Rooth 1985, 1990

Core assumptions and claims:

1. Frame adverbials denote sets of intervals and combine with the VP intersectively.

2. QAdvs only have implicit restrictors determined by context. Adverbials that appear to restrict them semantically are syntactically (even in LF syntax) in their nuclear scope.

3. Focus in the nuclear scope of a QAdv may be interpreted as alluding to the QAdv's contextual restriction.

Remark: Johnston's description of Rooth's approach perpetuates some misunderstandings. For clarification, read Kai's thesis (ch. 2) and Rooth's SALT 6 paper.

Illustrations

(1) \([\text{on Monday}] = \lambda t. \text{t is on a Monday}\)  
\([\text{in the morning}] = \lambda t. \text{t is in the morning of some day}\)  
\([\text{when John was asleep}] = \lambda t. \text{John is asleep at t}\)  
\([\text{when John called}] = \lambda t. \text{John calls at t}\)

(2) \([\text{Mary call in the morning}] = \lambda t. \text{[Mary calls at t & t is in the morning of some day]}\)

(3) \([\text{always (C) Mary call in the morning}] = 1 \iff \forall t \in C: \text{[Mary calls at t & t is in the morning of some day]}\)  
'all intervals in C are such that Mary calls at them and they are in a morning'

conceivable values for C and resulting types of readings:


\footnote{or: \(\lambda t. \text{[John is asleep at t & t < s^*]}\), if past tense is interpreted in the when-clause. See inconclusive discussion re Ogihara SALT IV etc. I will be ignoring all tenses in when-clauses (as does Johnston).}
(a) $C = \text{the set of times when I saw Mary}$
   $\Rightarrow \text{'purely context-restricted reading' (see below)}$

(b) $C = \text{the set of times when Mary called}$
   $\Rightarrow \text{'head-restriction reading'}$

(c) $C = \text{the set of times which are in a morning}$
   $\Rightarrow \text{'adjunct-restriction reading'}$

What does focus have to do with it?

Focus values

$[[\alpha]]$ is the ordinary semantic value of $\alpha$, $\ll\alpha\gg$ is the focus value of $\alpha$. $\ll\alpha\gg$ is always a set which contains $[[\alpha]]$ and other entities of the same semantic type as $[[\alpha]]$.

(4) $[[\text{Mary take JOHN to the cinema}]] = \lambda t. \text{Mary takes John to the cinema at } t$
    $\ll\text{Mary take JOHN to the cinema}\gg$
    $= \{P: \exists x. P = \lambda t. \text{Mary takes } x \text{ to the cinema at } t\}$

(5) $[[\text{MARY take John to the cinema}]] = \lambda t. \text{Mary takes John to the cinema at } t$
    $\ll\text{MARY take John to the cinema}\gg$
    $= \{P: \exists x. P = \lambda t. x \text{ takes John to the cinema at } t\}$

(6) $[[\text{Mary call IN THE MORNING}]] = [[\text{MARY CALL in the morning}]] = \lambda t. [\text{Mary calls at } t \& t \text{ is in a morning}]

(7) $\ll\text{Mary call IN THE MORNING}\gg$
    $= \{P: \exists Q. P = \lambda t. [\text{Mary calls at } t \& Q(t) = 1]\}$

(8) $\ll\text{MARY CALL in the morning}\gg$
    $= \{P: \exists Q. P = \lambda t. [Q(t) = 1 \& t \text{ is in a morning}]\}$

Focus interpretation operator

Every focus must be in the scope of a focus-interpretation operator. The focus interpretation operator takes an implicit argument (the "focus anaphor") which refers to a contextually salient entity of an appropriate type.

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3I depart from Rooth, v. Fintel, etc. by integrating the union-operation into the focus-interpretation relation.
\[
\phi \sim C \text{ has no semantic value w.r.t. } g \text{ (presupposition failure), unless }
\]
g(C) \models \phi \models g.

Where defined, \([\phi \sim C] g = [\phi] g\)

A typical constellation: the implicit argument of \(\sim\) is coindexed with the implicit restrictor of a nearby QAdv:

\[(10) \text{ always (C) } [\phi \sim C]\]

In this configuration, the adverb's restriction is presupposed to be a subset of the union of the focus value of the nuclear scope.

