

## Lecture 5. Dynamic Semantics, Presuppositions, and Context Change, I.

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**Readings for Lectures 5 and 6:** Full references and links for downloading are in References at the end. These will also be on the CD.

- (1) (Stalnaker 1974) His classic paper on pragmatic presupposition
- (2) (Stalnaker 1978) This one, Assertion, is also directly relevant.
- (3) (Lewis 1979) David Lewis’s classic “Scorekeeping” paper, another foundation of context change theory
- (4) (Heim 1983a) Heim’s theory of context change directly applied to presuppositions.
- (5) (Heim 1982) Her very influential and very readable dissertation. A real classic. Try to read most of Chapter 1 and Chapter 2 and at least part of Chapter 3.
- (6) (Heim 1983b) A much shorter presentation of some of the main ideas of the dissertation.
- (7) (Karttunen 1976) – Karttunen’s seminal work on “discourse referents”.
- (8) (Roberts 2004) – a good recent handbook article on context and dynamic interpretation.
- (9) (Kamp 1981) Kamp’s Discourse Representation Theory, the classic paper.

**Semantics CD 2009:** Today everyone in class will receive a CD with readings in formal semantics and formal pragmatics, including much else: the 2009 semantics CD is the 2008 semantics CD plus new things. If you are not in class today, you may be able to copy the CD: I will provide a master copy for LaTyp at RGGU and one for OTiPL at MGU.

### 1. Before the shift from “static” to “dynamic” semantics

#### 1.1. Context-dependence

In the early years of formal semantics (mostly “Montague grammar”) in the 1970’s, there was awareness of the context-dependence of the interpretation of many expressions, and Montague himself worked on formal pragmatics as well as semantics (Montague 1968, 1970), concentrating on such elements as “I”, “you”, “now”, and the Present Tense.

Under the traditional “static” view of semantics, the core of the meaning of a sentence is its truth-conditions, and whatever those truth-conditions depend on is treated as a parameter of interpretation. We’ve already seen how truth is relative to a model and an assignment  $g$  of values to variables, which is expressed with the notation  $[[\alpha]]^{M,w,i,g} = \dots$

In Montague’s own intensional logic, the parameters of possible world ( $w$ ) and time ( $i$ ), for

‘instant’) were also included:  $[[\alpha]]^{M,w,i,g} = \dots$ . So a sentence like (1) may receive truth-value 0 in the actual world but 1 in some other possible worlds, and similarly (2) may be true in, say, the actual world at some times but false at other times.

- (1) McCain was elected president of the U.S. in 2008.
- (2) It’s snowing in Moscow.

Something more has to be done for *demonstratives* (words like *this*, *that*, *there*, *then*, words which may or must be accompanied by some demonstration, and for which we may speak of their “intended referent”) and *indexicals* (words like *I*, *here*, *now*, *today*, which anchor in a relatively fixed way to certain aspects of the speech-act context in which they are uttered). We’ll look more at demonstratives and indexicals later. One kind of proposal adds a parameter  $c$  (the context of utterance) to the evaluation, and the meanings of those words may be specifically dependent on  $c$  in the kind of way that variables in logic are given values by  $g$ .

So, for instance, the first-person pronoun *I* is an expression of type  $e$ , but it does not behave either like a constant (*John*) or like the third-person pronouns *he*, *she*, *it*, which can be analyzed as being very similar to the variables of logic. But if we have the utterance context  $c$  as a parameter of interpretation, we can write a rule for the denotation of *I*: *I* refers to whoever is the speaker in context  $c$ .

- (3)  $[[I]]^{M,w,i,g,c} = \text{speaker}(c)$

Here we treat *speaker* as a function that applies to a context and returns as value whoever is the speaker in that context. Similarly for *location* of the context, the *time* of the context, etc.

But demonstratives like *this* and *that* are less simple, since there can be multiple occurrences of them within a single sentence, and different occurrences can have different referents. One kind of proposal (oversimplified, ignoring some interesting issues) is to put indices on demonstratives as we do on pronouns: *that<sub>1</sub>*, *that<sub>2</sub>*, ... and to interpret them using context-dependent functions like  $\text{Dem}_1(c)$ ,  $\text{Dem}_2(c)$ , ... to be understood as “the first demonstrated (or ‘intended’) referent in context  $c$ ”, “the second ...”, etc.

The second-person pronoun *you* is in some ways like an indexical, in some ways like a demonstrative. It’s like an indexical in a simple two-person conversation, where there is just one addressee in the context, so we can speak of *the* addressee of the context. But in a sentence like (4), it behaves more like a demonstrative, and we should probably index the occurrences, *you<sub>1</sub>*, *you<sub>2</sub>*, etc.

- (4) I want you to take one step forward, and you to take one step back.

These could be interpreted by functions  $\text{Addressee}_1(c)$ ,  $\text{Addressee}_2(c)$ , etc.

