $T$  is a monadic temporal sentential operator (e.g., 'sometimes' + present tense or 'on July 4, 1968' + past tense), the content of the result of applying  $T$  to a clause  $S$  is made up of the content of  $T$  together with the content base rather than the content of  $S$ . In general, if  $T$  is a temporal operator, the content of the result of applying  $T$  to an expression is a complex made up of the semantic content of  $T$  and the content base rather than the content of the operand expression. Ordinarily, the content of an expression containing as a part the result of applying a temporal operator  $T$  to an operand expression is made up, in part, of the content base of the operand expression rather than its semantic content. (For complete accuracy, the notion of semantic content with respect to a context, a time, and a location, for a language  $L$  should be defined recursively over the complexity of expressions of  $L$ .)<sup>17</sup>

It is instructive to look at how the four-tiered corrected theory treats a simple, untensed clause, such as (1') and various complex sentences built from it. The character of (1') is given by the following rule:

- (22) For any context  $c$ , the content base of (1') with respect to  $c$  is the proposition matrix  $c_A$  *writing*, where  $c_A$  is the agent of  $c$ . This proposition matrix is made up of the content bases of 'I' and of 'be writing' with respect to  $c$ . The latter may be taken to be the property or concept of writing.

<sup>16</sup> On this account, the sentence 'Rain is falling' typically expresses, with respect to a context of utterance  $c$ , the proposition that rain is falling at  $c_L$  at  $c_T$ , where  $c_L$  is the location of  $c$  and  $c_T$  is the time of  $c$ . (An exception arises if, for example, the sentence is used as a shorthand for 'Rain is falling there', with implicit reference to some location other than that of the context.) No actual reference is made, however, either explicitly or implicitly, to either  $c_L$  or  $c_T$ . Instead, assuming that the sentence is subject-predicate, the predicate 'is falling' expresses as its semantic content the spatially and temporally indexed concept or property of falling at  $c_L$  at  $c_T$ , and the extension determined is the class of things that are falling at  $c_L$  at  $c_T$  in the world of the context. This contrasts with the account proposed by Mark Crimmins and John Perry. See their 'The Prince and the Phone Booth: Reporting Puzzling Beliefs,' *Journal of Philosophy* 86 (December 1989), pp. 685–711, at pp. 699–700; and Crimmins's *Talk about Beliefs* (Cambridge, Mass.: MIT Press, 1992), pp. 16–18.

<sup>17</sup> The content base of the result of attaching a content operator (such as 'necessarily' or the 'that'-operator) to a sentence is a complex made up of the content base of the operator and the content base of the sentence, rather than its content. Thus, for example, the content base of the 'that'-clause 'that Frege is writing' with respect to any context  $c$  does not involve the content of 'Frege is writing' with respect to  $c$  (which is the proposition that Frege is writing at  $c_T$ ). Instead, it is something like the ordered pair of two elements: (a) a certain abstract entity, analogous to a property, which is the operation of assigning any proposition to itself (this operation—call it ' $O_p$ '—is the content base of the 'that'-operator); and (b) the proposition matrix *fw*. Thus, the content base of 'that Frege is writing' has the structure  $\langle O_p, \langle \text{Frege, writing} \rangle \rangle$ . The content of 'Sometimes, Frege believes that he is writing' has the following structure, where ' $\Sigma$ times' designates the property of proposition matrices of being true at some time(s):

- (i)  $\langle \langle \text{Frege, } O_p, \langle \text{Frege, writing} \rangle, \text{believing} \rangle, \Sigma \text{times} \rangle$ .

(For further details, see appendix C of *Frege's Puzzle*.)

The schedule of (1') with respect to a given context  $c$  is thus given by the following rule:

- (23) For any time  $t$ , the semantic content of (1') with respect to  $c$  and  $t$  is the proposition made up of the content of 'I' with respect to  $c$  and  $t$  (i.e., the result of applying the schedule of 'I' with respect to  $c$  to the particular time  $t$ ) and the property of writing-at- $t$  (the result of applying the schedule of 'be writing' to  $t$ ). This may be taken to be the proposition that  $c_A$  is writing at  $t$ , where  $c_A$  is the agent of  $c$ .

