



ESSLI Summerschool 2014: Intro to Compositional Semantics

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First Lecture: Structural Ambiguity

Overview

Ambiguity:
Examples

Structural
Ambiguity

About
Meaning

Purely
Structural?

Scope and
Domains

Syntactic
Domains
and Recon-
struction

Logical
Form

Opaque
and
Transparent
Readings

Overview

Ambiguity:
Examples

Structural
Ambiguity

About
Meaning

Purely
Structural?

Scope and
Domains

Syntactic
Domains
and Recon-
struction

Logical
Form

Opaque
and
Transparent
Readings

Our plan for this course:

- **Today:** Getting attuned: Structural Ambiguity (Wolfgang)
- Tuesday: Introducing Extensions (Ede)
- Wednesday: Composing Extensions (Wolfgang)
- Thursday: Quantifiers (Wolfgang and Ede)
- Friday: Propositions and Intensions (Ede)

Recall that this course is foundational . . .

Overview

Ambiguity:
Examples

Structural
Ambiguity

About
Meaning

Purely
Structural?

Scope and
Domains

Syntactic
Domains
and Recon-
struction

Logical
Form

Opaque
and
Transparent
Readings

Reference:

Thomas Ede Zimmermann & Wolfgang Sternefeld (2013):

Introduction to Semantics: An Essential Guide to the Composition of
Meaning. De Gruyter Mouton. Berlin/Boston

Copies are available from the second author. Author's discount is 30%.
Please, have the exact amount of 21 Euro with you.



Overview

**Ambiguity:
Examples**

Structural
Ambiguity

About
Meaning

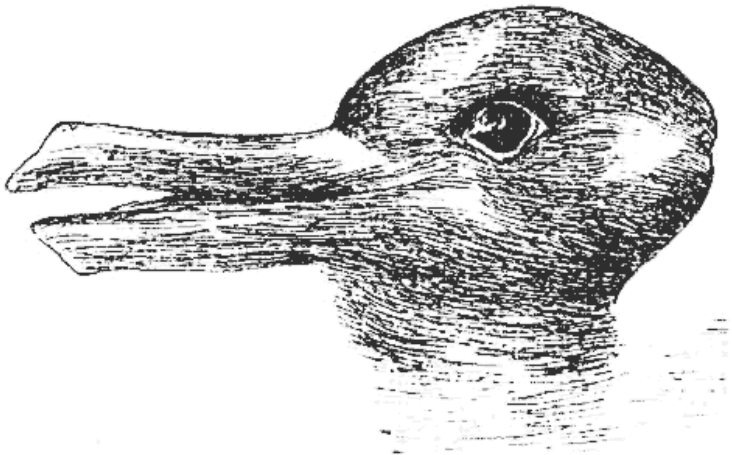
Purely
Structural?

Scope and
Domains

Syntactic
Domains
and Recon-
struction

Logical
Form

Opaque
and
Transparent
Readings



Refers to either rabbit or duck but not both at a time

Overview

**Ambiguity:
Examples**

Structural
Ambiguity

About
Meaning

Purely
Structural?

Scope and
Domains

Syntactic
Domains
and Recon-
struction

Logical
Form

Opaque
and
Transparent
Readings

Refers to either rabbit or duck but not both at a time



Overview

**Ambiguity:
Examples**

Structural
Ambiguity

About
Meaning

Purely
Structural?

Scope and
Domains

Syntactic
Domains
and Recon-
struction

Logical
Form

Opaque
and
Transparent
Readings

Overview

Ambiguity:
Examples

Structural
Ambiguity

About
Meaning

Purely
Structural?

Scope and
Domains

Syntactic
Domains
and Recon-
struction

Logical
Form

Opaque
and
Transparent
Readings

Likewise, **ambiguity of words** arises by interpreting a string of sounds in two ways by referring to different things or concepts.

- (1) *bright*: shining or intelligent
to glare: to shine intensely or to stare angrily
deposit: minerals in the earth, or money in a bank, or a pledge, or ...

Similarities and differences:

- perception and understanding depend on context
- ambiguity resolution is unconscious and automatic
- ambiguity is not perceived as such
- Difference: the relation between a picture and its referent is more or less iconic (only partly conventional), whereas the relation between a word and its denotation is arbitrary and highly conventionalized

Overview

Ambiguity:
Examples

Structural
Ambiguity

About
Meaning

Purely
Structural?