Examples of unions of some focus values from above:

\[(11) \models \{\text{P: } \exists x. P = \lambda t. \text{Mary takes } x \text{ to the cinema at } t\} =
\{t: \exists x. \text{Mary takes } x \text{ to the cinema at } t\}\]

\[(12) \models \{\text{P: } \exists Q. P = \lambda t. [\text{Mary calls at } t & Q(t) = 1]\} =
\{t: \text{Mary calls at } t\}\]

\[(13) \models \{\text{P: } \exists Q. P = \lambda t. [Q(t) = 1 & t \text{ is in a morning}]\} =
\{t: t \text{ is in a morning}\}\]

**Evaluation of Rooth's approach**

A. The phenomenon is not restricted to temporal adjuncts

\[(14) \text{ Mary always takes } \text{JOHN} \text{ to the cinema.}
\] 'whenever Mary takes someone to the cinema, she takes John to the cinema'

\[(15) \text{ MARY always takes John to the cinema.}
\] 'whenever someone takes John to the cinema, Mary takes him to the cinema'

\[(16) \text{ Tai always eats WITH CHOPSTICKS. (from v. Fintel)}
\] 'whenever Tai eats with something, he eats with chopsticks'
Tai always EATS with chopsticks.
'whenever Tai does something with chopsticks, he eats with them'

Jane always USES A CALCULATOR to do her taxes.
'whenever Jane does something to do her taxes, she uses a calculator to do her taxes'

Jane always uses a calculator TO DO HER TAXES.
'whenever Jane uses a calculator (for something), she uses a calculator to do her taxes'

In at least some of these cases, there is no plausible syntactic analysis on which the apparent restrictor forms a constituent and occupies a suitable position w.r.t. to the QAdv. This suggests that something like Rooth's analysis of QAdvs and focus interpretation is needed anyway, independently of the analysis of temporal adverbials.

**B. Predictions about preposed (or otherwise raised) adjuncts**

Rooth (1985, pp. 179 - 183) observed that preposing of the adjunct in the following examples eliminates the head restriction reading, regardless of where intonational focus is placed.

When John is in the shower, he usually shaves.

To figure her taxes, Jane often uses a calculator.

Further examples (?):

In the morning, Mary usually calls.

With chopsticks, Tai always eats.

John, I always take to the cinema.

What Rooth's theory predicts: that a focus which is not within the QAdv's nuclear scope cannot serve to express a presupposition about that QAdv's restriction.

What it doesn't automatically predict: that a head-restriction reading for (20) - (24) couldn't arise "accidentally", unrelated to focus interpretation.

Johnston argues that the nuclear scope of a QAdv is never larger than VP. If this is correct, then Rooth's predictions about preposed adjuncts extend to all adjuncts outside of VP (including those adjoined to IP on the right).
C. Absence of "all nuclear scope" readings

Rooth (1985, p. 201) notes an unexpected difference between when-clauses and other types of adjuncts:

"An interesting property of (218)

(218) Jane often uses a calculator to figure her taxes,

is that it can in fact be understood to mean that something which happens often is that Jane uses a calculator to figure her taxes; this reading is perhaps more evident in (55).

(55) Jane often uses her calculator to compute prime numbers.

This reading can be analyzed as being associated with a broad focus on the entire argument of often. [ (56) below] does not have this reading, a fact not predicted by my analysis:

(56) Jane often uses a calculator when she's computing prime numbers.

I do not have an explanation for this. while-adverbials ... have the reading in question:

(57) Jerry often chewed gum while walking down the steps.

That is, (57) can be understood to mean that something which happened often is that Jerry walked down the steps while chewing gum."

Johnston (ch. 2.3.2) makes a related observation:

"Interestingly, though, constructions with when-clauses and adverbs of quantification have no reading in which the restriction is solely determined from context. There is no interpretation of (133)

(133) Marty always shaves when he is in the shower,

such that for some contextually determined set of intervals, it is true at each of those intervals that Marty shaves and he is in the shower."

