Individual Anchors for Tenses: How Keats Learned to Read Before Shakespeare

Jason Merchant[1]
University of Chicago

A usual semantics for tenses[2] assumes that modeling tense semantics involves quantification over times and that the domain of quantification for times is an ordered set of times T_u called a "timeline," with a total ordering relation $<_T$ over T_u which is transitive, irreflexive, and antisymmetric. The default timeline is from the beginning of the universe to the end of the universe, passing through now.[3] One-place predicates can be modeled as functions from individuals to times to truth values, <e, <i, t>> (abstracting away from world and event variables). This gives the standard interpretation for synonymous examples like (1) as in (2):

(1) a. Keats ate lunch before Shakespeare.
    b. Keats ate lunch before Shakespeare did.
    c. Keats ate lunch before Shakespeare ate lunch.

(2) $\exists t[t \in T_u](t < n \ \&\ \text{eat.lunch}(t)(\text{keats}) \ \&$
    $\exists t'[t' \in T_u](t' < n \ \&\ \text{eat.lunch}(t')(\text{shakespeare}) \ \&\ t < t'))$

In the actual world—in which John Keats was born considerably after William Shakespeare died—(1) is not true,[4] and could not be true, since (even assuming additional contextual restrictions on time spans considered for the relevant events of eating lunch, as famously noted first in Partee 1973; see also Schlenker 2004) there are no times at which the predicate "eat lunch" is true of Keats that precede any involving Shakespeare.

[1] Thanks to Anastasia Giannakidou for discussion; also to Chris Kennedy, Salikoko Mufwene, and Joachim Lambek for comments on an earlier version.

[2] See Kamp and Reyle 1993, Ogihara 1996, Smith 2003, and the papers in Guéron and Lecarme 2004 for recent approaches and references.

[3] It is usually assumed that T_u is dense: that is, that T_u stands in a one-to-one mapping to $\Re$, the real correspondent function R:$T_u \rightarrow \Re$ such that for any distinct t_1, t_2 in T_u, if $t_1 <_T t_2$, then $R(t_1) < R(t_2)$. I will assume that T_u is not dense, for reasons given below. Thanks also to Dam Thanh Son for discussion of the properties of physical time.

[4] Though it could be true on a habitual reading of the past tense, of course: here I am interested only in the truth conditions of the simple ("perfective"), episodic past, where the contrast is stark.

Linguistic Analysis, 39, 3-4
2014 Linguistic Analysis
P.O. Box 2418, Vashon, WA 98070

Now consider the following, which could be true:[5]

(3) a. Keats learned to read before Shakespeare.
 b. Keats learned to read before Shakespeare did.
 c. Keats learned to read before Shakespeare learned to read.

The examples in (3) all have the paraphrases in (4).

(4) Paraphrases:
 a. The age at which Keats learned to read is less than the age at which Shakespeare learned to read.
 b. Keats was younger when he learned to read than Shakespeare was when he learned to read.

The puzzle is clear: how can the standard semantics for tense yield the apparently contradictory result that (3) could be true in the same models in which (1) must be false? How is this?

Intuitively, the solution is to posit that an individual can serve as an **individual anchor** in the sense of Giannakidou 1998 (see also Grano 2012) for tense evaluation. That is, an individual *i* can trigger separate domains of quantification for a *t* variable of a predicate of which *i* is an argument. In other words, it would seem that we would like the domain of quantification to be able to be relativized to an individual (with obvious parallels to restricted quantification over events and objects as well).

Implementing this intuition is not as straightforward as it might seem. Informally, it might seem we would want something along the lines of (5a), and let the truth conditions of the example in (3) be something like (5b):

(5) a. For any individual *i*, there is a distinct timeline T, T_i (the lifetime of *i*), which starts at *i*'s birth or coming-into-existence[6] (t_b in $T_u = t_0$ in T_i) and ends at *i*'s death or ceasing-to-exist or ceasing-to-be-relevant[7]. (*i*'s age, in other words).

[5] I am ignorant of any historical evidence to settle whether this is true in the actual world, but it could be, which is the point. For the sake of judgments, assume it is true, that is, that young John was a reading prodigy and young William wasn't.

[6] Or at some other significant milestone.