Scope and
Domains

Syntactic
Domains
and Recon-
struction

Logical
Form

Opaque
and
Transparent
Readings

Ambiguity of words also extends to **ambiguous sentences**:

- (2) They can fish
- They put fish into cans
 - They are able to fish

Different interpretations may arise from

- the meaning of lexical items
- their syntactic category
- the structure of the sentence

This last point is not obvious for (2), but there are more convincing examples...



Overview

Ambiguity:
Examples

**Structural
Ambiguity**

About
Meaning

Purely
Structural?

Scope and
Domains

Syntactic
Domains
and Recon-
struction

Logical
Form

Opaque
and
Transparent
Readings

(3) John decided to marry on Tuesday



- (3) John decided to marry on Tuesday
- a. John's decision to marry was taken on Tuesday
 - b. John decided that Tuesday be the day of his marriage

We say that a. and b. are different **paraphrases** of the ambiguous sentence.

No lexical ambiguity, but different structures (syntactic ambiguity):

(4) John decided to marry on Tuesday

(5) John decided to marry on Tuesday

Overview

Ambiguity:
Examples

Structural
Ambiguity

About
Meaning

Purely
Structural?

Scope and
Domains

Syntactic
Domains
and Recon-
struction

Logical
Form

Opaque
and
Transparent
Readings

We use of boxes as a primitive kind of syntax:

- boxes provide partial tree structures
- the material inside a box is a constituent
- boxes are unlabelled
- boxes may not overlap

Syntactic Ambiguity

Two (partially) boxed structures of a sentence are incompatible if their joint structure contains overlapping boxes. Incompatibility is a test for **syntactic ambiguity**.



Overview

Ambiguity:
Examples

Structural
Ambiguity

About
Meaning

Purely
Structural?

Scope and
Domains

Syntactic
Domains
and Recon-
struction

Logical
Form

Opaque
and
Transparent
Readings

Some basic principles of semantic analysis:

(6) The meaning of a sentence (or of complex constituents) is composed from the meaning of its parts.

Complex meanings are derived from simpler meanings in a recursive way, with lexical meanings as the basic building blocks.

(7) As shown by structural ambiguities, the composition of meaning also depends on the syntax.

Frege's Principle of Compositionality:

The meaning of a complex expression is a function of the meaning of its (immediate) constituents and the way they are combined.

Overview

Ambiguity:
Examples

Structural
Ambiguity

About
Meaning

Purely
Structural?

Scope and
Domains

Syntactic
Domains
and Recon-
struction

Logical
Form

Opaque
and
Transparent
Readings

However, what is meaning? Today we do not specify the meaning of any expression whatsoever; rather. . .

- we simply assume that lexical expressions do have meaning and leave it to our intuition that meanings can differ
- we concentrate on differences of meaning that derive from the way meanings are combined
- we compare different meanings by concentrating on ambiguous sentences
- we apply a simple criterion to differentiate between different meanings of sentences, namely:



Overview

Ambiguity:
Examples

Structural
Ambiguity

About
Meaning

Purely
Structural?

Scope and
Domains

Syntactic
Domains
and Recon-
struction

Logical
Form

Opaque
and
Transparent
Readings

The Most Certain Principle of Semantics:

If a sentence A is true of a certain situation, and if a sentence B is false of the same situation in the same circumstances, then A and B differ in meaning.

In plain words: A and B differ iff they report different facts or state of affairs. Facts A and B differ iff one can hold (be true) without the other (being true).

Overview

Ambiguity:
Examples

Structural
Ambiguity

About
Meaning

Purely
Structural?

Scope and
Domains

Syntactic
Domains
and Recon-
struction

Logical
Form

Opaque
and
Transparent
Readings

Cautionary notes:

The above criterion when applied to ambiguous sentences forces us to say that such sentences split up in two sentences A and B, one being true and the other being false in the same context of utterance.

Likewise, ambiguous words should rather be considered as two words, or two different lexemes.

However, we will not be strict and continue with every day use by saying:

- (8) If a (“)sentence(”) may be both true and false in the same circumstances, it is (semantically) ambiguous.

Nonetheless, we do insist that in order to describe the different state of affairs by using paraphrases, the paraphrases themselves must not be ambiguous. (Finding such unambiguous paraphrases with the same meaning as the sentence to be paraphrased may be quite a challenge!)

More examples:

(9) John told the girl that Bill liked the story

Overview

Ambiguity:
Examples

Structural
Ambiguity

About
Meaning

Purely
Structural?

