

## Lecture 10. Relative Clauses

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### 1. History

Reference: (Stockwell et al. 1973)

#### 1.1. 1957-1960 Transformational grammar, early period.

*Syntactic Structures* (Chomsky 1957): a "Generalized transformation", taking two sentences as input and embedding one into the other as a relative clause.

In a slightly oversimplified form (I don't have the original here to check), the rule can be written as follows:

Structural Description: X – NP – Y    S2: W – NP – Z  
                                  1    2    3            4    5    6

Condition: 2 = 5

Structural Change:    1 - 2 + which/who/that + 4 + 6 – 3

Example: Input: The professor resigned. I liked the professor.

Output: The professor that I liked resigned.

Omitted details: animacy conditions: *who* requires human NP; *which* disprefers human NP; *that* is ok with human or non-human;  $\emptyset$  is possible if the NP is not subject of the embedded sentence; "pied-piping" possibilities: *to whom*, *the brother of whom*, etc.

Note: with respect to the *Aspects*-theory analyses presented below, the *Syntactic Structures* 'generalized transformation' corresponds to the NP-S analysis: identity conditions concern full NPs and the relative clause is adjoined to the NP of the matrix clause.

About semantics: Semantics was mostly ignored at that time. Examples just had "a" and "the"; there was some discussion of perceived semantic problems, but no systematic solutions.

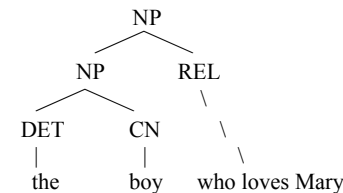
#### 1.2 1965 Transformational grammar: The "standard" theory of Aspects.

One of the main innovations in *Aspects* (Chomsky 1965): Everything is together in one big Deep Structure. So the relative clause starts out as a clause embedded in an NP.

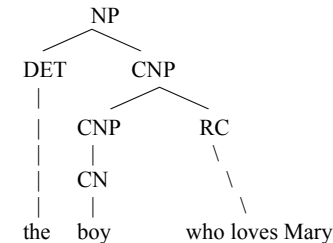
Three competing analyses, discussed in (Stockwell et al. 1973) : the "Art-S" analysis, where the relative clause starts out embedded in the determiner; the "Nom-S" analysis, and the "NP-S" analysis. Review Lecture 1, where we discussed a "flat" analysis (NP → Det Nom REL), a Nom-S analysis (CNP → CNP REL), and an NP-S analysis (NP → NP REL). We didn't discuss the Art-S analysis, and although it is still interesting, I won't discuss it today either.

Let's review the arguments concerning the Nom-S vs. the NP-S analyses, because that is still a live issue. And in the time since *Aspects*, other analyses have also arisen, in particular a "Raising analysis", where the head originates inside the relative clause. Attention has also been given in more recent times to other kinds of relative clause constructions that don't occur in English: correlative relative clauses (Dayal 1995) and head-internal relative clauses (Kim 2004).

b. "NP - REL" structure: The relative clause combines with a complete NP to form a new NP.



c. "CNP - REL" structure: (CNP: common noun phrase: common noun plus modifiers)



At the time of *Aspects*, where the trees above have *who*, the Deep Structure trees would have had a complete NP. So at that time, when syntacticians were beginning to also think about semantics, there was still the assumption that complex sentences were formed from complete simpler sentences. And the problem of the "identity" conditions between matrix NP and embedded NP were beginning to be taken more seriously.

#### Semantic problems:

- Conjunction or *if*-clause? and What is the determiner in the embedded structure?

(1) a. *John ate a fish that he caught.* Approximately: *John caught a fish and John ate a fish.* (plus "identity", usually represented by coindexing.)

(2) *John ate every fish that he caught.* Not at all equal to *John caught every fish and John ate every fish.* Closer to *If John caught a fish, he ate a fish.* But not very close. And what about the matrix “every”? Maybe *John ate every fish if he caught it* ?? What does the “it” come from? (Here we see how the problems of relative clauses are related to the problems of bound variable pronouns in general.)

(3) *No fish that John caught was happy.* ???

(4) *How many fish that John caught did he eat?* ???