#### Implicit context-dependence

In (Partee 1984) and (Partee 1997), I discussed the challenge posed to compositionality by various kinds of context-dependence, including the interpretation of possessives as in (5).

- (5) John’s team.

John’s team may be the team John plays for, the team he owns, the team he coaches, the team he is a fan of, and many other possibilities, some more “probable” than others, but that very probability may be heavily dependent on the context. What the semantics fixes is that the expression in (5) denotes *is the* team that John stands in a certain relation  $R$  to, but the semantic rules don’t fix the value of  $R$ . (Relational nouns like *mother* encode a specific

relation in their lexical semantics, so there is no compositionality problem in interpreting *John's mother*.) The solution proposed in the works mentioned above is to let the semantics assign a meaning that includes a particular free variable, something like  $R_{POSS}$  in this case (for “possessive relation”), whose value is taken to be dependent on the context in the same sort of way that a demonstrative is.

$$(6) \quad TR(\text{John's team}) = \lambda x (\text{team}(x) \ \& \ R_{POSS}(\text{John}, x))$$

And it would be lexically specified that the value of  $R_{POSS}$  has to be fixed by a variable assignment associated with the context, a variable assignment we might call  $g_c$ .

$$(7) \quad [[R_{POSS}]]^{M, w, i, g_c} = g_c(R_{POSS})$$

This is similar to the way we distinguished the interpretation of constants and variables in the logic: the value of the constants depends just on the interpretation function  $I$  of the model (the “lexicon”), while the value of the variables depends just on  $g$ . Now we are saying that the variable-like elements have lexical restrictions of their own – some (the “bound variable pronouns”) behave like logical variables, others want their values fixed in more restricted ways, by being “demonstrated”, or by being an “intended possessive relation”, etc.

### 1.2. The architecture of the semantics-pragmatics interface

The picture I've been painting gives a rather simple, modular view of the interface between semantics and pragmatics. Semantics works in its compositional way, climbing up the syntactic tree and assigning semantic values to the larger expression as a function of the semantic values of their parts, and at certain points the semantics inserts a variable or a context-dependent function term, which will be evaluated after all of the semantics is done. So the “semantic” output for a sentence like (8) might look very roughly as in (9).

- (8) John's team needs you.  
(9)  $need(\lambda x (\text{team}(x) \ \& \ R_{POSS}(\text{John}, x)), \text{Addressee}_1)$

This determines the truth-conditions for the sentence up to a point, but depends on a further step to evaluate what relation  $R_{POSS}$  picks out in the given context and who  $\text{Addressee}_1$  is in the given context.

So the architecture suggests a clean division of labor between semanticists and pragmaticists: we figure out how the compositional rules work, and they figure out what the nature and variety of the various context-dependent elements is and how they get their values from the context.

But with the work of Heim and Kamp and Stalnaker and Karttunen and Lewis and others, there was gradual recognition that the role of context is not so one-sided and “modular”. The crucial realization was that context also *changes* during the course of interpretation. This led to the idea of *dynamic semantics*; in Heim's terms, the meaning of a sentence is no longer a set of (static) truth-conditions. Rather, the meaning of a sentence is best viewed in terms of its *context change potential*: a sentence meaning is a function from contexts to contexts: it can be uttered in a certain class of contexts, and produces certain possible changes in those contexts as a result. We will see by the end of Lecture 6 how we can get truth-conditions as a by-product on this view.

There were at least three domains in which the dynamic two-way interaction of context and interpretation became particularly evident: (i) anaphora, and the interpretation of definite and indefinite NPs; (ii) tense and temporal anaphora; (iii) presuppositions and their “projection”

from one part of a sentence to a larger part. (There are certainly others as well.)

We'll use the first of these to illustrate this big theoretical shift, because Heim's dissertation is a beautiful classic. By the end of next week, we will probably be able to say at least a little bit about presupposition at the same time; Heim herself showed how her theoretical framework gave a natural account of presuppositions and presupposition projection. Others such as Van der Sandt have also emphasized the close parallels between anaphora and presupposition. We'll devote more time to presupposition later in the semester.

### 1.3 The context of Heim's work

Today we will start with the first chapter of Heim's dissertation (Heim 1982). At around the same time, Hans Kamp was independently working on the same problem, and the theory introduced in his paper (Kamp 1981) has much in common with Heim's theory. Heim's theory is known as “File Change Semantics”, Kamp's as “Discourse Representation Theory”; I will often refer to the two together as the Kamp-Heim approach.

We'll spend two weeks on this theoretical approach and the issues it is concerned with. This week we will discuss a bit Heim's Chapter I, “Problems concerning indefinites and anaphora in logical semantics”, which lays out the central issues and provides a critical introduction to the major approaches that had been taken to them prior to Heim's and Kamp's work. And we'll begin to discuss Heim's Chapter II, “Indefinites as variables” (just mentioning Kamp's paper), and how Heim's and Kamp's work has led to “dynamic semantics”. Next we'll continue with Heim's Chapter II, and very briefly discuss Heim's treatment of definite descriptions as anaphoric expressions in her Chapter III, “Definites in File Change Semantics”, just enough to be able to talk about the architecture of File Change Semantics and the parallels it helps to illuminate between presupposition phenomena and anaphora.

