Indefinites: Lewis & co.

Plan:

- ▶ Karen Lewis argues that indefinites contribute novel discourse referents via pragmatics, not semantics
    1. A student walked into Sue's office and asked her about his exam.
    2. Finally, a student needed her help!
- ▶ Menagerie of some dynamic treatments of indefinites
    - ▶ Heim
    - ▶ DPL
    - ▶ GSV
    - ▶ Dekker's PLA
    - ▶ Mandelkern ms.
    - ▶ Elliott [see talk announcement]
    - ▶ (Charlow will be discussed 7 April)
- ▶ House rules: questions and comments encouraged throughout

Elliott talk

- ▶ Tuesday March 23rd 14:00 EST
- ▶ I'll plan to talk for 60 mins followed by discussion
- ▶ Here is the link (password is "anaphora").

LINK w/embedded password

https://mit.zoom.us/j/94232517330

Lewis 2012: Discourse dynamics, pragmatics, and indefinites

Goal: to "maintain a traditional static notion of content and account for the relevant updates to the context by appealing to pragmatics"

- ▶ Problem domain: indefinites
  - ▶ **_Truth conditions_**: standard classical existential quantification
  - ▶ **_Novelty_**: (roughly) "a speaker is talking about something that is novel for the purposes of the conversation"
  - ▶ **_Licensing_**: the use of an indefinite licenses the anaphoric use of a referring expression such as a pronoun that takes the indefinite as its antecedent

A typical licensing use

4.   a. A woman walked in.
      b. She ordered lunch.

► "In some cases, there may even be no fact of the matter which woman discourse (4) is about.
► But it is clear that according to the conversation, the properties of being a woman, walking in, and ordering lunch should be bundled together.
► The discourse does not accurately represent the world if there turns out not to be a single object that shares these properties.
► And the conversational participants are not accurately tracking the conversation if they think that there are two distinct things under discussion, say, a woman who walked in and another individual that ordered lunch."

The dynamic view

- (4a) encodes an instruction to add a file card to the context
  - give it a label that has not yet been used, such as x, and then
  - record on it *x is a woman* and *x walked in*.
- (4b) encodes an instruction to update the file card labeled x
  - add in the information *x ordered lunch*
- simultaneously accounts for novelty and licensing
- also explains donkey anaphora

The pragmatic view

- "A well-run conversation is just like any ... other co-operative, rational activity."
- In particular, "To be able to follow a conversation, then, participants must keep track of the objects under discussion."
- "On my view... tracking the conversation—i.e. updating the conversational context—is a pragmatic process involving plan recognition."
- Compatible with Grice: implicatures depend on recognizing speakers' intentions
- Not identical to Grice, which involves recognizing what the speaker intends for the listeners' beliefs to change, but also "how the speaker wants to fit her contribution into the overall conversation".

Davis 1998: the "close-but" implicature

15.
    a. Did anyone in the class get an A?
    b. Some students got B+'s.

▶ Standard scalar implicature for (15b):
    ▶ not all students got B+'s.
▶ Intended implicature: no students got A's.
▶ Only the intended implicature settles the QUD.
▶ 15b is a strategic way of answering the question, since it provides additional information, namely
    ▶ What is the highest grade that a student did get?
▶ So recognizing speaker's plans can explain implicatures beyond the reach of standard Gricean maxims

Application to indefinites

Lewis' view:

- "By assumption, the semantic value of an indefinite does not pick out a particular file card (or object in the world).
- Neither does it encode anything about novelty or familiarity.
- [An indefinite] simply makes a general, existential claim about the world."

How the lunch example works

4.   a. A woman walked in.
        b. She ordered lunch.

▶ Content of (4a): there is at least one woman who has the property of walking in.
▶ "Explicitly using the expression *a woman* is a fairly perspicuous way of revealing a plan to talk about a woman."
▶ There are other ways of conveying the truth conditional content, e.g.:
  ▶ Not every woman didn't enter.
▶ too complicated, indefinite more "transparent"
▶ I'm not fully tracking how the point about double negation supports the main argument
  ▶ Maybe: indefinites are especially, perhaps uniquely good at revealing a plan to talk about a new entity?

Explanation

- ▶ "Does the speaker want to convey information about a woman already under discussion, or is this woman novel to the discussion?
- ▶ If the speaker had wanted to pick out a particular woman already under discussion, she had a much better way to do so, one far less prone to interpretive error: she could have used a pronoun, definite description, demonstrative, or name.
- ▶ But the speaker didn't do so. So *unless there is some other clear reason for the speaker making an existential claim rather than one containing a definite expression* [as we will see below; my emphasis –CB], [4a] is indicative of a plan to convey information about a new woman under discussion.
- ▶ Talking about a novel woman is often indicative of a plan to go on and say something more about that woman.