D. Johnston's aspectual constraint on head-restriction readings

Head restriction readings are impossible when the matrix predicate is stative.

Note: Johnston has "atelic" instead of "stative." But as Kai pointed out to me, he gives no examples with atelic nonstatives which would justify this. Where he has non-progressive activity VPs (shave, buy cigarettes, ...), he labels them "telic" without discussion.
(25) Marty is always in the shower WHEN HE SHAVES.
    *'whenever he is in the shower, he shaves'

(26) Our professor is always chewing tobacco WHEN WE ARE IN CLASS.
    *'whenever he is chewing tobacco, we are in class'

(27) (a) Fortunately, I always fainted when I was at home.
    (b) Fortunately, I was always unconscious when I was at home.

(28) (a) The pipes always freeze when we are on vacation.
    (b) The power is always out when we are on vacation.

Rooth's theory allows us to generate a head restriction reading for (25), with the following predicted truth-conditions: Every interval at which Marty is in the shower is an interval at which he shaves. If \textit{be in the shower} has the subinterval property, but \textit{shave} does not, these truth-conditions are impossible to fulfill. Assuming that impossible readings are unavailable, we would thus derive the following prediction: Head restriction readings are unavailable when the matrix predicate is atelic and the adjunct predicate is telic. Adjunct restriction readings are unavailable when the adjunct predicate is atelic and the matrix predicate is telic. No problems with either reading should arise when both predicates are atelic, or when both are telic.

But these are not the correct predictions.

\textbf{Johnston's explanation of his aspectual constraint}

\textbf{Goal:} amend Rooth's theory in such a way that (a) the head restriction reading gets impossible truth-conditions iff the matrix is stative, and (b) the adjunct restriction reading never gets impossible truth-conditions.

\textbf{Amendment One:} Revise the semantics of \textit{when}, so that the meaning of \textit{when} involves a maximalization operation.

\begin{align*}
(29) \quad [[\textit{when } \phi]] &= \lambda t. \left[ [\phi](t) = 1 & \forall t' \left[t \sqcap t' \& [\phi](t') = 1 \Rightarrow t = t' \right] \right] \\
(30) \quad \textit{when he is asleep} &= \lambda t. [\text{he is asleep at } t \& t \text{ is not part of a larger interval at which he is asleep}] \\
\end{align*}
Amendment Two: For the composition of the adverbial with the modified VP, replace simple intersection with a rule that is sensitive to the aspect of modifiee.

\[(31) \]
\[(a) \text{ If } [[\text{VP}]] \text{ is telic, then } [[\text{VP } \text{AdvP}]] = \lambda t.([[\text{VP}]](t) = 1 \& \exists t' \in t: [[\text{AdvP}]](t') = 1].\]
\[(b) \text{ If } [[\text{VP}]] \text{ is atelic, then } [[\text{VP } \text{AdvP}]] = \lambda t.([[\text{VP}]](t) = 1 \& [[\text{AdvP}]](t) = 1].\]

New predictions (leaving everything else in Rooth's theory unchanged):

\[(32) \text{ truth-conditions for head restriction reading of (25):} \]
\[\text{'every interval at which Marty is in the shower is a maximal interval at which he shaves' -- impossible}\]

\[(33) \text{ truth-conditions for head restriction reading of (26):} \]
\[\text{'every interval at which our professor is chewing tobacco is a maximal interval at which we are in class' -- impossible}\]

\[(34) \text{ truth-conditions for head restriction reading of (27):} \]
\[\text{'every interval at which I faint is included in a maximal interval at which I am at home' -- okay}\]

But a problem seems to remain for Rooth's treatment of adjunct restriction readings.

\[(35) \text{ He always SHAVES when he is in the shower.} \]
\[\text{predicted meaning, assuming focus on matrix VP:} \]
\[\text{'every interval that is contained in a maximal be-in-the-shower time is a shaving interval' -- impossible!}\]

For the predictions to come out right, the focussed constituent would have to include the connective \textit{when}. Possible way out (?) : \textit{when}-clause is moved to the edge of the nuclear scope (without moving out of it), then its entire sister node is focussed.