Lecture 10: Tense, Aspect, and Events

Recommended readings to learn more:

(Vendler 1957, Bennett and Partee 1972, Comrie 1976, McCoard 1978, Dowty 1979, Bach
1981, Kamp and Rohrer 1983, Comrie 1985, Dahl 1985, Bach 1986, Parsons 1990, Smith
1991, Klein 1994, von Stechow 1995, Ogihara 1996, Landman 2000, Tatevosov 2005,
Casati and Varzi 2006)

0. Introduction.

One BIG topic we haven't discussed at all this semester is tense and aspect, and the semantics of
event descriptions of various kinds, including tensed sentences. This lecture might be considered
an "appetizer" – just a brief look at a few main ideas, with pointers to some interesting work.

This is one area in which there is very constructive and productive interaction among researchers
with quite different backgrounds and interests – logicians, philosophers, theoretical linguists of
different kinds, including both 'formal' and 'non-formal' semanticists, typologists,
computational linguists, and others.

Outline:

1. Classical tense logic -- (Prior 1967). Related to classical modal logic (Hughes and Cresswell
1968, Hughes and Creswell 1996). Tense and modal operators as operators on sentences;
sentences true "at a time" and "in a possible world".

2. Early innovations from logicians and philosophers: Reichenbach (1947) and the notion of
"reference time". Davidson (1967) and the idea that sentences are descriptions of events (or
states, processes, etc.)

3. Montague (1970) combined tense and modality, combined (formal) pragmatics and semantics.
Hans Kamp, in his dissertation under Montague's supervision (Kamp 1968) and the subsequent
article (Kamp 1971), extended this approach in showing the distinction between *now* and the
Present Tense.

4. Aspect: Early work by philosophers and logicians on "Aktionsart", or "lexical aspect":
distinctions among predicates over various sorts of "eventualities" (Emmon Bach's term):
events, processes, states (Kenny 1963, Vendler 1967).

5. Subsequent work involving linguists and drawing on a great deal of linguistic research on
tense and aspect systems of natural languages has stimulated the development of richer
theoretical frameworks, cross-linguistic study, and the interaction of formal and non-formal
semanticists, syntax-semantics-morphology studies, more study of lexical semantics and its

interaction with compositional semantics. Joint work on aspect by linguists and philosophers
(Dowty 1979, Bach 1981, Bach 1986, Parsons 1990, Smith 1991, Klein 1994) (and many others)
leading to contemporary understanding of the distinction between "lexical aspect" and
"viewpoint aspect" (Smith's terminology). Linguists have made important contributions to the
study of tense as well, and to the kinds of interaction between tense and aspect that are often
found in natural languages.

1. Classical tense logic

Sentences are true at times. Tense operators are like quantifiers over times.

$\| \varphi \|^{M,g,t} = 1$ means that φ is true with respect to model M and assignment g at time t.

$\|PAST \varphi\|^{M,g,t} = 1$ iff there is some t' earlier than t such that $\| \varphi \|^{M,g,t'} = 1$

That is, PAST tense means something like "at some time in the past, φ was true", where φ is the
present tense version of the same sentence. (Present tense is not represented by any operator at
all; it's assumed to be the 'basic' form.)

$\|FUT \varphi\|^{M,g,t} = 1$ iff there is some t' later than t such that $\| \varphi \|^{M,g,t'} = 1$.

Future and past are treated symmetrically in standard tense logic.

(Whiteboard picture, showing the basic idea of "time of evaluation" vs. what we might call
"event time".)

Compare classical modal logic: a sentence is true at a given possible world; "Possibly φ" is true
at w iff φ is true at some world w' accessible from w. "Necessarily φ" is true at w iff φ is true at
every world w' accessible from w.

2. Early innovations: Reichenbach's reference times, Davidson's events

Reichenbach (1947) was a philosopher who noticed many aspects of natural language which
were not adequately captured in first-order predicate logic augmented with tense operators, and
in particular several of the mismatches between tense logic and the kinds of tense and aspect
systems found in English and German. He proposed a tense logic that might be closer to natural
language, for which he introduced the influential notion of "reference time".