## 2. Do indefinites refer? Russell's view: NO.

- (1) A dog came in.  
(2) John is friends with a dog.

Russell (1919): **NO**. Sentence (1) asserts that:  $\text{Dog} \cap \text{Came-In} \neq \emptyset$ .

In traditional logical terms:  $\exists x(\text{Dog}(x) \ \& \ \text{Came-in}(x))$

This is entirely analogous to a universally quantified sentence like (3):

- (3) Every dog came in

Set-theoretically:  $\text{Dog} \subseteq \text{Came-in}$       Logical notation:  $\forall x(\text{Dog}(x) \rightarrow \text{Came-in}(x))$

So on Russell's view, *a dog* and *every dog* are equally quantificational, not referential.

### Arguments:

**Argument 1.** What is the referent?

- (4) John is friends with a dog, and Mary is friends with a dog.

If *a dog* **refers**, then this should assert that Mary is friends with the same dog that John is friends with. But it doesn't; Mary may be friends with the same or a different dog.

Assumption: If an expression refers, each occurrence of it should have the same reference. But consider indexicals and demonstratives like *I*, *this*, and (referential uses of) *he*.

**Argument 2.** Negation.

(5) It is not the case that a dog came in.

This sentence says that no dog came in. It doesn't say of some particular dog that it didn't come in. That is easier to account for on Russell's view than on the view that *a dog* refers.

**Argument 3.** Indefinites embedded under other quantifiers. Compare (7) and (8):

- (7) Every child owns a dog.
- (8) Every child owns Fido.

Russell's analysis gets this right; how could it be accounted for if indefinites refer?

Russell's view became the 'received' view for decades. But the problem posed for it by anaphora, especially *discourse anaphora*, has been known for a long time (Strawson (1952)).

(9) A dog came in. It lay down under the table.

This would be simple to account for if *a dog* refers; then we could say that *it* has the same referent. How can one account for such anaphora on a Russellian view? Heim's Chapter I is devoted to a critique of the proposals that existed as of 1980.

**3. The semantic problems of indefinites, quantification, discourse anaphora, donkey sentences.**

**Discourse anaphora**

- (1) *John /the man/ a man* walked in. *He* looked tired.
- (2) *Every man /no man/ more than one man* walked in. *\*He* looked tired.

Natural question: But isn't *they* ok in (2)? Answer: Yes, but plural pronouns are a different story. See (4). The argument here rests on the contrast in the use of **singular** pronouns. We may come back to plural pronouns later.

**Bound variable anaphora**

- (3) {*John /the man/ a man/ every man /no man/ more than one man*} was sure that *he* would win. Antecedent 'higher' in tree than bound variable pronoun. All OK.

**"Pragmatic" anaphora with 'constructed' antecedent**

- (4) {*Every man /no man/ more than one man*} voted for the second proposal. *They* (all) regretted having to make a choice.

We'll avoid examples with plural pronouns, and focus on the contrast between (1-2) and (3).

**Different "discourse" behavior of logically equivalent sentences.**

(Argues against a purely pragmatic account of the differences in (1-2).)

- (5) a. *One of the ten marbles is not in the bag. It is probably under the sofa.*
  - b. *Nine of the ten marbles are in the bag. ??It is probably under the sofa.*
- (Partee examples, approximately cited by Heim, p.21)

**Informal generalization: (Karttunen 1976) An indefinite NP introduces a "new discourse referent", which has a "limited lifespan."**

Examples that show "limited lifespan" of a 'discourse referent' introduced by an indefinite:

- (6) a. *John wants to catch a fish and eat it.*
- b. *Maybe he would share it with me.* (An example of "modal subordination": (Roberts 1989) )
- c. *\*It's probably under the boat now.*

If (6a) is about a 'non-specific' fish, i.e. a situation in which the speaker does not attribute to John an attitude toward a particular fish, then the "discourse referent" corresponding to *a fish* exists only within the hypothetical situation<sup>2</sup> corresponding to John's desire. On this interpretation of (6a) it is possible to follow (6a) by (6b) but not by (6c). Sentence (6c) would be fine as a continuation of (6a) if (6a) is interpreted as being about an attitude of John toward a specific fish (i.e., that there's a fish which John wants to catch and eat).

Heim's and Kamp's work provided formal foundations for the notion of "discourse referent" and laid the basis for the transition to "dynamic semantics", in which the meaning of a sentence is its "context change potential".