The semantic content of (1') with respect to a context  $c$  *simpliciter* is therefore the proposition that  $c_A$  is writing at  $c_T$ , where  $c_T$  is the time of  $c$ .

We may contrast this with the indexical sentence (2). Its character is given by something like the following rule:

- (24) For any context  $c$ , the content base of (2) with respect to  $c$  is the higher-order proposition made up of the content bases of (1') and of 'now' + present tense with respect to  $c$ . The former may be taken to be the proposition matrix  $c_A$  *writing*, and the latter the property of proposition matrices of obtaining (or being true) at  $c_T$ , where  $c_A$  is the agent of  $c$  and  $c_T$  is the time of  $c$ .

This rule reveals the fact that the content base, of the eternal sentence (2) is in fact already a full-fledged, eternal proposition, rather than a non-eternal proposition matrix. The schedule of (2) with respect to a context  $c$  is thus a constant function from times to the, higher-order proposition about the proposition matrix  $c_A$  *writing* that it obtains at  $c_T$ . The content of (2) with respect to a context  $c$  *simpliciter* is this same higher-order singular proposition, whereas the semantic content of the simpler (1') with respect to  $c$  is the proposition that  $c_A$  is writing at  $c_T$ . Since,  $c_A$  is writing at  $c_T$  if and only if the proposition matrix  $c_A$  *writing* obtains at  $c_T$ , the semantic contents of (1') and (2) with respect to any context of utterance are trivially equivalent. If we assume that sentence (1) is merely a surface transformation of (1'), then *what is said* by a speaker uttering either (1) or (2) at the same time is very nearly the same, as long as the speaker is the same. Still, the content bases are very different. With respect to any context  $c$ , the content base of (1) is noneternal, neutral with respect to time, whereas the content base of (2) is eternal. As Kaplan notes, only the former can be felicitously operated upon by temporal operators.

Contrary to Kaplan, since the contents, *what is said*, are trivially equivalent, the function of 'now' cannot be primarily to affect what is said in context. Its effect on content is in fact nil (or virtually so). Rather, the function of 'now' is primarily to affect the content base of its operand, eternalizing it and thereby sealing it off from the influence of external occurrences of temporal operators. For example, attaching 'sometimes' to sentence (1), whose content base with respect to any context is noneternal, aptly yields sentence (21), whose content base is eternal. By contrast, 'sometimes' is at best superfluous in

- (25) Sometimes, I am writing now.

Compare also the role of 'present' in (15).

Analogously, the schedule of a sentence like ‘I will be writing tomorrow’, as uttered by a speaker  $c_T$  at time  $c_A$ , is the constant function that assigns to any time  $t$  the eternal proposition that  $c_T$  *writing* obtains on  $d^+$ , where  $d^+$  is the day after the day of  $c_T$ . The schedule of the sentence ‘I will be writing on the next day’, with respect to the same context, is a nonconstant function that assigns to any time  $t$  the proposition that  $c_A$  *writing* obtains on the day next after  $t_D$ , where  $t_D$  is the day of  $t$ . Despite the close similarity between the contents of the two sentences with respect to any context (*what are said*), the schedules are very different, and only the latter sentence may be felicitously operated upon by temporal operators. Compare ‘On December 24, 2001, I will be writing on the next day’ with ‘On December 24, 2001, I will be writing tomorrow’.