(Whiteboard): the 3-way distinction among Speech Time, Reference Time, and Event Time.
    Examples: Simple present: S = R = E   I see him.
                   Simple past: R < S, E=R   I saw him.
                   Present perfect: R=S, E < R   I have seen him.
                   Past perfect: R < S, E < R   I had seen him
The idea helped, but didn't solve all the problems linguists (and philosophers) could identify.

Davidson (1967) introduced the idea that sentences are indefinite descriptions of eventualities.

Davidson's proposed analysis (within first-order logic) for (1) is (2)[1].

(1) a. Jones buttered the toast
    b. Jones buttered the toast slowly in the bathroom with a knife.
(2) a. $\exists e$ [BUTTER(e,j,t) $\wedge$ BEFORE(e, now)]

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[1] I've added the last clause to indicate past tense; Davidson was focusing on the treatment of adverbial modifiers
and not explicitly addressing tense.

b. ∃e [BUTTER(e,j,t) ∧ SLOWLY(e) ∧ IN(e,b) ∧ WITH(e,k) ∧ BEFORE(e, now)]

This was the first introduction of the "event argument", which adds one more argument to all (or perhaps not all) verbs. A verb like *butter* now has not just a subject and an object argument, but also an event argument. Two good books to read about the advantages the event argument provides and the new kinds of questions and issues it raises are Parsons (1990) and Landman (2000). There are many articles, books, and anthologies of works by linguists exploring issues related to the event argument as a real syntactic and semantic "argument"; see, for instance (Partee 1984, Partee 1991, Bach et al. 1995, Kratzer 1995, Kratzer 1998, Rothstein 1998, Tenny and Pustejovsky 2000, Kratzer 2004).

3. Montague

Among Montague's many important innovations, he combined tense logic and modal logic, and expanded them beyond application just to whole sentences, but to the full range of semantic types, through his typed intensional logic, of which we have seen little pieces. One can define an adjective like *former* in his system, for instance, and not only a sentence-level operator like Past Tense. Montague also built in some elements of formal pragmatics to be able to account for *indexical* elements like *I, now, here* and the Present Tense.

Indexicals: words or morphemes whose interpretation depends on the context of utterance. Indexicals are closely related to *demonstratives*, and the terms are not always sharply distinguished. For a demonstrative like *this, that, there, then, he, she*, one needs to know more than just the situation of the utterance but also the intentions of the speaker. But sometimes the intentions of the speaker are just considered part of the context of utterance.

Kamp on *now*: Before Kamp's work (Kamp 1968, 1971), it had not been noticed that there is a distinction between Present Tense and *now*. But Kamp's work opened up interesting perspectives on the behavior of tenses in embedded contexts, where they are often "anaphoric" in various ways. Kamp noted that the Present Tense doesn't always "refer" to the speech time, but *now* (with a few special exceptions) does. The following examples are not Kamp's own, but related ones that make his point. ((3) is from http://semantics-online.org/lsa311/ , which I believe is from Kai von Fintel's class in the 2005 Linguistic Institute held at MIT.)

(3) a. Once everyone alive hadn't been born yet. (Ambiguous; contradictory on one reading.)

b. Once everyone now alive hadn't been born yet. (Unambiguous, no contradictory reading.)

There is no present tense in (3). A similar example with explicit present tense is (4).

(4) a. Someday Susan will marry a man she loves.

b. Someday Susan will marry a man she loves now.

Like (3a), (4a) is ambiguous: the present tense can either refer to the present time (in which case (4a) and (4b) have the same truth conditions), or it can be analogous to a pronoun, picking up the time of event described in the main clause – a man she loves then.

Or compare (5a) and (5b):

(5) a. Will he ever admit that he is wrong?

b. Will he ever admit that he is wrong now?

More on tense and anaphora, and tenses acting sometimes "referentially" and sometimes like "bound variables": (Partee 1973, Bäuerle 1979, Partee 1984, Abusch 1988, Abusch 1997, Kratzer 1998). Interesting work on the pragmatic element in the selection of the relevant

reference time for evaluating nominal predicates (cf. the interesting temporal interpretation problems in sentences like *John met his wife when they were both 5 years old*: in principle, *wife* could be interpreted under the past-tense operator, but we evidently interpret it as 'wife now', not 'wife then'): (Enç 1981, Enç 1986, Enç 1987, Musan 1997).