Scope and
Domains

Syntactic
Domains
and Recon-
struction

Logical
Form

Opaque
and
Transparent
Readings

More examples:

(9) John told the girl that Bill liked the story

(10) John told the girl that Bill liked the story

Overview

Ambiguity:
Examples

Structural
Ambiguity

About
Meaning

Purely
Structural?

Scope and
Domains

Syntactic
Domains
and Recon-
struction

Logical
Form

Opaque
and
Transparent
Readings



More examples:

(9) John told the girl that Bill liked the story

(10) John told the girl that Bill liked the story

(11) John told the girl that Bill liked the story

Such ambiguities are **purely structural**.

Overview

Ambiguity:
Examples

Structural
Ambiguity

About
Meaning

Purely
Structural?

Scope and
Domains

Syntactic
Domains
and Recon-
struction

Logical
Form

Opaque
and
Transparent
Readings

More examples:

(9) John told the girl that Bill liked the story

(10) John told the girl that Bill liked the story

(11) John told the girl that Bill liked the story

Such ambiguities are **purely structural**.

Likewise:

(12) John saw the man with the binoculars

More examples:

(9) John told the girl that Bill liked the story

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(9) John told the girl that Bill liked the story

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(11) John told the girl that Bill liked the story

Such ambiguities are **purely structural**.

Likewise:

(12) John saw the man with the binoculars

(13) John saw the man with the binoculars

(14) John saw the man with the binoculars

(15) a. He put the block in the box on the table

b. He put the block in the box on the table

(16) a. Er tat den Block in der Box auf den Tisch (= (15-a))

b. Er tat den Block in die Box auf dem Tisch (= (15-b))

(15) a. He put the block in the box on the table

b. He put the block in the box on the table

(16) a. Er tat den Block in der Box auf den Tisch (= (15-a))

b. Er tat den Block in die Box auf dem Tisch (= (15-b))

Purely Structural?

Assumption: Both *in*+Dative and *in*+Accusative have the same meaning!
The directional “meaning” of *in*+Accusative then has to be contributed by the meaning of the verb.



Overview

Ambiguity:
Examples

Structural
Ambiguity

About
Meaning

Purely
Structural?

Scope and
Domains

Syntactic
Domains
and Recon-
struction

Logical
Form

Opaque
and
Transparent
Readings

(17) a. John told the girl that Bill liked the story

b. John told the girl that Bill liked the story

Purely Structural?

Assumption: *that* is a complementizer in both structures.



Overview

Ambiguity:
Examples

Structural
Ambiguity

About
Meaning

Purely
Structural?

Scope and
Domains

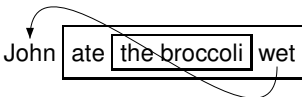
Syntactic
Domains
and Recon-
struction

Logical
Form

Opaque
and
Transparent
Readings

(18) John ate the broccoli wet

(18) John ate the broccoli wet



Overview

Ambiguity:
Examples

Structural
Ambiguity

About
Meaning

Purely
Structural?

Scope and
Domains

Syntactic
Domains
and Recon-
struction

Logical
Form

Opaque
and
Transparent
Readings



Overview

Ambiguity:
Examples

Structural
Ambiguity

About
Meaning

Purely
Structural?

Scope and
Domains

Syntactic
Domains
and Recon-
struction

Logical
Form

Opaque
and
Transparent
Readings

(19) John ate the broccoli wet

Overview

Ambiguity:
Examples

Structural
Ambiguity

About
Meaning

Purely
Structural?

Scope and
Domains

Syntactic
Domains
and Recon-
struction

Logical
Form

Opaque
and
Transparent
Readings

Whether or not an ambiguity is purely structural depends on

- the analyses of critical words like prepositions
- additional theoretical constructs that do not meet the eye, like empty lexemes, e.g. relative pronouns
- the expressive power of the underlying grammatical theory, e.g. the question which kinds of grammatical relations are captured by the grammar (ie. phrase structure rules alone)
- assumptions about hidden syntactic operations like QR, as we will show in a minute

Overview

Ambiguity:
Examples

Structural
Ambiguity

About
Meaning

Purely
Structural?

Scope and
Domains

Syntactic
Domains
and Recon-
struction

Logical
Form

Opaque
and
Transparent
Readings

Having introduced ambiguities by way of examples we now introduce some technical **terminology** used by linguists in analysing these ambiguities.