Explanation cont'd

- So co-operative interlocutors who want to responsibly track the conversation, upon recognizing the speaker's plan to talk about a new woman, will add a novel file card with the information x is a woman and x walked in (where x is a previously unused symbol).

- The addition of the appropriate file card connects the existential claim to the set of file cards, making it relevant to the conversation in general.

- But this very same act explains why the subsequent anaphoric pronoun in [4b] is licensed—there is now an appropriate file card in the context which it can pick up on."

- "This replicates the elegant results of the dynamic semantic accounts without making the mistake of semantically encoding novelty and without abandoning traditional treatments of semantic content."

Comments (Zhuoye Zhao)

- ▶ The explanation depends on assuming that, e.g., pronouns and definite descriptions are better ways of signalling an intention to talk about a previously mentioned object
  - ▶ Because the referent of an indefinite is indeterminate—need not be a particular woman—
    - ▶ The use of an indefinite **can** be used to introduce a novel object
  - ▶ Because the referent of a pronoun or definite is determinate—it needs to be a familiar object—
    - ▶ The use of a pronoun or indefinite **cannot** be used to introduce a novel object
- ▶ BTW, how does donkey anaphora work? Pragmatic update must be sub-sentential

Karen 9 Mar: "I do not claim, nor do I think I need to claim, that because the referent of a pronoun or definite is determinate that is needs to be a familiar object. Rather what I said is that definites and pronouns (because they have determinate reference) are better, more perspicuous devices for referring to familiar objects in discourse. That doesn't mean they can't also sometimes introduce novel objects (which I think they in fact do)." CB: Right on!

Case in point: novelty and possessive descriptions

- ▶ In virtue of what must pronouns and definite descriptions pick out a familiar object?
- ▶ It's not in virtue of their meaning being determinate
- ▶ Because if it were, possessives would not be able to introducing novel objects, but they make excellent first mentions:

1. A woman entered. She had a child with her.
2. A woman entered. **Her son** was with her. She spoke to *her son*.

- ▶ So "definite" possessives can either introduce a novel object (**first occurrence**) or can recall an already familiar object (*second occurrence*).
- ▶ Perhaps pronouns and definite descriptions presuppose familiarity.
- ▶ If so, the grammar is still in the business of regulating discourse structure

Good predictions: non-licensing, non-novel uses

- ▶ If indefinites do not conventionally guarantee novelty,
- ▶ then under the right planning circumstances,
- ▶ a use of an indefinite might not give rise to novelty
- ▶ This in fact is exactly what happens: novelty without licensing
  1. Negation:
     a. Sue didn't talk to a student yesterday. [discuss NPIs]
     b. He didn't need help.
  2. Some attitude contexts?
     a. Sue thought she saw a unicorn.
     b. It was eating grass. (# without modal subordination)
  - ▶ These uses do not license anaphora.
  - ▶ But they seem ok wrt novelty.

Summary uses: licensing without novelty

1.
   a. *A student* walked into Sue's office and asked her about his exam.
   b. Finally, a student needed her help!

2.
   a. I went to see *Star Trek* on Sunday.
   b. That's pretty much all I did all weekend: I saw a movie.

3.
   a. We have *this nail* here.
   b. Unfortunately, now we have a nail and no hammer.

4.
   a. I went out to dinner with *the woman from the bar* last night.
   b. Can you believe it—a woman went out to dinner with me!

▶ Various antecedent expressions: indefinite, proper name, demonstrative, definite description.

▶ Unlike previous slide, no interaction with a superordinate operator

▶ Not incompatible with a claim that indefinites license anaphora

Defending traditional dynamic accounts (Anna Alsop)

Dynamic accounts do not require indefinites to be non-coreferent

- ▶ Heim 1983: indefinites require (technically, presuppose) *indifference*:
    - ▶ the index of an indefinite must treat all individuals as equal
    - ▶ Nothing prevents two indefinites from describing a single reference maker.
    - ▶ [add implementation details]
- ▶ GSV: indefinites must refer to two distinct pegs
    - ▶ distinct pegs, in turn, must be indifferent
    - ▶ Once again, nothing prevents two indefinites from having the same reference maker.

Lewis: "It is important to note that novelty is not a matter of reference or denotation; no one claims that the object in the world that actually satisfies the indefinite description has to be new to the conversation. Novelty is the claim that, roughly, a speaker is talking about something that is novel for the purposes of the conversation."

Pushback cont'd

- In what sense are the summary cases in violation of dynamic requirements?
- Sharpening the defense of dynamic treatments: dynamic treatments guarantee indifference, but they do not guarantee that indefinites must be first mentions, so summary cases are in fact compatible with at least two paradigm dynamic accounts.
- Slogan: each indefinite must create a novel peg, but distinct pegs can corefer
- Summary examples teach us something important about the nature of indefinites, but don't adjudicate between dynamic versus pragmatic treatments

A response from Karen

Lewis, 9 Mar 2021: "Novelty of peg does not require novelty of referent. But it does require novelty of object under discussion. That is, it is not a misunderstanding of the conversation to think that there are possibly 2 different individuals under discussion (this is what you are calling the guarantee of indifference). But in the summary cases this is a misunderstanding of the objects under discussion in the conversation. There is not indifference, rather it is a misunderstanding of the conversation to think there are, e.g., possibly 2 students under discussion."