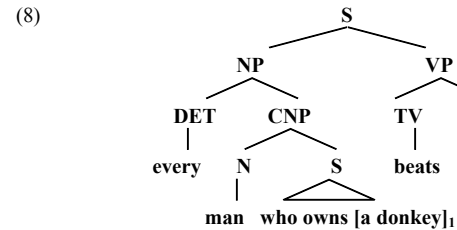
**The problem of "donkey sentences"**

- (7) a. *Every man who owns a donkey beats it.*
- b. *If a man owns a donkey, he always beats it.*

How to explain that *it* can be anaphoric to *a donkey* in these sentences?

How to explain that *a donkey* seems in effect to act like a *universally* quantified NP in these sentences?

Structure of (7a) below in (8). Coindexing indicates "intended coreference", but syntactic coindexing doesn't guarantee the desired semantic "identity", as we will see in (9).



If the VP were just *is happy*, with no pronoun to worry about, we could do a straightforward compositional semantic interpretation of the subject NP on the classic analysis (as in Lecture 3, with the generalized quantifier interpretation of *a donkey*) with no problem. On that analysis, the indefinite NP is interpreted with narrow scope (scope confined to the relative clause) and an existential interpretation. (Review Relative Clause rule for steps a-b.)

- (9) a.  $TR([who\ owns\ [a\ donkey]_i]) = \lambda z [\exists x_1 [donkey(x_1) \ \& \ own(z, x_1)]]$
- b.  $TR([man\ who\ owns\ [a\ donkey]_i]) = \lambda w [\text{man}(w) \ \& \ \lambda z [\exists x_1 [donkey(x_1) \ \& \ own(z, x_1)]](w)]$

<sup>1</sup> In the literature, this use of *a fish* is often called "non-referential", and the context in which it occurs is called "referentially opaque".

<sup>2</sup> In Haspelmath (1997), see the discussion of (Fauconnier 1985) and the concept of "mental spaces": if a fish exists only in the 'mental space' or the 'possible worlds' of John's desires, then corresponding "discourse referent" is limited to John's desire-worlds.

- =  $\lambda w[\text{man}(w) \ \& \ \exists x_1 [\text{donkey}(x_1) \ \& \ \text{own}(w, x_1)]]$
- c.  $\text{TR}([\text{every man who owns } [a \text{ donkey}]_1])$   
 =  $\text{TR}(\text{every})(\text{TR}([\text{man who owns } [a \text{ donkey}]_1]))$   
 =  $\lambda P[\forall y(\lambda w[\text{man}(w) \ \& \ \exists x_1 [\text{donkey}(x_1) \ \& \ \text{own}(w, x_1)]](y) \rightarrow P(y))]$   
 =  $\lambda P[\forall y([\text{man}(y) \ \& \ \exists x_1 [\text{donkey}(x_1) \ \& \ \text{own}(y, x_1)]] \rightarrow P(y))]$
- d.  $\text{TR}([\text{every man who owns a donkey beats it}_1])$   
 =  $\text{TR}([\text{every man who owns } [a \text{ donkey}]_1]) (\text{TR}([\text{beats it}_1]))$   
 =  $\lambda P[\forall y([\text{man}(y) \ \& \ \exists x_1 [\text{donkey}(x_1) \ \& \ \text{own}(y, x_1)]] \rightarrow P(y))](\text{beat}(x_1))$   
 =  $\forall y([\text{man}(y) \ \& \ \exists x_1 [\text{donkey}(x_1) \ \& \ \text{own}(y, x_1)]] \rightarrow \text{beat}(x_1)(y))]$   
 =  $\forall y([\text{man}(y) \ \& \ \exists x_1 [\text{donkey}(x_1) \ \& \ \text{own}(y, x_1)]] \rightarrow \text{beat}(y, x_1))]$

[Exercise for the reader: fill in the reasons for every step of the derivation, and fill in any missing steps. And practice **type-checking**: draw a derivation tree for this sentence, and fill in the types of the expressions at each node.]

This corresponds to the ‘standard’ belief that indefinite NPs are interpreted as ‘existential quantifier phrases’. And it would be fine, except **there is no reasonable compositional way to get this indefinite phrase connected to the pronoun *it* in the VP**. (This is discussed in detail in Heim Chapter 1.) Can *it* be a bound variable? Discourse pronoun? Note that in the formulas above, the variable  $x_1$  in the translation of the VP is **not** bound by the quantifier  $\exists x_1$  in the translation of *a donkey*, because it’s not in the scope of the quantifier. This is the problem that was faced by formal semantics (and all semantics, but it was not recognized until semantics became sufficiently explicit) before Heim’s and Kamp’s work.

Heim’s Section 1.6. gives a good succinct summary of the problems. Heim notes that there is no obvious “best” analysis emerging so far – all the analyses considered have problems, and it is not clear which problems will be most serious in the long run. And she notes that the problems to be discussed in section 2, concerning donkey sentences, will present all four kinds of approaches with difficulties that outweigh most of the weaknesses noted so far. Common denominator: Proponents of either approach agree that **the following three assumptions cannot all be true** (differing about which to modify):

- (a) Indefinites are existential quantifiers (except for generic ones), and never change force.
- (b) Indefinites obey the same scope-island restrictions as other quantifying NPs (and there is no exportation.)
- (c) Pronouns are either bound variables, or else refer.