### PURE TENSES

A considerably richer semantic theory of temporal operators may be obtained by drawing a three-way distinction among *quantificational* or *general* temporal operators, *specific* or *singular* temporal operators, and *pure tense* operators such as simple past or future tense. Quantificational or general temporal operators include such operators as ‘sometimes’, ‘always’, present perfect tense (as in ‘I have been writing’ in the sense of ‘I have sometimes been writing’), ‘it will always be that’ + present tense, ‘twice before’ + past tense, and so on. Specific or singular temporal operators include ‘it is now the case that’, ‘on December 24, 2001’ + future tense, ‘when Frege wrote “Thoughts”’ + past tense, and so on. (Compare ‘possibly’ with ‘actually’.) The difference between these two sorts of temporal operators lies in their accompanying semantics. Roughly, a specific sentential temporal operator  $T$  is one such that there is some specific time  $t$  semantically associated with  $T$ , with respect to a context (and a time and a possible world), in such way that the result of applying  $T$  to a sentence  $S$  is true with respect to a time  $t'$  if and only if  $S$  is true with respect to  $t$ , and  $t$  stands in some appropriate temporal-order relation to  $t'$ . For example, ‘On December 24, 2001, I will be writing’ is true with respect to a context  $c$  and the year 1996 if and only if both of the following conditions obtain: (a) clause (1') (or sentence (1)) is true with respect to  $c$  and December 24, 2001; and (b) 2001 is later than 1996. A general sentential temporal operator  $T$  is a nonspecific temporal operator such that there is some specific property  $P$  of classes of times semantically associated with  $T$  (with respect to semantic parameters) in such a way that the result of applying  $T$  to a sentence  $S$  is true with respect to a time  $t'$  if and only if the class of times with respect to which  $S$  is true and that stand in some appropriate temporal-order relation to  $t'$  has  $P$ . For example, in the case of the present perfect tense, the property  $P$  is that of being nonempty, and the appropriate temporal-order relation is the earlier-than relation.<sup>18</sup>

<sup>18</sup> These explications of the notions of specific and general temporal operators cannot be regarded as strict definitions and are intended only to convey a general idea. The operator ‘when Frege wrote “Thoughts”’ + past tense is to count as a specific temporal operator even if it should turn out that Frege did not write ‘Thoughts.’ Also, given a sufficiently liberal notion of a property

Now consider ordinary past or future tense, as in ‘Frege was writing’ or ‘Frege will be writing’. Past tense is often treated as though it were a quantificational temporal operator, so that the displayed sentence is regarded as being true with respect to a time  $t$  if and only if ‘Frege is writing’ is true with respect to some time or other earlier than  $t$ . (See, for example, the quotation from G. E. Moore in section 2.3.) While a simple past-tensed sentence is sometimes used in this way (roughly, as equivalent to the corresponding present-perfect-tensed sentence), it generally is not. Ordinarily, a simple past-tensed sentence like ‘Frege was writing’ is used with implicit reference to a specific (though perhaps vaguely delineated) time, so that if Frege was not writing at the relevant time, then what is said is false even if Frege was writing at some time or other prior to the utterance. Compare ‘I asked Frege to come along, but he was writing’ with ‘I have sometimes asked Frege to come along, but he has sometimes been writing’. Analogous remarks apply to future tense.

Most simple sentential temporal operators require, in idiomatic English, an appropriate adjustment in the tense of the operand. For example, if I wished to apply the temporal operator ‘at 3:00 p.m. on August 24, 1996’ to sentence (1), at the time of my writing these words—which happens to be 2:55 p.m. on August 24, 1996—I must accompany it with a shift from present to future tense. If I wait six minutes and forever thereafter, I must instead use past tense. It is not sufficient to say when my writing occurs; I must also specify whether the time of my writing is now, or previously, or still to come. The content base of each sentence is eternal, and the same proposition (or at least very nearly the same propositions) would be asserted at each time, and yet grammar compels me to indicate besides the indicated time, the temporal direction of that time—either earlier or later—from the time of utterance. What I say is that (a) my writing occurs at 3:00 p.m. on August 24, 1996; and (b) 3:00 p.m. on August 24, 1996, is future (or present or past, depending on the tense used). It is not enough simply to date the described state of affairs. One is linguistically required also to place the state of affairs described within what J. M. E. McTaggart called the *A-series*—the everchanging manifold divided into past, present, and future, in which each element in the third of these three categories eventually finds itself temporarily in the second before coming to rest in the first. In this sense, the specific temporal operator ‘at 3:00 p.m. on August 24, 1996’ is *incomplete*. Simple past tense and simple future tense are complementary incomplete temporal operators, which modify an untensed, temporally unmodified clause like (1’) to form a sentence that may now be modified by an incomplete specific or incomplete general temporal operator. The tense operator primes the atomic clause for the application of a specific or general (incomplete) temporal operator. An