4. Aspect: basics

4.1. Lexical aspect, Aktionsart.

Building on work by Aristotle, Kenny and then Vendler proposed various tests for classifying different sorts of verbs according to their behavior in various kinds of temporal inference patterns. The best basic reference for linguists on this work is Dowty (1979). Other linguists including Bach, Dahl, Smith, and Klein have built on this work and extended it. Dahl and Comrie are non-formal semanticists who have made major contributions to the typological study of aspect.

Event-predicates vs process-predicates and state-predicates:

Test: Does *John is verb-ing* entail *John has verb-ed*?
Process and state predicates: Yes. (*run, smile, live in Texas*).
Event predicates: No. (*build a house, die, win the race, reach the top, buy a car*)

Test: Co-occurrence with *in 3 minutes/hours/days/weeks* vs. *for 3 minutes/hours/days/weeks*.

Processes and some states: good with for-adverbials, not (except with a different reading) with in-adverbials. (The reading of in-adverbials that is relevant for the test is a reading that tells how long the event took. The irrelevant reading is a reading that means "sometime within the interval that starts now, or at some given reference point, and ends 3 minutes/hours/etc from that point.")

Extended events: Good with in-adverbials, bad with for-adverbials.

Instantaneous events: Bad with both.

Some "atemporal predicates": Bad with both. (So 'statives' have to be divided; there are lots of problems in trying to fit all sorts of states into suitable aspectual categories.)

Examples:

(6) a. Process: John worked for 3 hours. *John worked in 3 hours.

b. Extended event: *John built the house for 3 weeks. OK: John built the house in 3 weeks.

c. Aspectually ambiguous: John washed the dishes for 20 minutes. John washed the dishes in 20 minutes. ('wash the dishes' as a kind of process vs. as a kind of event)

d. Instantaneous event: The rock hit the window *for three minutes/ *in three minutes (ignore the irrelevant reading, "in three minutes from the time when …".

Semantic analysis:
In classic temporal logic, sentences were true at 'moments', and there was no good way, for instance, to talk about the relation between *build a house* and *be building a house*. Bennett and Partee introduced *interval semantics*, allowing that a basic sentence might be true at a moment (*the rock hit the window*) or at an interval (*John build a house*). The later widespread adoption of *event semantics*, with an event argument as first proposed by Davidson, made it even easier to analyze tense and aspect. One of the most influential ways to formalize the distinctions in Aktionsart, or lexical aspect, builds on analogies with the distinction between mass nouns

(analogous to process predicates) and count nouns (analogous to event predicates): see (Link 1983, Link 1987), collected in (Link 1998), also (Bach 1986, Krifka 1987, Dowty 1991, Krifka 1992, Krifka 1998, Partee 1999), for more on this analysis and on the connections between them in the dual aspectual classifications of "incremental theme" verbs like *read, eat, write, build.*

(7) a.   John ate an apple in 10 minutes/ *for 10 minutes   ('quantized' count noun, telic)
     b.   John ate soup for 10 minutes/ *in 10 minutes   ('non-quantized' mass noun, atelic)
     c.   John ate apples for 10 minutes/ *in 10 min ('non-quantized' plural noun, atelic)
     d.   John ate two apples *for 10 minutes/ in 10 minutes ('quantized' plural noun, telic)

In general, work on *lexical aspect*, or *Aktionsart*, is concerned with the 'temporal constitution' of eventualities and its reflection in event predicates: are eventualities conceived of as bounded (telic) or unbounded (atelic), as having duration, as having definite endpoints/ beginning points, etc. *Viewpoint* aspect, which we look at next, is more about the various kinds of aspectual modifications that can be made to the basic predicates, by the addition of various aspectual operators. But the line between them isn't always clear! And since languages as well as theories differ, terminology is not always consistent! Watch out!

4.2. Viewpoint aspect.

What is the difference between English simple past and present perfect?
(8) a. Mary ate three apples.
     b. Mary has eaten three apples.