The semantic problems were related to syntactic problems, especially with respect to stating the identity conditions between matrix NP and embedded NP. On the NP-S analysis, the statement was simple enough (“identity”), but it gave peculiar results in many cases, as evident from the semantic comments above. On the CNP analysis, it was impossible to state an identity condition in any straightforward way, since there is no separate matrix NP that doesn’t contain the whole relative clause.

Looking ahead to the Montague analysis: we can argue (Partee 1973, 1975) that compositionality requires the third structure: that “boy who loves Mary” forms a semantic constituent with which the meaning of the DET combines. We can show that the NP-REL structure cannot be interpreted compositionally, but the CNP-REL structure can be, if we abandon the idea that the embedded clause expresses a complete proposition, and put a *variable* in the embedded NP position. (The NP-REL structure is a good structure to provide a basis for a compositional interpretation for *non-restrictive* relative clauses, and the non-restrictive relative clause *is* a complete proposition. More on them below.)

## 2. Montague grammar: Montague 1973, Rodman 1976.

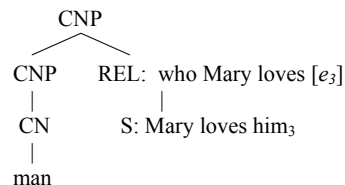
### 2.1. The basic analysis

Montague’s PTQ (Montague 1973) contained many ideas that were new to linguists, some of which had antecedents in the work of other logicians and philosophers. Montague introduced a version of Quine’s treatment of relative clauses as “sentential adjective phrases” derived from open sentences by lambda-abstraction, without any kind of “deletion under identity”. He also introduced the binding of bound-variable pronouns by lambda-operators rather than directly by quantifiers or by their antecedents, a move which has had major consequences for theories of anaphora, and which applies also in the analysis of relative clauses.

From Lecture 2:

We begin with an illustration of what the rule does before stating it (in a sketchy form). Consider the CNP *man who Mary loves*:

Syntactic derivation (very sketchy):



The types for CN, CNP, and REL are all  $e \rightarrow t$ ; so the principle for combining CNP and REL gives:  $\lambda y[\text{CNP}'(y) \ \& \ \text{REL}'(y)]$  (Predicate conjunction)

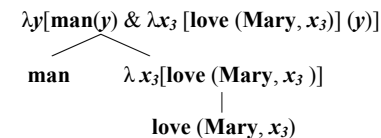
The relative clause itself is a predicate formed by  $\lambda$ -abstraction on the variable corresponding to the WH-word. (Partee 1976 suggests a general principle that all “unbounded movement rules” are interpreted as involving variable-binding; and  $\lambda$ -abstraction can be taken as the most basic variable-binding operation.)

A syntactically very crude and informal version of the relative clause rule, with its semantic interpretation, can be stated as follows:

**Rel Clause Rule, syntax:** If  $\phi$  is an S and  $\phi$  contains an indexed pronoun  $he_i / him_i$  in relativizable position, then the result of adjoining *who(m)* to S and leaving a trace  $e_i$  in place of  $he_i / him_i$  is a REL.

**Rel Clause Rule, semantics:** If  $\phi$  translates as  $\phi'$ , then REL translates as  $\lambda x_i[\phi']$ .

Semantic derivation corresponding to the syntactic derivation above; compositional translation into IL: (read bottom-to-top) (**and see Homework problem 5a**)



By  $\lambda$ -conversion, the top line is equivalent to:  $\lambda y[\text{man}(y) \ \& \ \text{love}(\text{Mary}, y)]$   
(end of extract from Lecture 2)

**Semantic consequences** of the change from “deletion under identity” to “restrictive relative clauses as lambda-abstracts”:

- The embedded NP position is just a variable, bound by the lambda-abstractor: *who Mary loves* in *the boy who Mary loves* is not underlyingly a complete sentence. It is not *Mary loves a boy* or *Mary loves the boy*. It is  $\lambda x[\text{Mary loves } x]$ .
- The relative clause by itself does not carry any presuppositions concerning the embedded NP. The embedded NP is just a variable. Any presuppositions relating to the relative clause come from the higher determiner.
- The earlier claims that relative clauses are sometimes equivalent to conjunction and sometimes equivalent to *if*-clauses, which created unsolvable problems for the classical transformational analyses (see reports of much discussion and worrying in (Stockwell et al. 1973)), are all resolved as consequences of the semantics of the determiner; nothing special has to be done about the relative clause itself, which is always combined with the head CNP by predicate conjunction.