of a class, some precaution must be taken if a specific temporal operator is to be precluded from being a general temporal operator. It may be appropriate to define a general temporal operator as a *nonspecific* temporal operator of a certain sort. (A similar difficulty is encountered in defining ordinary quantifiers in such a way as to preclude ordinary singular terms.) More importantly, the explications provided here are appropriate for what I shall call *complete* temporal operators below, although the terminology of ‘specific’ or ‘singular’ and ‘quantificational’ or ‘general’ temporal operators will be used also for the components of these, which I shall call ‘incomplete’ temporal operators below (e.g., ‘when Frege wrote “Thoughts”’ without an accompanying tense operator). These various notions can be made precise, though it is preferable to leave them at an intuitive, informal level in motivating the account under consideration here.

incomplete specific or general temporal operator combines with a pure tense operator to form a complete temporal operator. The complete temporal operator applied to (1') is 'at 3:00 p.m. on August 24, 1996' + future tense. The extension of a complete temporal operator is a function from proposition matrices (or minimally, from sentence superintensions) to truth values, and the content of a complete temporal operator is accordingly a concept or property of proposition matrices.

It is instructive to regard ordinary past tense as a superintensional operator with the following distinguishing property: its extension with respect to a time  $t$  and a possible world  $w$  is the function that assigns to any proposition matrix  $m$  (alternatively, to any sentence schedule or superintension—i.e., any function from times to sentence intensions) not a truth value, but the class of times  $t'$  earlier than  $t$  at which  $m$  obtains in  $w$  (or equivalently, the characteristic function of this class of times). An analogous construal is possible for the future tense operator, replacing 'earlier' by 'later'. A past-tensed or future-tensed but otherwise temporally unmodified sentence would thus have as its extension not a truth value, but a class of times. For example, the extension of the simple past-tensed sentence

(26) I was writing,

with respect to a context  $c$ , a time  $t$ , and a possible world  $w$ , would be the class of times  $t'$  earlier than  $t$  such that the component untensed clause (1') is true with respect to  $c$ ,  $t'$ , and  $w$ . An unmodified past-tensed sentence like (26) may be represented formally as

(27) *Past Tense[Be Writing(I)]*.<sup>19</sup>

Such a sentence essentially stands in need of completion by an incomplete temporal operator, either specific or general, in order to achieve truth value. The extension (with respect to a context, a time, and a possible world) of an incomplete specific temporal operator, like 'at 3:00 p.m. on August 24, 1996', may be taken to be simply the indicated time, rather than the corresponding function from proposition matrices (or sentence schedules or superintensions) to truth values. Where  $T$  is any incomplete specific temporal operator without an accompanying tense operator, the result of applying  $T$  to a past-tensed sentence such as (26) is representable as

(28)  $T(\textit{Past Tense[Be Writing(I)])}$ .

This is a complete sentence, whose extension is a truth value. The sentence is true (with respect to semantic parameters) if and only if the extension of  $T$  is an element of the extension of the operand past-tensed clause *Past Tense[Be Writing(I)]*. It is thus as if the past tense operator in

(26) transformed its operand clause (1') into the corresponding predicate  
(29) is a past time at which I be writing.

<sup>19</sup> The naked infinitive phrase 'be writing' might be represented further as

(i) *Progressive Tense (Write)*.

The word 'writing' itself is functioning here adjectivally.

An incomplete specific temporal operator such as ‘at 3:00 p.m. on August 24, 1996’ attaches to the tensed sentence as if the operator were a singular term to which a monadic predicate attaches. The complete temporal operator ‘at 3:00 p.m. on August 24, 1996’ + past tense is a one-place connective. Its extension may be regarded as a function from proposition matrices to truth values.