#### 4. Previous approaches to anaphora with indefinite antecedents – Heim Ch. I

##### 4.1 Anaphoric pronouns as bound variables.

Let’s go back to the earlier example (9) from Section 2:

(9) A dog came in. It lay down under the table.

Strawson used such examples to argue against Russell, and to argue that indefinites sometimes DO refer. But must the pronoun in (9) refer? Sometimes pronouns are understood as bound variables. Could there be a way of analyzing the pronoun in (9) as a bound variable?

(9’)  $\exists x(\text{dog}(x) \ \& \ x \text{ came in} \ \& \ x \text{ lay down})$

Such a proposal was made by Geach (1962), who proposed assigning truth conditions to the whole discourse, not to its individual sentences.

Problems for this approach:

##### Problem 1. Discourse anaphora in discourses that cannot be simple ‘conjunction’

(10) (Strawson 1952) A: A man fell over the edge.  
B: He didn’t fall; he jumped.

(11) (Heim) A: A dog came in.  
B: What did it do next?

For (10) we need a theory which can allow that A’s statement is false and B’s true. For (11) it is hard to imagine a coherent meaning for the “whole text” – what would its type be? We need to explain how A’s utterance has a statement-meaning and B’s a question-meaning.

Heim notes that Geach’s analysis is not hereby refuted; perhaps it just needs supplementation.

##### Problem 2. Maximality/ uniqueness

A worse problem, discussed by Evans (1980, p.339).

(12) John owns some sheep.

According to Russell:  $(\exists \geq 2x)(\text{Sheep}(x) \ \& \ \text{Own}(j,x))$

(13) John owns some sheep. Harry vaccinated them.

Geach-type analysis would be:  $(\exists \geq 2x)(\text{Sheep}(x) \ \& \ \text{Own}(j,x) \ \& \ \text{Vaccinated}(h,x))$

But imagine a situation in which John owns 6 sheep and Harry vaccinated 3 of them. Geach’s analysis predicts that (13) should then be true; but our intuition is that it’s false.

Evans (1980, p.343) claims that a similar problem also arises even for the singular case.

(14) There is a doctor in London. He is Welsh. (Or: ..., and he is Welsh.)

vs.

(15) There is a doctor in London who is Welsh.

According to Geach’s analysis, (14) is equivalent to (15). But according to Evans, that’s wrong. (The literature on *uniqueness* picks up on this argument; see Kadmon’s dissertation (Kadmon 1987), Heim’s later work (Heim 1990) and other work on “E-type” pronouns, etc.)

##### Problem 3. Theories of structural constraints on quantifier scope, scope islands.

(9) A dog came in. It lay down under the table.

(16) Every dog came in. #It lay down under the table.

(17) No dog came in. #It lay down under the table.

“Real quantifiers” can’t bind across sentence boundaries.

This is of course a theory-dependent objection. It will be re-examined in Heim’s 2.1.2.

##### 4.2 Anaphoric pronouns as picking up speaker’s reference.

“A radically different approach to the relation between an indefinite antecedent and a

pronoun anaphoric to it was originally suggested by Grice. The suggestion was taken up by Kripke (1977), on whose paper I will base my discussion.” (Heim 1982, pp. 14-15). The central idea: Distinguish the literal semantic value of an expression from what a speaker is intending to convey with it. (“Semantic reference” vs. “speaker’s reference”).

The dilemma that we seem to be faced with: The anaphoric pronoun in (9) seems to pick up the referent of its antecedent, and yet Russell gave good arguments for saying that indefinite NPs don’t have a referent. Geach tried to exploit the fact that some pronouns don’t “pick up a referent” but act as bound variables. Kripke argues that there is no dilemma, because two different senses of “reference” are being conflated.

Kripke’s idea: Russell is right about the semantic value of indefinites. But there may still be a “speaker’s reference”: it may be clear to the hearer that the speaker has a particular individual in mind as the thing that satisfies the indefinite description (e.g. “is a dog and came in”), and about which he may be trying to convey some further information (e.g. that it lay down under the table.)

It would then not be unreasonable to suppose that pronouns should be able to pick up the *speaker’s reference* of their antecedents; we know independently that pronouns can get their values from the context, i.e. that pragmatics as well as semantics is relevant to the interpretation of pronouns.

David Lewis (1979) suggests a variant approach: a pronoun may refer to whatever object is maximally salient in the situation of its utterance. An object may become salient by linguistic or non-linguistic means. Linguistic means include but are not limited to the production of an antecedent that (semantically) refers to that object. An existential statement may raise an object’s salience. So it could be argued that my utterance of (18) can raise the salience of the dog that “is responsible for the truth of what I say, and for my saying it”, even if I am unable to pick out what dog that is. Thus Lewis’s analysis avoids the commitment to “having a particular referent in mind”.