[7] This last disjunct may be needed if the effects extend to posthumous events, as a reviewer points out, such as "Keats had his first posthumous publication before Shakespeare."

b. $\exists t[t \in \mathrm{T}_{\mathrm{keats}}](\text{learn-to-read}(\text{keats})(t)$ &
$\exists t'[t' \in \mathrm{T}_{\mathrm{shakespeare}}](\text{learn-to-read}(\text{shakespeare})(t')$ & $t < t'))$

But while such formulas seem perspicuous, technically they do not achieve what is desired, as they do nothing but cut up the existing set of points of time (or intervals) into distinct ordered sets and relabel them. The ordering over T remains the same, and so the relativized readings cannot be captured: they continue to come out as false.

Instead, we need something more complex, such as the following.

(6) For any individual i in U, let there be an ordered set of positive integers, T_i, called the timeline (or "age") of i, with the following properties:
1. There is a bijection from T_i to T_{u} such that for any distinct t_1, t_2 in T_{u}, and any distinct t'_1, t'_2 in T_i,
   a. if $t_1 <_{\mathrm{T}} t_2$, then $t'_1 < t'_2$, and
   b. if there is no t_3 s.t. $t_1 <_{\mathrm{T}} t_3$ and $t_3 <_{\mathrm{T}} t_2$, then there is no t'_3 s.t. $t'_1 < t'_3$ and $t'_3 < t'_2$;[8] and
2. The first element in T_i, t_1, corresponds to the first t in T_{u} such that *exist(i)(t)* is true and $t_1 = 1$.

Call each pair in the bijection *correspondents*.

We can then also define truth relative to a timeline (an "age") as being a function of the truth relative to time (with the concomitant and obvious change to the definition of well-formedness of a formula to allow P to combine with t').

(7) For any proposition of the form $P(i)(t)$, where i is an individual, P a predicate, and t a time, if the interpretation function $[\![\ ]\!]$ maps $P(i)(t)$ to true with respect to T_{u}, then let $[\![\ ]\!]$ map $P(i)(t')$ to true with respect to t's correspondent t' in T_i.

Note that this definition allows for an otherwise undefined formula to have a context-dependent truth value (the formula would be undefined, since P does not take integers—which t' is—as a possible argument, normally).

[8] This requirement ensures that the computation of difference across different T_is will be comparable; this is what necessitates the assumption that T_{u} is not dense: whether this is because time is itself quantized (that is, that T_{u} directly corresponds to time), or because humans' cognitive models of time are quantized (that T_{u} is a cognitive construct), is not an issue that needs to be resolved here. As a matter of linguistic analysis, only the second claim is needed or relevant.

Using such domains relativized to individuals, the puzzling examples in (3) can be assigned the truth conditions captured by the formula in (8).

(8) $\exists t[t \in T_{keats}](\text{learn-to-read(keats)}(t)\ \&$
$\exists t'[t' \in T_{shakespeare}](\text{learn-to-read(shakespeare)}(t')\ \&$
$t < t'\ ))$

It is a pragmatic matter whether the default domain of quantification (the timeline of the universe) or an individual's timeline is used (as Musan 1995, 1997 posits for temporal anchoring in nominals as well). Certain predicates, especially those denoting significant milestones in an individual's life, seem to allow easier access to T_i for that individual. "Learn to read" is clearly one such, while "eat lunch" is not ("learn to speak," "learn to walk," "menstruate,"[9] "begin shaving," "leave home," "finish school," "marry," "be baptized," "have a child," "buy a house," "get a job," "finish x's PhD," "get x's first book published," "complete x's first/last triathlon," "win a gold medal at the Olympics," "get tenure," "retire," are several more among a large number of others, whose number is limited only pragmatically). "Die" seems for many speakers to fall fairly squarely in the middle: examples like (9) fluctuate between the true claim that Keats was younger when he died (at age 25, in 1821) than Shakespeare was when he died (at age 52, in 1616), and the false claim that in absolute (universe timeline) terms, Keats's death preceded Shakespeare's (false, since, 1821 $\nless$ 1616). This is accounted for by assigning the truth conditions in (10), and by noting that the pragmatics of choosing which domain of quantification for T is chosen (T_u or T_i), is subject to individual variation and effort.

(9) a. Keats died before Shakespeare.
b. Keats died before Shakespeare did.
c. Keats died before Shakespeare died.

(10) $\exists t[t \in T](t < n\ \&\ \text{die(keats)}(t)\ \&\ \exists t'[t' \in T](t' < n$
$\&\ \text{die(shakespeare)}(t')\&\ t < t'))$

[9] The facts of biology make (i) only true on the relativized-to-individuals readings, making this and similar predicates particularly clear examples of the phenomenon:
(i) Like many girls these days, Anne started menstruating before her mother started menstruating.