The basic semantic concept is the notion of **scope**. As this notion is notoriously difficult to define, we approach the problem by reference to the **syntactic** notion of a **domain**.

Let us first describe an ambiguity in terms of scope:

(20) ten minus three times two

a. $10 - (3 \times 2)$

b. $(10 - 3) \times 2$



Having introduced ambiguities by way of examples we now introduce some technical **terminology** used by linguists in analysing these ambiguities.

The basic semantic concept is the notion of **scope**. As this notion is notoriously difficult to define, we approach the problem by reference to the **syntactic** notion of a **domain**.

Let us first describe an ambiguity in terms of scope:

(20) ten minus three times two

a. $10 - (3 \times 2)$

b. $(10 - 3) \times 2$

The brackets instruct us to apply subtraction and multiplication in different order, with different results. As for the notion of scope, we say that in (20-a) multiplication, being applied first, has **narrow scope** w.r.t. subtraction, being in the scope of subtraction. Conversely, subtraction has **wide scope** w.r.t. to multiplication, or **takes scope over** multiplication.

In (20-b), it's the other way round.



Turning next to the syntactic notion of a **domain**, scope taking depends on different syntactic structures that display different “domains”:

(21)

ten minus	three times two
-----------	-----------------

(22)

ten minus three	times two
-----------------	-----------

In syntactic terminology, we say that in (21), “times” is in the domain of “minus”, and conversely in (22).

(23) Let X and Y be constituents. Then X is in the **syntactic domain** of Y if and only if X is not contained in Y but is contained in the smallest box that contains Y .¹

Note: the notion “smallest box” requires a complete analyses.

¹ Readers with some background in syntax should notice the obvious similarity to the concept of c-command in Generative Syntax. Presupposing a customary definition of c-command, it follows that X is in the domain of Y if and only if Y c-commands X .

Overview

Ambiguity:
Examples

Structural
Ambiguity

About
Meaning

Purely
Structural?

Scope and
Domains

Syntactic
Domains
and Recon-
struction

Logical
Form

Opaque
and
Transparent
Readings

Correlation between syntax and semantics:

The Scope Principle:

If α takes scope over β then β is in the syntactic domain of α .

What elements of NL play the role of subtraction and multiplication?

How do these operations comply with syntactic operations?

At this point we cannot fully answer these questions, but confine ourselves with examples that illustrate the concepts of scope and scope dependence.



Overview

Ambiguity:
Examples

Structural
Ambiguity

About
Meaning

Purely
Structural?

Scope and
Domains

Syntactic
Domains
and Recon-
struction

Logical
Form

Opaque
and
Transparent
Readings

High attachment of PP:

(24)

Low attachment of PP:

(25)

Paraphrases?

Overview

Ambiguity:
Examples

Structural
Ambiguity

About
Meaning

Purely
Structural?

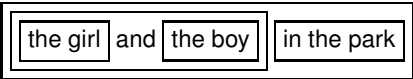
Scope and
Domains

Syntactic
Domains
and Recon-
struction

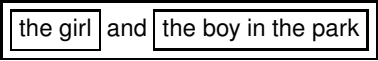
Logical
Form

Opaque
and
Transparent
Readings

High attachment of PP:

(24) 

Low attachment of PP:

(25) 

Paraphrases?

(26) the girl and the boy who are in the park

(27) the girl and the boy who is in the park



(28) a. The doctor

didn't leave

because he was angry

b. The doctor

didn't

leave

because he was angry

Cautionary note:

It follows from (28-b) that the doctor left! Hence, *leave* is not negated, though in the domain of *didn't*!

Therefore, the Scope Principle only goes one way. That is, if α is in the domain of β , β is not necessarily in its semantic scope of α .

Overview

Ambiguity:
Examples

Structural
Ambiguity

About
Meaning

Purely
Structural?

Scope and
Domains

Syntactic
Domains
and Recon-
struction

Logical
Form

Opaque
and
Transparent
Readings



Overview

Ambiguity:
Examples

Structural
Ambiguity

About
Meaning

Purely
Structural?

Scope and
Domains

**Syntactic
Domains
and Recon-
struction**

Logical
Form

Opaque
and
Transparent
Readings

A problem for the Scope Principle:

(29) Beide Studenten kamen nicht
both students came not
'Both students didn't come'

Overview

Ambiguity:
Examples

Structural
Ambiguity

About
Meaning

Purely
Structural?