**Problem** Heim raises for Grice-Kripke-Lewis account: minimal pairs like Partee’s (21a-b):

- (21) a. I dropped ten marbles and found all of them, except for one. It is probably under the sofa.  
b. ?? I dropped ten marbles and found only nine of them. It is probably under the sofa.

If salience can be raised indirectly, by virtue of there being an entity ‘responsible for the truth’ of an utterance, then why should there be any difference between 21a and 21b? It seems that we cannot after all look only at truth-conditions of sentences and context, but must consider how the sentences are worded.

First attempt at expressing the generalization illustrated by (21a-b): (p. 22)

A necessary condition for an utterance of a sentence S to promote an object x to maximal salience is that S contain either an NP that refers to x or a singular indefinite NP whose predicate is true of x.

If something like this is true we want to know why. On a Lewis-style approach, it seems to be an added stipulation.

Note that on Geach’s approach, the difference between (21a) and (21b) is accounted for.

### 4.3 Anaphoric pronouns as disguised definite descriptions.

This approach, best represented by Evans (1977, 1980), also maintains Russell’s claim that indefinites do not refer, but says that there is a third kind of interpretation for pronouns in addition to interpretations as bound variables and as “pragmatic” pronouns (referring by virtue of their referent’s salience). He calls these **E-type pronouns**<sup>3</sup>.

(9) A dog came in. It lay down under the table.

E-type pronouns have quantified (rather than referential) antecedents, but are not bound by them. Their meaning is the meaning of a systematically constructed definite description.

(9’) A dog came in. The dog that came in lay down under the table.

(24) Just one man drank champagne. He was ill.

(24’) Just one man drank champagne. The man who drank champagne was ill.

How to evaluate Evans’s proposal? We need to know how to interpret definite descriptions.

Evans’s assumption about a sentence containing a singular definite description “the F”: it implies that there is exactly one F and is true if that unique F satisfies whatever the sentence predicates of “the F”. So the second sentence of (9) is predicted to imply that exactly one dog came in, and to be true just in case the unique dog that came in lay down under the table.

The uniqueness claim for definites (and for such pronouns) is controversial. Evans predicts (contrary to Geach) that the following pairs are “by no means paraphrases”:

(27) A wine glass broke last night. It had been very expensive.

(27a) A wine glass which had been very expensive broke last night.

(14) There is a doctor in London and he is Welsh.

(14a) There is a doctor who is Welsh in London.

Heim doubts Evan’s uniqueness implication for (27), considering a scenario in which she dropped a tray with three wine glasses, breaking all of them, but two were cheap and didn’t matter to her. She finds a clearer contrast in (14) vs. (14a), and agrees with Evans’s intuitions about them. But she is skeptical about his explanation for the source of the contrast.

Her conclusion to the discussion of Evans’s proposal is to separate it into two claims:

- (a) certain anaphoric pronouns mean the same thing as certain definite descriptions;  
(b) definite descriptions are to be analyzed in a certain way, which involves predicting uniqueness-implications for singular definite descriptions.

She has cast doubt on (b), but does not question (a). The problem with (a) is that there is no available theory of the semantics of definite descriptions that helps. Paraphrasing anaphoric pronouns away as disguised definite descriptions doesn’t solve the problem without a better theory of the meaning of definite descriptions. (There has been much continuing work on “disguised definite description” approaches, including work by Heim herself, although that’s not the approach she takes in her dissertation.)

<sup>3</sup> No one has been able to remember or reconstruct why Evans called these pronouns “E-type pronouns”, but one thing everyone agrees on is that he did not name them after himself. There is a very funny invented etymology by Larry Horn on Linguist List, here: <http://www.linguistlist.org/issues/5/5-280.html>.

#### 4.4 Anaphoric pronouns and the ambiguity hypothesis.

Maybe indefinites are ambiguous, and we just have to give up looking for a uniform account.

One account which argues that there must be a referential/nonreferential (or specific/nonspecific) ambiguity in indefinites *in addition to* a scope ambiguity is Fodor and Sag (1982), using an argument based on scope islands. From (35) we conclude that “the rumor that ...” is a scope island, since “each” cannot get wide scope; yet in (36), it seems that “a student of mine” can indeed have ‘wide scope’. And since ‘a student of mine’ can have wide scope but cannot have intermediate scope, it seems better to posit a “referential” (i.e. scope-irrelevant, “as if maximal scope”) reading in addition to a quantificational reading for indefinites, than to try to invent mechanisms for giving them idiosyncratic scope-escaping properties.

- (35) John overheard the rumor that each of my students had been called before the dean.  
(36) John overheard the rumor that a student of mine had been called before the dean.