Examples: *At least one boy who Mary loves is happy.* *The boy who Mary loves is happy.* *Every boy who Mary loves is happy.* *No boy who Mary loves is happy.* In each case the relevant structure is:

Det ( $\lambda x[\text{CNP}(x) \ \& \ \text{REL}(x)]$ ) (*happy*)

After  $\lambda$ -conversions:

- (5) a.  $\exists x$  (boy(x) & loves(x)(Mary) & happy(x))  
b.  $\forall x$  ((boy(x) & loves(x)(Mary))  $\rightarrow$  happy(x))  
c. happy (tx (boy(x) & loves(x)(Mary))) (assuming we treat the subject NP as a type e NP)  
d.  $\neg\exists x$  (boy(x) & loves(x)(Mary) & happy(x))

We return to this issue in the light of the recent arguments of Lander and Rudnitskaya (FSIM 2005).

## 2.2. Effects of the determiner on the semantics of the relative clause

On the Montague analysis, all effects of the semantics of the determiner on the semantics of the relative clause are effects that apply to the entire CNP, not just the relative clause, but they may be most noticeable with respect to the relative clause.

- Licensing of NPIs. As discussed earlier, a determiner like *no* or *few* licenses NPIs both in its CNP and in the rest of the sentence. The determiner *every* licenses NPIs in the CNP but not in the rest of the sentence. These properties are predicted from the semantic monotonicity properties of the determiner (Lecture 8 and (Ladusaw 1980)). “In the CNP” is usually illustrated by relative clauses, but also includes PP adjuncts and other modifiers: *Every student who has any ambition works hard. Every student with any ambition works hard. No one who knew anything about it said anything. No author of any non-fiction work was included in any of the lists.*
- Presuppositions. Some determiners presuppose that the CNP they apply to is non-empty. The definite determiner (with the singular), if used to form an e-type NP, presupposes that the full CNP is true of exactly one entity. Other determiners may have other presuppositions: they always apply to the full CNP; effects on the interpretation of the relative clause are therefore real but indirect.

*The one student who knew the answer was absent.* Presupposition: Exactly one student knew the answer.

*Most of the students who knew the answer were absent.* Presupposition: Some students knew the answer.

*Students who knew the answer received a good grade.* Presupposition – none.

*Some students who knew the answer tried to explain it.* Presupposition – none.

*Mary knows that some students who knew the answer tried to explain it.*

Presupposition – Some students knew the answer. But the presupposition comes from the higher verb *know*, not from the determiner and not from the relative clause. When diagnosing presuppositions and their sources, always look at them compositionally. A good reference is (Heim 1983), on your CD.

- Realis-irrealis.

Look at the distribution of indicative/subjunctive in relative clauses in Spanish. Perhaps something similar can be found in Russian with the distribution of relative clauses with *kotoryj by*. There isn't much indication of irrealis in English relative clauses, but one can sometimes find uses of bare present tense ‘in place of’ future which parallel the use of bare present in *if*-clauses, and parallel ‘counterfactual’ back-shifting of tenses.

English:

- (6) a. If John wins, he will get a prize. (\*If John will win, he will get a prize.)  
b. The person who wins will get a prize.  
c. The person who will win will get a prize: This is grammatical, but it presupposes that there already exists now a unique person who will win. Sentence (6b), but not (6c), is compatible with a situation in which the winner is not yet determined.

How to analyze those: I haven't seen explicit discussion of this, but my instinct would be to generate (6b) with the NP *in situ*, under the scope of the main clause future modal *will*, and generate (6c) with the NP quantified in, so that it is outside the scope of the future modal *will*, and gets its temporal evaluation directly from the context of utterance. Alternatively, both could be generated *in situ* (that's probably better, because I expect we can find this phenomenon inside islands, which would argue against a movement analysis), and make sure the rules for Sequence-of-Tense phenomena in English allow a *will* only when its present Tense is anchored directly to the context of utterance: I think that's correct.