Scope and
Domains

Syntactic
Domains
and Recon-
struction

Logical
Form

Opaque
and
Transparent
Readings

A problem for the Scope Principle:

- (29) Beide Studenten kamen nicht
both students came not
'Both students didn't come'
- (30) Reading *A*: neither of the two students came
- (31) Reading *B*: not both of the students came (one of them came)



Syntactic analyses:

- (32) a. (dass) beide Studenten **nicht** kamen
(that) both students not came
b. (dass) **nicht** beide Studenten kamen
(that) both students not came

Verb movement, leaving what is called a **trace**; traces are coindexed with the moved material (their antecedent):

- (33) a. kamen_x beide Studenten nicht t_x
b. kamen_x nicht beide Studenten t_x

Topicalization (leaving again a trace):

- (34) a. Beide Studenten_y kamen_x t_y nicht t_x
b. Beide Studenten_y kamen_x nicht t_y t_x

We can account for the ambiguity assuming that semantic interpretation refers to the position of the trace, either by undoing the movement or by assuming that the trace somehow retains the semantic material of the moved items.

Overview

Ambiguity:
Examples

Structural
Ambiguity

About
Meaning

Purely
Structural?

Scope and
Domains

Syntactic
Domains
and Recon-
struction

Logical
Form

Opaque
and
Transparent
Readings

The general technical term for this is **reconstruction**.

Note: the same method could also be applied to the English version if it is assumed that the subject is generated inside the VP, as shown in (35):

(35) both students_y didn't t_y come

The choice would then be to reconstruct *both students*, or to interpret *both students* **in situ**, i.e. at the surface position.

Overview

Ambiguity:
Examples

Structural
Ambiguity

About
Meaning

Purely
Structural?

Scope and
Domains

Syntactic
Domains
and Recon-
struction

Logical
Form

Opaque
and
Transparent
Readings

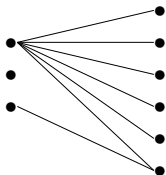
The following ambiguity pertains to German:

(36) jeden Schüler_{object} lobte genau ein Lehrer_{subject}
every pupil praised exactly one teacher

(37) a. Reading A: For every pupil there is exactly one teacher who praised him

b. Reading B: There is exactly one teacher who praised every pupil

(38) teachers pupils



Overview

Ambiguity:
Examples

Structural
Ambiguity

About
Meaning

Purely
Structural?

Scope and
Domains

Syntactic
Domains
and Recon-
struction

Logical
Form

Opaque
and
Transparent
Readings

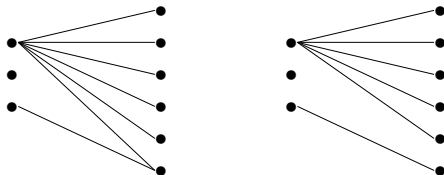
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Overview

Ambiguity:
Examples

Structural
Ambiguity

About
Meaning

Purely
Structural?

Scope and
Domains

Syntactic
Domains
and Recon-
struction

Logical
Form

Opaque
and
Transparent
Readings

Here the choice is again to reconstruct or to interpret in situ:

(39) *jeden Schüler*_{object} lobte_x genau ein Lehrer_{subject} *t*_{object} *t*_x
every pupil praised exactly one teacher

If we assume backwards movement to the position of the trace, the structure that is interpreted semantically differs from what we see (and hear); in pre-minimalist terms the syntactic representation that serves as the input to semantics was called the **Logical Form** of a sentence.

Accordingly, (39) can have two different LFs, one with reconstruction of the object, and one without.

Overview

Ambiguity:
Examples

Structural
Ambiguity

About
Meaning

Purely
Structural?

Scope and
Domains

Syntactic
Domains
and Recon-
struction

Logical
Form

Opaque
and
Transparent
Readings

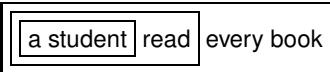
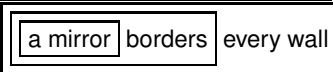
Another important case for LFs are the following ambiguous sentences:

(40) A student is robbed every day in Tübingen

(41) A carpet touched every wall

(42) A student read every book

Would-be pseudo structure:

- (43) a. 
- b. 

Overview

Ambiguity:
Examples

Structural
Ambiguity

About
Meaning

Purely
Structural?