**Note:** This issue has been followed up on extensively in recent years, in work of Reinhart, Abusch, Kratzer, and others.

### 5. The main ideas of Heim’s solution. (Chapter II)

#### 5.1. Indefinite NPs: What is their semantics?

In predicate position, as in (10), uncontroversially of type  $\langle e, t \rangle$ , as in our fragment in Lecture 3. Not discussed by Heim. (Montague had a different treatment, which we’ll ignore. It’s discussed and argued against in (Partee 1986).)

- (10) a. *John is a man.*  
b. **TR**(*is a<sub>pred</sub> man*) = **man** (Lecture 3)

In subject or object or other positions (“argument positions”), as in (11), it’s more controversial.

- (11) a. *If a man owns a donkey, he always beats it.* (Heim p.123, from (Geach 1962))  
b. *A cat was at the door. It wanted to be fed.* (Heim p.166)

**Classical Montague:** A generalized quantifier with  $\exists$  in its meaning, as illustrated above.

**Heim** (building on (Lewis 1975)); similar theory independently developed by (Kamp 1981). See also (Heim 1983b). **Indefinite as a free variable.** The indefinite is like a free variable  $x_i$ , with no quantificational force of its own, which gets bound in one of two ways<sup>4</sup>:

- (a) by being under the scope of an *unselective quantifier*, as in (11a, 12) (more in Sec 2.2), or  
(b) by an operation of *existential closure*, which puts an implicit unselective  $\exists$  on texts and on the “Nuclear Scope” of tripartite structures. See example (11b) and Sec. 2.3.

- (12) a. *In most cases, if a table has lasted for 50 years, it will last for another 50.*

<sup>4</sup> Later theories have proposed other ways that implicit variables get introduced and get bound; see, for instance, (Yanovich 2006), as well as (Kratzer and Shimoyama 2002).

- b. *Sometimes, if a cat falls from the fifth floor, it survives.*  
c. *If a person falls from the fifth floor, he or she will very rarely survive.*

The examples above, from Heim p. 123, illustrate the “**quantificational variability**” of the interpretation of an indefinite NP. The examples have paraphrases involving ‘most tables’, ‘some cats’, ‘very few people’ respectively.

#### 5.2 Adverbs of quantification, and quantificational determiners, as unselective binders.

Lewis’s treatment of Q-adverbs as “**unselective quantifiers**” (Lewis 1975).

- (13) “always ( $\varphi, \psi$ )” is true if every assignment to the free variables in  $\varphi$  which makes  $\varphi$  true also makes  $\psi$  true. (Heim p.125)

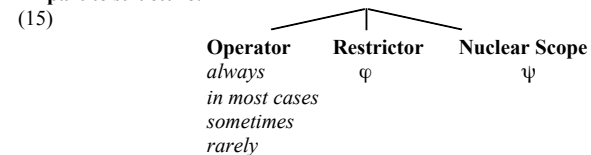
Applied to (7b), this rule gives truth conditions equivalent to those of (14) below, where the unselective quantifier is paraphrased by a pair of selective ones:

- (14)  $\forall x \forall y ((x \text{ is a man} \ \& \ y \text{ is a donkey} \ \& \ x \text{ owns } y) \rightarrow x \text{ beats } y)$

#### Tripartite structures

In the structure “always ( $\varphi, \psi$ )”,  $\varphi$  plays the role of *restricting* the domain of quantification. It has thus become common since Heim’s work<sup>5</sup> to follow her terminology and view unselective quantificational structures as having the following three parts:

#### Tripartite structure:



#### Every, etc as unselective binders.

Heim argues that not only the adverbs of quantification act as unselective binders, binding all indefinites in their scope, but so do the determiner quantifiers like *every*. She solves the problem of the donkey-sentences by treating the “logical form” of (7b) as very similar to that of (7a), even though on the surface the two sentences are quite different.

But they are not semantically so different, if we remember that a Det could be looked at as taking two  $\langle e, t \rangle$  arguments. In Heim’s approach, we replace the  $\langle e, t \rangle$  arguments by *open sentences*, type  $t$  but with one or more free variables. And the Det becomes a variable-binding operator, but an unselective binder.

Compare the two treatments of (7a): what gets bound by what, and how.

**MG semantics** corresponding to tree (8):

- (16) **Every’ (CNP’)(VP’)** Types: CNP’:  $\langle e, t \rangle$ , VP’:  $\langle e, t \rangle$ . **Every’:**  $\langle \langle e, t \rangle, \langle \langle e, t \rangle, t \rangle \rangle$   
**Every’ ( $\lambda w [\text{man}(w) \ \& \ \dots]$ ) (beat’( $x_i$ ))**

<sup>5</sup> See, for instance: (Bach et al. 1995, Hajičová et al. 1998, von Stechow 1994)

(See complete derivation in (9).)