Same semantic phenomenon without a relative clause:

- (7) a. The winner will get a prize. This is “ambiguous” (or unspecified), allowing both the interpretations of (6b) and (6c).  
b. The winner will lose this time. – Gets a non-contradictory reading only when the interpretation of the *the winner* is anchored to the actual situation, referring this time to someone who won in the past (‘the one who won’), not to the future time of losing. In fact we can get near-minimal pairs in terms of preferred reading: (a) *The winner will win again next time.* (‘the winner’ = ‘the one who won’) (b) *The winner will win by 2 points.* (a prediction; ‘the winner’ = ‘the one who wins’)

### Spanish

- (8)a. Busco a un lingüista que habla el basco.  
seek-Pres.1.sg. a linguist that speaks.Pres.Indic.3.sg the Basque  
I am looking for a (certain) linguist who speaks Basque.  
b. Busco a un lingüista que hable el basco.  
seek-Pres.1.sg. a linguist that speaks.Pres.Subjunc.3.sg the Basque  
I am looking for a (any) linguist who speaks Basque.

I think you can get parallel examples in Russian: is it correct that if you use *ždat'* with Genitive (intensional interpretation), you can get *kotoryj by* in the relative clause, and if you use *ždat'* with Accusative (extensional interpretation), you can't?

Analysis: Subjunctive relative clauses have to be “licenses” by some appropriate Irrealis operator (that's a first approximation to a real semantics) in whose scope the NP occurs. Indicative relative clauses are licensed by ordinary indices of evaluation (whether ‘actual world and time’ or some ordinary embedded index of evaluation, not associated with ‘irrealis’). It's a matter of linguistic research to find out how ‘local’ the licenser must be, and what if any ‘intervention effects’ we find – does the NP automatically have to have its properties determined by the closest operator?

### 3. Restrictive vs. Non-restrictive Relative Clauses.

In English, the distinction between restrictive and non-restrictive (appositive) relative clauses is grammaticized. In German, and perhaps in Russian (?), such a distinction can be made semantically, but it does not seem to be grammaticized.

Distinction in English (from (Stockwell et al. 1973)):

- Appositives, but not restrictives, require comma intonation after the head NP.
- Restrictives, but not appositives, permit *that* as a relative pronoun.
- Appositive, but not restrictives, may modify proper nouns that have no determiners: \**John that came early also left early.*
- Restrictives, but not appositives, may modify *any* + N: \**Any plane, which crashes, is a failure.*
- Appositives, but not restrictives, may modify an entire proposition. *He said he would resign, which I thought was a good idea.*

The correct semantic generalization about the distribution of non-restrictive relative clauses is this: the head NP must be *referential*. Rodman (1976) managed to capture part of this restriction in his analysis of non-restrictive clauses as NP-S structures with the semantics of conjunction, and Potts completed the job in his treatment of appositives as conventional implicatures.

Rodman (1976) argued in favor of treating non-restrictive clauses by the NP-S analysis and analyzed them semantically as conjunctions, which agrees with Potts's analysis of appositives of all kinds (Potts 2002, 2003), although Rodman had no way of making the relative clause a "backgrounded" conjunct.

Backgrounded but *not presupposed*: non-restrictive relative clauses.

(9) Jill, who lost something on the flight from Ithaca to New York, likes to travel by train.

- A number of authors have considered the embedded proposition, that Jill lost something on the flight from Ithaca to New York, to be a presupposition (Keenan 1971, Levinson 1983), but arguments against considering it a presupposition can be found in Padučeva (1985, p.65) and later in (Chierchia and McConnell-Ginet 1999) and (Kadmon 2001).

Contrasting sentence with a real presupposition: Pseudo-cleft construction.

(10) What Jill lost on the flight from Ithaca to New York was her new flute.

**Analysis** -- I think the best current analysis of non-restrictive relative clauses and other appositive constructions comes from the work of Chris Potts, mentioned above.