In ordinary use, a past-tensed but otherwise temporally unmodified sentence like (26), standing alone as a declarative sentence in a piece of discourse, may be regarded as involving an implicit, specific, demonstrative temporal operator ‘then’, or ‘at that time’, in order to obtain a complete sentence, ‘I was writing then’. This ordinary sort of use of (26) would thus be represented formally as

(30) *Then(Past Tense[Be Writing(I)])*

and would be taken to mean something like *That time is a past time at which I be writing*. If the time implicitly designated in an utterance of (26) (standing alone as a declarative sentence in a piece of discourse) is not one at which the speaker writes, what is said is false even if the speaker has written at other times prior to the utterance. Analogous remarks apply to ‘I will be writing’.<sup>20</sup>

Taking the extension of an incomplete specific temporal operator like ‘at 3:00 p.m. on August 24, 1996’ without an accompanying tense operator to be simply the indicated time, in order to obtain a complete sentence whose extension is a truth value from an incomplete specific temporal operator and an untensed clause like (1’) as operand, a tense operator must be supplied as a bridge connecting the content base of the operand clause with respect to a context *c* to the extension with respect to *c* of the temporal operator, thereby achieving truth value. Which tense operator is appropriate will depend on the direction of the indicated time, earlier or later, relative to the time of *c*. This account thus accommodates the fact that the appropriate complete temporal operator typically shifts its constitutive tense from future to past with the passage of time.

On a Fregean approach, incomplete specific temporal operators like ‘now’ and ‘at 3:00 p.m. on August 24, 1996’ would be taken as expressing as the operator’s semantic content (*Sinn*), a certain concept or property of the time so designated. On a Millian approach, by contrast, the semantic contents of these operators may again be regarded as simply the indicated time. On either approach, the content of a specific temporal operator like ‘when Frege wrote “Thoughts”’ may plausibly be regarded as analogous to that of the corresponding definite description ‘the past time at which Frege writes “Thoughts”’. (The word ‘when’ in such constructions is the temporal analogue of the definite-description operator ‘the’.) To repeat, the corrected theory is completely neutral regarding such issues and is consistent with either approach.

In earlier work, I have advocated a Millian version of the corrected theory, on which the semantic content of ‘now’ with respect to a context is taken to be the time of the context itself rather than a concept or property (*presentness*) of that time (see *Frege’s Puzzle* and ‘Tense and Singular Propositions’). It does not follow, contrary to

<sup>20</sup> See W. V. O. Quine, *Word and Object* (Cambridge, Mass.: MIT Press, 1960), pp. 170–171.

an argument of Quentin Smith,<sup>21</sup> that my nonneutral approach is committed to a rejection of McTaggart's A-series of time in favor of the B-series—in which any element is past, present, or future not per se but only relative to some (another or the same) element of the series—and hence to a 'tenseless' theory of time, according to which the distinction among past, present, and future is unreal, illusory, relational (to a particular speech act or thought act), merely subjective, or carries no special metaphysical or cosmological significance.<sup>22</sup> Nor does it follow that tensed sentences like (1), (2), and (26), on my approach, locate particular states of affairs within the B-series but not within the A-series. On the contrary, even the corrected theory, which is itself neutral with regard to the contents of specific temporal operators—and of which my Millian account is a special version—explicitly recognizes, for example, that (26) places the speaker's writing in the past. On a Millian version of the corrected theory, this is not accomplished by the implicit 'then' in (26). On any version of the corrected theory, it is accomplished by the explicit 'was'. The A-property of pastness is overtly expressed in (26), by the very presence of past tense. Similarly, futurity is expressed by future tense.<sup>23</sup>

Just as an incomplete specific temporal operator may be plausibly treated as a singular term, so an incomplete quantificational temporal operator may be plausibly

<sup>21</sup> See Q. Smith, *Language and Time* (Oxford: Oxford University Press, 1993), especially pp. 44–48; L. N. Oaklander and Q. Smith, eds., *The New Theory of Time* (New Haven, Conn.: Yale University Press, 1994), especially pp. 12–19, 51–54, 136–153.

<sup>22</sup> Those (such as myself) who accept the A-series as veridical need not deny that the dating of an event or state of affairs within the series, or indeed that the whole series itself, is relativized to a 'frame of reference.' They may hold that, relative to one's frame of reference, the division among past, present, and future is real, with the present enjoying a special metaphysical status and each time eventually having its turn at it.