**Heim semantics** corresponding to tripartite structure:

- (17) **Every'** (CNP')(S') Types: CNP', S': t. **Every'**: An unselective variable-binder.  
No MG type ("syncategorematic")

Note that Heim's unselective *every* operator binds both the 'man-variable' and the 'donkey-variable', unlike Montague's *every* (which doesn't directly bind anything; but indirectly it causes the 'man-variable' to get bound, but not the 'donkey-variable'.)

### 5.3. Existential closure.

Heim's strategy: consider the complex sentences first, to understand the true nature of the indefinite NP and to see arguments for believing that it has no quantificational force of its own, but gets its quantificational force from various unselective quantifiers that can bind it.

But then what about the simple sentences where the indefinite looks like it has an existential quantifier as part of its meaning, like (11b)?

**Idea: existential closure at the level of texts.**

Interpretation of (11b) before existential closure, treating sequences of sentences as conjoined (Simplest "rhetorical structure"; there are other possibilities as well.):

- (18)  $(\text{cat}(x_i) \ \& \ \text{be-at-the-door}(x_i) \ \& \ \text{wanted-to-be-fed}(x_i))$

**Existential closure:** Unselective binder  $\exists$  binds all variables free in its scope, in this case just  $x_i$ . (For interpretation of subscript on  $\exists$ , see Heim p.166-167)

- (19)  $\exists_i (\text{cat}(x_i) \ \& \ \text{be-at-the-door}(x_i) \ \& \ \text{wanted-to-be-fed}(x_i))$

### 5.4. Other important aspects of Heim's system.

**The interpretation of Definites:** Indefinites introduce *new* variables ("discourse referents") and put restrictions on their domain; definites are also interpreted as variables, but *old* variables, and their descriptive content is presupposed rather than acting as a domain restrictor. This is a formalization of the "familiarity theory" of definites, which is in competition with the "uniqueness theory" of definites. The familiarity theory treats definites as anaphoric, with much appeal to accommodation for apparently novel definites. The debate continues. More on definites next week.

Heim's most famous example in support of the familiarity theory, against the uniqueness theory:

- (20) Everybody who bought a sage plant here bought eight others along with it. (p.89)

**Still to come:** Heim's "Chapter 3" theory, File Change Semantics, a truly dynamic system. The Chapter 2 theory can be construed as a "Logical Form" solution, with new representations but not a big change in how the semantics works. In the Chapter 3 theory, to be discussed next week, we will see a bigger change; similar ideas, but with a very different architecture.

## Homework #2: Due April 17.

**Choose one or two or three questions to write about – do a reasonable amount total.** If one of the questions is particularly interesting for you, you can concentrate on just that one; or you can choose to say a little bit about several of them.

1. In Heim's Chapter 2 theory, she handles "discourse anaphora" with indefinite antecedents (*A cat was at the door. It wanted to be fed.*) by positing existential closure over texts, as we saw in the last section. Aside from whatever doubts we might have from a syntactic point of view, can you think of some examples that might pose difficulties for that solution? (There may even be some problematic examples in this handout.)

2. Typology question 1: Heim's dissertation is focused on the interpretation of indefinite and definite NPs in English, NPs headed by the articles *a* and *the*. Consider Russian, and/or any language that you have worked on that has more or fewer articles than English does (let's refer to "Language L"). Write down your thoughts and/or questions about what proposals have been or might be made for the treatment of "definite" and "indefinite" NPs in Language L, and about how Heim's arguments do or don't apply to any such treatment in Language L. This question is a little bit vague; feel free to interpret it in any way that makes it interesting for you.

3. One of the big issues (and this is currently beginning to be a "hot topic" in formal semantics and pragmatics) is whether in a language like Russian, a bare NP is *ambiguous* between a definite and an indefinite interpretation, or whether it has a *neutral* interpretation – and in the latter case, what that neutral interpretation might be.

(i) Show how Heim's approach (especially in Chapter 3, which we'll discuss next week) would make it easier to analyze Russian as having a *neutral* definite-indefinite interpretation for a bare singular NP than Russell's or Montague's approach would.

(ii) Do you know of, or can you find, any evidence concerning the question of whether bare singular NPs in Russian (or in any Language L you may know about) are ambiguous between definite and indefinite or not?

4. Look back at Lecture 4. Study the differences between entailments, conventional implicatures, and conversational implicatures. In Russian (or in your native language if it's not Russian), give some examples of each, and explain why you have chosen to classify them as you have. It may be interesting to try to identify some borderline cases for which you're not sure how to classify them: we could then discuss those together in seminar, and come back to them when we have more discussion of conventional implicatures and presuppositions. (You can also include presuppositions in this assignment; but we won't try yet to make a clear distinction between semantic and pragmatic presupposition.)

I'm suggesting that you use Russian for this task, not any other "Language L", so that I can understand your answers and so that we can compare them. But something like this for another "Language L" might turn out to be a possible topic for your presentation in Week 10.

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