From Potts (to appear)

A major innovation of Karttunen and Peters (1979) is that meaning language terms are marked as either at-issue or CI (their 'extensional' and 'implicature' meanings, respectively). I implement the distinction via the set of types in (21). (I provide intensional types but work almost exclusively with extensional ones.)

(21) i.  $e_a$ ,  $t_a$ , and  $s_a$  are basic at-issue types.

ii.  $e_c$ ,  $t_c$ , and  $s_c$  are basic CI types.

iii. If  $\tau$  and  $\sigma$  are at-issue types, then  $\_ \tau, \sigma \_$  is an at-issue type.

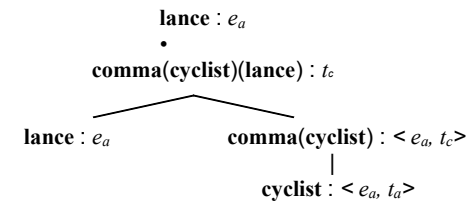
iv. If  $\tau$  is an at-issue type and  $\sigma$  is a CI type, then  $\_ \tau, \sigma \_$  is a CI type.

v. The full set of types is the union of the at-issue and CI types.

....

On the type-theoretic conception advocated here, the syntax remains surface-true and unremarkable, as exemplified in (5). [I'll have to do this on the blackboard.]

Semantic parse tree:



...

For basic NAs, we need the meaning of  $\text{COMMA}$  to take  $\langle e_a, t_a \rangle$  expressions to  $\langle e_a, t_c \rangle$  results:

(38)  $\text{COMMA}$  translates as:  $\lambda f \lambda x. f(x) : \langle \langle e_a, t_a \rangle, \langle e_a, t_c \rangle \rangle$

I henceforth write this meaning as **comma**. It works in conjunction with **feature semantics**, (27), to license subtrees of the form in (39), a part of (5).

(39)  $\text{comma}(\text{cyclist}) : \langle e_a, t_c \rangle$

|  
 $\text{cyclist} : \langle e_a, t_a \rangle$

(The excerpt above gives an analysis of simple NP appositives, but the same applies to non-restrictive relatives. Potts has a direct account of the requirement of referentiality of the antecedent, since it must be of type  $e$ .)

### 4. The Lander-Rudnitskaya Challenge

### 5. Other topics not covered.

Correlative relative clauses (Dayal 1995)

Internally headed relative clauses (Kim 2004)

Note: Minjoo Kim's dissertation on internally headed relative clauses in Korean and Japanese is available in the Semantics Archive: <http://semanticsarchive.net/> (That's an important resource that you should know about, and look at it periodically to see what's new.) Minjoo's dissertation abstract is here:

<http://semanticsarchive.net/Archive/zY0M2ZhM/MinJooKimThesisAbstract.pdf>

The full thesis is in the archive too, easy to find.

Reduced relative clauses, other modifiers that are neither simple adjectives nor simple PPs nor full relative clauses

Free relatives: definite, universal, or is there a unified analysis possible? (Jacobson 1995)

### Homework #5 (last homework) Due May 24.

Reminder: All homeworks received by May 24 will be counted as “not late”. Late homeworks will be accepted from May 25 through May 31; no homeworks accepted after May 31. For a “5” you must do all 5 homeworks, not more than 3 of them late. For a “4” or a zacet, you must do at least 3 homeworks, and at least one of them must not be late.

Homework #5: Topic completely open – your choice. You may do some parts of earlier homeworks that you didn’t do then, or you may write about anything in semantics that interests you, whether or not we have discussed it in class, and not necessarily formal semantics. If you gave a presentation in FSIM, you can count that as your homework #5 (just remind me.) I just want it to be new – don’t give me something that you are also using in another class, though it can certainly be something related.

Some of you wrote to me in your “anketa” about topics in semantics or syntax that you were interested in. It would be a nice Homework #5 if you would write two or three pages about how something you have learned or thought about in this class might be useful for some of the things you are interested in. It’s ok for it to be about “future research” – maybe you can think of some semantic hypotheses that you could test in the future, or some things to ask about when you are doing semantic fieldwork.

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