<sup>23</sup> Furthermore, even if the particular word 'now' does not express any concept as its semantic content, a relevant concept of presentness may be semantically contained elsewhere in other expressions. In my 'Existence,' in J. Tomberlin, ed., *Philosophical Perspectives*. Vol. 1, *Metaphysics* (Atascadero, Calif.: Ridgeview, 1987), pp. 49–108, I suggest that the English word 'current', as in 'the current US president', exemplifies an ambiguity analogous to David Lewis's distinction between the primary (indexical) and secondary (nonindexical) English senses of 'actual'. (Consider 'In 1989, current interest rates were higher than present rates'.) The secondary sense of 'current' is a concept of precisely the sort that Smith misinterprets me as rejecting (note 21 above).

On the other hand, on the corrected theory a tensed sentence is translatable, in some relevant sense, into an untensed sentence that places the described state of affairs in the B-series. According to the corrected theory, in uttering the sentence 'At  $t^*$ , Frege was writing', one asserts that (a) *fw* obtains at  $t^*$ , and (b)  $t^*$  is past. This is an A-determination, rather than a B-determination, in virtue of the second conjunct. But since propositions are eternal, the second conjunct is not the proposition matrix  $t^*$  *being past* (which obtains only after  $t^*$ , not at  $t^*$  itself or at any earlier time), but the eternal proposition that  $t^*$  is past at  $c_T$ , where  $c_T$  is the time of utterance. And this proposition is tantamount to the B-determination that  $t^*$  is earlier than  $c_T$ . For this reason, it is a conceptual mistake to pose the question of whether 'time is tensed' (i.e., whether the A-series is cosmologically veridical or objective, etc.) in terms of the untranslatability of tensed A-statements into tenseless B-statements. And indeed, it is a philosophical mistake to infer from the translatability (in this sense) of A-statements into B-statements that the A-properties of pastness, presentness, and futurity are somehow unreal or illusory, and so on. Doing so is analogous to claiming to have discovered a cure for baldness, which consists in paraphrasing any statement ascribing baldness to Jones into a statement asserting the binary relation of *being bald at*—not a property—to hold between Jones and the time of utterance. Though Jones may rejoice in his loss of the property of baldness, he still has no need of shampoo. (Hegelians, who love a synthesis, will probably conclude that he wears a wig.)

treated as a corresponding quantifier. The extension of ‘sometimes’, for example, may be taken to be the class of all nonempty classes of times (or equivalently, the characteristic function of this class), and its semantic content may likewise be taken to be the corresponding higher-order property of being a nonempty class of times. A quantificational temporal operator thus also requires an accompanying tense as a bridge connecting the superintension of its operand clause to its own extension. The result of applying a quantificational temporal operator to a tensed sentence is true if and only if the extension of the tensed sentence (which is not a truth value but a class of times) is an element of the extension of the quantificational temporal operator. Thus, for example, the sentence ‘Sometimes, Frege was writing’ is true with respect to a time  $t$  if and only if the class of times earlier than  $t$  at which Frege is writing (the extension of ‘Frege was writing’ with respect to  $t$ ) is nonempty—that is, if and only if some time  $t'$  is a time earlier than  $t$  at which Frege is writing. (The complete quantificational temporal operator ‘sometimes’ + past tense provides a roughly correct, albeit somewhat strained, definition of one use of the present perfect tense, as in ‘Frege has been writing’, as well as of language theorists’ alternative use of simple past tense.) Incomplete quantificational temporal sentential operators such as ‘sometimes’, ‘always’, and ‘twice before’ are thus regarded as attaching to tensed sentences in the way that quantifiers such as ‘something’, ‘everything’, and ‘exactly two smaller things’ attach to monadic predicates, whereas incomplete specific temporal operators such as ‘on August 24, 1996’ and ‘when Frege wrote “Thoughts”’ are regarded as attaching to tensed sentences in the way that singular terms are attached to by monadic predicates.<sup>24</sup>