No obvious difference in truth conditions. Kamp (Kamp 1979, Kamp and Rohrer 1983, Kamp and Reyle 1993) argued on the basis of such distinctions as the distinction between French Passé Composé and Passé Simple that truth conditions are not enough; something analogous to Reichenbach's reference time is also needed. (In his Discourse Representation Theory, important weight is given to a representational level containing "discourse entities", which may include events and times as well as more entity-like entities, for capturing these things.)

Klein (1994) has a nice account that draws both on the Reichenbachian tradition and on work in formal semantics. He introduces the notion of "Topic Time" where Reichenbach had "Reference Time" and connects it to independently motivated notions of Topic in linguistics. Then he makes the following generalizations:

TENSE concerns the relationship of Topic Time to Utterance Time.
(Viewpoint) ASPECT concerns the relationship of Event Time to Topic Time.

Progressive aspect: Topic time is within event time. ("looking at event from within")
Perfective aspect: Event time is within topic time. ("looking at event as a completed whole")
Perfect aspect: Event time precedes topic time. ("looking at event from a later perspective")

5. More progress and issues in tense and aspect: a tiny sample.

5.1. Stage-level and individual-level predicates.

(9) Carlson (1977, 1980): the interpretation of bare plurals. See also Diesing 1992.
        (a) Opera tickets are available. (Stage-level: existential interp.)
        (b) Opera tickets are expensive. (Indiv-level: generic interp.)

(10) Interpretation: "Stage-level" predicates express properties of spatio-temporal manifestations of individuals, typically "temporary" properties, "episodic". "Individual-level" predicates express properties of individuals, including "kinds". Bare plurals denote kinds; predicating a stage-level property of a kind gets interpreted as saying that the kind has instantiations manifesting the given property.

Other structures sensitive to stage-level/individual-level predicates (see Kratzer (Kratzer 1995)and Diesing (Diesing 1992)):
(11) Adjectival complements of perception verbs (Siegel 1976a, Siegel 1976b)
        (a) Mary saw Bill naked. (Stage-level)
        (b) *Mary saw Bill intelligent. (Individual-level)

  (12) Existential <u>there</u>-construction (Milsark 1974, Milsark 1977)
        (a) There were dogs available. (st-level)
        (b) *There were dogs intelligent. (i-level)

5.2. The ontology of entities and events.

Event vs. *entity* as a matter of perspective; frequently interchangeable.

Via nominalization, virtually anything can be regarded as an entity or individual (Cresswell 1973), and we tend to nominalize when we want to talk <u>about</u> anything, including *events, times, actions*, etc.

Less typical combinations (Partee 1991): NPs with stage-level modifiers (13), and sentences with i-level main predicates (14).

(13) How can there be a cherry that has no stone? ... A cherry when it's blooming, it has no
                stone.
(14)   A quadratic equation usually has two different solutions. (Lewis 1975)

5.3. Slavic aspect.

The Slavic languages are known for having particularly rich aspectual systems, and there has been a great deal of work done on Slavic aspect within many different theoretical and descriptive frameworks. Within Russia, important recent and current work has been done by Elena Paducheva (1994, 1996, 1998), including recent work joint with Mati Pentus (Paducheva and Pentus In press) partially integrating Paducheva's earlier work with recent formal semantics approaches, and by Sergej Tatevosov. Tatevosov has recently added a formal semantics perspective to his own work (Tatevosov 2005).

Hana Filip has done a great deal to bring the formal semantics insights of Dowty and Krifka to the study of Slavic aspect, adding a great deal of important work of her own (Filip 1992, 1996, 1999, 2000, 2003, 2005). There is new work connecting Gen Neg and Russian aspect: see (Levinson 2005).

References

Note: Robert Binnick maintains a large on-line bibliography of work on tense and aspect. It can be found at www.utsc.utoronto.ca/~binnick/TENSE/ . The site also includes links to downloadable abstracts and papers, and links to sites of others working on tense and aspect. And Casati and Varzi, in addition to their article (Casati and Varzi 2006) in the online Stanford Encyclopedia of Philosophy, also have an online bibliography (Casati and Varzi 1997).

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