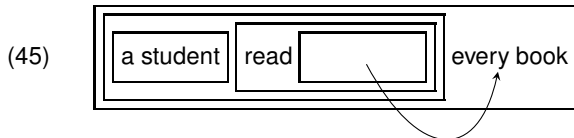
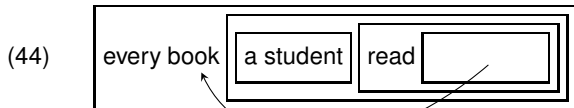
Scope and
Domains

Syntactic
Domains
and Recon-
struction

Logical
Form

Opaque
and
Transparent
Readings

Possible structures in accordance with the Scope Principle at LF:



The required LF-operation is called **Quantifier Raising (QR)**.



Overview

Ambiguity:
Examples

Structural
Ambiguity

About
Meaning

Purely
Structural?

Scope and
Domains

Syntactic
Domains
and Recon-
struction

Logical
Form

Opaque
and
Transparent
Readings

- (46) Gertrude is looking for a book about Iceland
- There is a certain book about Iceland (the one Gertrude's sister requested as a Christmas present) that Gertrude is looking for
 - Gertrude is trying to find a present for her sister and it should be a book on Iceland (but she has no particular book in mind)

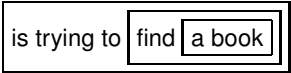
The reading of *a book* (paraphrased as “a certain book”) is often called **specific**, **referential**, or **transparent**. The reading in which the identity of the book does not matter is called the **unspecific**, **notional**, or **opaque reading**.

The ambiguity is often analysed as a matter of scope:

(47) Gertrude is trying to find a book

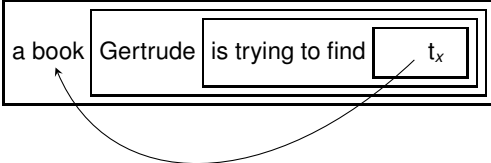
In situ interpretation (opaque):

(48) Gertrude is trying to find a book



QR-interpretation (transparent):

(49) a book Gertrude is trying to find t_x



The relevant scope-inducing item is the verb *try*.

Overview

Ambiguity:
Examples

Structural
Ambiguity

About
Meaning

Purely
Structural?

Scope and
Domains

Syntactic
Domains
and Recon-
struction

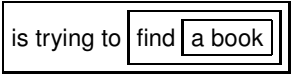
Logical
Form

Opaque
and
Transparent
Readings

(47) Gertrude is trying to find a book

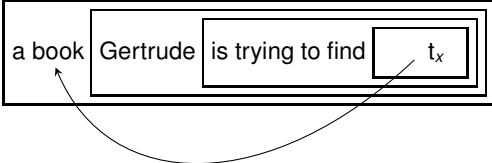
In situ interpretation (opaque):

(48) Gertrude is trying to find a book

The diagram for (48) shows the phrase "Gertrude is trying to find a book". The words "find a book" are enclosed in a single box. This box is inside a larger box that also contains the words "is trying to". This larger box is inside an even larger box that contains the entire sentence "Gertrude is trying to find a book".

QR-interpretation (transparent):

(49) a book Gertrude is trying to find t_x

The diagram for (49) shows the sentence "a book Gertrude is trying to find t_x". The words "Gertrude is trying to find" are enclosed in a box. This box is inside a larger box that also contains the words "a book". This larger box is inside an even larger box that contains the entire sentence. A curved arrow points from the t_x in the innermost box to the "a book" in the middle box, indicating a QR movement.

The relevant scope-inducing item is the verb *try*. Compare also:

(50) a. John found a book b. John seeks a book

try and *seek* are called **opaque verbs**. *find* is transparent. Only opaque verbs can induce the observed ambiguity between opaque and transparent readings.

Overview

Ambiguity:
Examples

Structural
Ambiguity

About
Meaning

Purely
Structural?

Scope and
Domains

Syntactic
Domains
and Recon-
struction

Logical
Form

Opaque
and
Transparent
Readings

A cautionary note:

QR was introduced to avoid a conflict with the Scope Principle. But the principle itself is not beyond doubt: it forces upon us a syntactic level of representation whose independent *syntactic* motivation is questionable (except for cases of reconstruction).

Alternatively, instead of introducing covert, invisible syntactic operations, it would also be possible to introduce covert invisible semantic operations. This requires advanced semantic techniques, as applied e.g. in categorial grammar.

The result would be a theory that derives the intended semantic results without movement but at the price of giving up the Scope Principle and complicating the semantics.