There are complications involved in extending this account of temporal operators to cases in which temporal operators such as ‘sometimes’, ‘always’, ‘now’, and ‘today’ are applied directly to present-tensed sentences, as in any of the examples (2), (14), (15), and (21). The account would suggest that such instances of present tense be regarded as instances of a pure tense operator, analogous to past or future tense except that its extension with respect to a time  $t$  and a possible world  $w$  is the function that assigns to any proposition matrix  $m$  the class of times  $t'$ —whether earlier than, later than, or overlapping with  $t$ —at which  $m$  obtains in  $w$ . Such an operator is required, on the account being considered here, in order to prime a temporally unmodified clause such as (1') for an operator such as ‘sometimes’ or ‘today’, to bridge the super-intension of the unmodified clause with the extension of the incomplete specific or general temporal operator.

Strictly speaking, (1) probably should not be regarded as the atomic sentence formed by attaching the temporally unmodified predicate corresponding to the naked infinitive phrase ‘be writing’ to the term ‘I’, as represented formally by

(31) *Be Writing (I)*.

<sup>24</sup> A problem for this account arises in connection with such constructions as ‘Frege always was busy’, which does not mean that every time is a past time at which Frege is busy. The sentence seems to mean instead that every past time is a time at which Frege is busy. But on the account proposed here, the past tense operator operates on the value base of the untensed clause ‘Frege be busy’ and the incomplete operator ‘always’ attaches to the result (i.e., to the past-tensed ‘Frege was busy’), apparently resulting in the incorrect former reading for the sentence. The alternative reading would seem to require seeing the past tense operator as somehow modifying the ‘always’ rather than the untensed clause.



What this represents is not (1) but (1'). Although (1') is not a grammatical sentence of English, it is complete in itself. Its extension (with respect to appropriate semantic parameters) is a truth value; it is true with respect to a context  $c$ , a world  $w$ , and a time  $t$  if and only if the agent of  $c$  is writing at  $t$  in  $w$ . What, then, becomes of (1)?

On the account of temporal operators under consideration, the result of applying present tense to (1'), represented formally as

(32) *Present Tense[Be Writing(I)]*,

is not a complete sentence of English, capable of truth value standing alone. Its extension is a class of times rather than a truth value. Yet surely one who wishes to assert what is encoded by a simple, atomic clause like (1') uses a tensed sentence, namely, (1). How are we to accommodate the fact that (1) is capable of achieving truth value when standing alone as a declarative sentence without an additional temporal operator?

On this theory, such uses are regarded as involving an implicit specific, indexical temporal operator such as 'now'. For example, sentence (1) standing alone would be seen as elliptical for (2), represented formally as

(33) *Now(Present Tense[Be Writing(I)])*.

This account of simple present tense is exactly analogous to the treatment suggested above of simple past tense according to which a simple past-tensed sentence such as (26) or 'Frege was writing', standing alone as a declarative sentence in a piece of discourse, is elliptical for a temporally indexical completion, for example, 'Frege was writing then'. We may call this the *ellipsis theory of present tense*.<sup>25</sup> It is not my

Whereas the latter reading of the sentence is closer to the actual meaning than the former (clearly a misreading), it also does not seem exactly correct. The sentence in question generally is not used with this meaning (although, of course, it *can be* so used). As with a simple past-tensed sentence, a sentence such as 'Frege always was busy' is ordinarily used with implicit reference to a particular (perhaps vaguely delineated) period or interval of time in mind, so that what is said is true as long as Frege is busy throughout that period even if at some other times he is not busy. This feature of such constructions can be accommodated on the present account by taking incomplete quantificational temporal operators, such as 'always', to involve implicit reference to a particular period or interval—very much in the manner of implicitly relativized uses of quantificational constructions in English (such as, the 'everything' in 'Everything is in order' or the 'everyone' in 'Is everyone here?'). A sentence such as 'Frege always was busy', standing alone as a declarative sentence in a piece of discourse, may thus be taken to mean something like the following: Every time during *that period* is an earlier time at which Frege is busy (with reference to a contextually indicated period of time).