Even otherwise close paraphrases like (11) seem to lack the relativized-to-individual reading, or if not lack completely, at least make such a reading extremely difficult; this seems to indicate that T in nouns is less accessible to such adjustment.

(11) Keats' death preceded Shakespeare's.

Next, note that we need some restrictions on when such pragmatic shifts are possible; defining the nature of such evaluation restrictions is an important task, naturally, but falls outside the scope of this note, so I will restrict myself to illustrating what is at stake. For example, (12a) should not come out true in the situation in (12b), which it would if it were given the semantic representation in (12c) (since 6 < 29, taking the integers as years for convenience here), with the lifetimes of the individuals switched. (Above, I restricted the domain shift to those individuals that are arguments of the predicate whose domain is shifted—perhaps only the most prominent argument on some scale, usually the subject in a language like English.)

(12) a. John's father got baptized before John got baptized.
b. John's father got baptized at age 30 in 2000 (when his son was 6) and John got baptized at age 5 in 1999 (when his father was 29).
c. $\exists t[t \in \mathrm{T}_{\mathrm{john}}]$(got-baptized(john's-father)(t) & $\exists t'[t' \in \mathrm{T}_{\mathrm{john's\text{-}father}}]$(got-baptized(john)$(t')$ & $t < t'$))

Note also that if the lifetime T_i is chosen for one predicate, it must be chosen for all relevant predicates (with possibly different individual anchors). This would seem to be parallel to the facts from the interpretation of individual variables in so-called "sloppy" readings of pronouns, and of tenses and aspects in parallel discourse structures, as investigated by Kehler 2002, Prüst et al. 1994, and others. Such mismatches, as represented in the following, are not just violations of some kind of pragmatic parallelism constraints, but are simply undefined: the connective *before*, while defined to apply to times (on the precedence relation) and to integers (on the less-than relation), cannot take its two arguments from separate domains, since there is no ordering defined between times and integers directly, as (13) would require to be evaluable. The strict requirement for commensurability, its "automaticity," in the word of a reviewer, therefore follows from the semantic types of the connectives and other quantifiers that relate times to each other.

(13) $\exists t[t \in T_{keats}]$(learn-to-read(keats)($t$) &
$\exists t'[t' \in T_{u}]$(learn-to-read(shakespeare)(t') &
$t < t'$))

Lifetime effects apply to non-human individuals as well, of course, including buildings, sicknesses, jobs, and the like. And these effects seem to be found with *after*, *later than*, and *earlier than* as well, which is to be expected if the account rests on a general pragmatic effect and is not due to some idiosyncrasy of the semantics of the connective *before*.

Works Cited

1. Fox, Danny and Martin Hackl. 2006. The universal density of measurement. *Linguistics and Philosophy* 29: 537-586.
2. Giannakidou, Anastasia. 1998. *Polarity sensitivity as (non) veridical dependency*. Amsterdam: John Benjamins.
3. Grano, Thomas. 2012. *Control and restructuring at the syntax-semantics interface*. University of Chicago doctoral dissertation.
4. Guéron, Jacqueline and Jacqueline Lecarme, eds. 2004. *The syntax of time*. Cambridge, Mass: MIT Press.
5. Kamp, Hans and Uwe Reyle. 1993. *From discourse to logic*. Dordrecht: Kluwer.
6. Kehler, Andrew. 2002. *Coherence in discourse*. Stanford, Calif : CSLI Publications.
7. Musan, Renate. 1995. On the temporal interpretation of noun phrases. MIT doctoral dissertation.
8. Musan, Renate. 1997. Tense, predicates, and lifetime effects. *Natural Language Semantics* 5:271-301.
9. Ogihara, Toshiyuki. 1996. *Tense, attitudes, and scope*. Dordrecht: Kluwer.
10. Partee, Barbara. 1973. Some structural analogies between tenses and pronouns in English. *The Journal of Philosophy* 70: 601-609.
11. Prüst, Hub, Remko Scha, and Martin van den Berg. 1994. Discourse grammar and verb phrase anaphora. *Linguistics and Philosophy* 17:261-327.

12. Schlenker, Philippe. 2004. Sequence phenomena and double access readings generalized: Two remarks on tense, person, and mood. In *The syntax of time*, Jacqueline Guéron and Jacqueline Lecarme, eds., 555-595. Cambridge, Mass: MIT Press.
13. Smith, Carlota S. 2003. *Modes of discourse*. Cambridge: Cambridge University Press.