<sup>25</sup> One alternative to the ellipsis theory is the theory that the English construction represented by 'Writing(I)' is simply sentence (1). Indeed, it is commonplace in most discussions concerning logical form to assume that (1) is, at least as typically intended, an atomic sentence constructed from the singular term 'I' and the simple predicate 'am writing', while regarding the present tense of the latter not as a separate component of the sentence but as somehow built into the predicate. In an effort to facilitate understanding of the general theory of temporal operators presented here, much of the preceding discussion was based on the presumption of some such theory. However, if verb tenses are to be taken seriously in accordance with the general theory of temporal operators presented here—as semantically significant contributions to sentences in themselves—this alternative theory ultimately requires the postulation of a systematic semantic ambiguity in the present tense, so that a simple, present-tensed sentence like (1) is ambiguous between the complete

(i) *Writing(I)*

purpose here to fill out the details of the ellipsis theory or to cite linguistic evidence either in favor of or against this general account of the simple tenses. It is adequate to my purpose merely to indicate the richness of the apparatus of the corrected theory for dealing with complete and incomplete temporal operators.<sup>26</sup>

It is interesting to note that on the ellipsis theory, a present-tensed sentence such as (3) is taken to be an incomplete sentence standing in need of completion, much as if it were the corresponding predicate ‘is a time at which this tree be covered with green leaves’. At the level of semantic content, the present tense operator thus converts the content base of its untensed operand clause into something like its corresponding property of being a time at which the tree in question is covered with green leaves. This theory of the pure tenses thus mimics Frege’s construal of a present-tensed sentence as standing in need of completion or supplementation, typically provided by the time of utterance. Frege’s theory works remarkably well as a theory of tense. Unfortunately, as we saw in sections 2.5 and 2.6, it fails as an account of temporal indexicality.

and the incomplete (in need of supplementation by an incomplete specific or general temporal operator)

(ii) *Present Tense*[*Writing(I)*].

The first would be an instance of the *tenseless* use of present tense, the second of the *tensed* use. The tenseless (1) has a truth value for its extension and would be an appropriate operand for any complete temporal operator, whereas the tensed (1) would be the result of applying, a certain tense operator (viz., present tense qua tense operator) to the tenseless (1). The more complex logical form of the latter would have to be regarded on this theory as going entirely unrepresented in the surface grammar. We may call this the *ambiguity theory of present tense*.

Certain general considerations tend to favor the ellipsis theory over the ambiguity theory of present tense. In general, when attempting to explain apparently divergent uses of a single expression or locution, if an ellipsis account is available, it is to be preferred over the postulation of a systematic semantic ambiguity—although, of course, some third alternative may be preferable to it. See S. Kripke, ‘Speaker’s Reference and Semantic Reference,’ in P. French, T. Uehling, and H. Wettstein, eds., *Contemporary Perspectives in the Philosophy of Language* (Minneapolis: University of Minnesota Press, 1979), pp. 6–27, especially p. 19.

<sup>26</sup> It is important for a full theory of the simple tenses to take account of the fact that the proper operands of tenses in English seem to be not whole clauses but simple predicates (or, more accurately, verbs). It is largely a simple problem of formal engineering to transform the theory of pure tenses presented here into a theory of tenses as operators on the content bases of simple predicates rather than on the value bases of whole clauses. For example, in accordance with the spirit of the general theory of tenses presented here, a past-tensed predicate such as ‘was writing’—which results from applying the past tense operation to the simple predicate (naked infinitive) ‘be writing’—may be regarded as having for its extension, with respect to a possible world *w* and a time *t*, not a class of individuals (or its corresponding characteristic function from individuals to truth values), but the function that assigns to each (possible, past, present, or future) individual *i* the class of times before *t* at which *i* is writing in *w*.

It may also be important to recognize that the ‘that’-operator, which transforms a sentence into a singular term (typically) referring to the sentence’s semantic content, may be attached in English to a tensed but apparently otherwise temporally unmodified sentence, for example, ‘When Frege wrote “Thoughts,” he knew that he was writing’. It may be necessary to regard such ‘that’-clauses as involving an implicit ‘then’ or ‘now’ operator. See note 17.