What summary uses might look like in GSV (Anna Alsop)

1. Null context, empty reference system (no pegs).

2. Update with "I went to see Star Trek on Saturday."

   ▶ No new pegs; narrows the context to possibilities such that the speaker went to see Star Trek on Saturday.

3. Add an exhaustivity inference, either a semantic Exh operator or Gricean pragmatics

   ▶ Narrows the context further to worlds in which the speaker only watched Star Trek, and no other movie.

4. Update with "I saw a^x movie."

   ▶ New peg, 1, for x; the possibilities $i = <r,g,w>$ that survive are ones in which $g(1)$ is a movie that the speaker watched.
   ▶ The input context from Step 2 only contains worlds in which the speaker watched Star Trek
   ▶ The updated context looks like this:

   $$[[[StarTrek], w_1], [[StarTrek], w_2], [[StarTrek], w_3]...]$$

   where for $w_1, w_2, ...,$ the speaker only watched Star Trek

Result (Anna cont'd)

- We've derived that the indefinite "a movie" necessarily refers to Star Trek in the context, even under the assumption that the indefinite does still introduce a peg.
- The exhaustive inference in Step 3 is crucial here, otherwise on some assignments $g(1)$ will be a movie other than Star Trek.
- Factors supporting this inference:
  - The sentence "That's pretty much all I did this weekend..."
  - There's probably a supporting scalar implicature arising from the use of the singular indefinite
- Conclusion: some dynamic systems have novelty conditions that can handle summary uses, given extra assumptions

Test case

1.   a. Yesterday, Bill came to Sue's office hours.
        b. Later, Rohit also came to Sue's office hours.
        c. Finally, a student needed her help!

- ▶ Possible judgments:
  - ▶ The indefinite tracks only Rohit (or only Bill)
  - ▶ (1c) is degraded, it should be a plural indefinite
  - ▶ Something is wierd here

Formal fragment: PL_{+D}: Predicate Logic Plus Dynamics

PL_{+D} syntax and model: standard predicate calculus

1.
$$\llbracket t \rrbracket_g = g(t) \text{ if t is a variable}$$
$$= F(t) \text{ if t is a constant}$$

2. $\llbracket Rt_1 \ldots t_n \rrbracket = \{g | \langle \llbracket t_1 \rrbracket_g \ldots \llbracket t_n \rrbracket_g \rangle \in F(R)\}$

3. $\llbracket \phi \wedge \psi \rrbracket = \{g | g \in \llbracket \phi \rrbracket \,\&\, g \in \llbracket \psi \rrbracket\}$

4. $\llbracket \exists x \phi \rrbracket = \{g | \exists k : k[x]g \,\&\, k \in \llbracket \phi \rrbracket\}$

Figure 1: PL_{+D} semantics

PL_{+D} pragmatic updates

Where C is the input context, P is the content of an arbitrary assertion, and H is an arbitrary predicate, the 2 pragmatic updates are:

1. $C[P] = C \cap P$ (Truth-conditional update)
2. $C[\exists x H x]^{46} = \bigcup_{g \in C} \{h | \, h[x]g \,\&\, h(x) \in F(H)\}$ (New file card update)

Implementation (available on repo)

32. a. A^x woman walked in.
     b. She$_1$ ordered lunch.

```
woman n = elem n [2,3,4,5]
cameIn n = elem n [3,4,5]
lunch n = elem n [3,4]

s1 = lift woman (var 1)               -- woman (x1)
s2 = conj s1 ((lift cameIn) (var 1))  -- came.in (x1)
s3 = exists 1 s2                      -- a^x1 woman came in
s4 = lift lunch (var 1)               -- she_x1 ordered lunch
c1 = updateWithAssertion nullContext s3
c2 = updateWithExistential c1 1 s2
c3 = updateWithAssertion c2 s4
```

Lewis: Let's see how PL?D explains (32). Conversational participants always update the context with the informational content of an assertion (by intersection). The content of (32a) is the set of assignment functions such that for each assignment function, there exists at least one x-variant that assigns x to a woman who walked in. If there is such an object in the model, this will amount to the denotation being the set of all assignment functions. The intersective update, therefore, has no effect on the input context.

```
nullContext == [[1],[2],[3],[4],[5]]
c1 == [[1],[2],[3],[4],[5]]
```

(32a), as an existential, also triggers the second pragmatic update. The function for adding a new file card takes the input context and returns all the x-variants of each assignment function that assign x to a woman who walked in. So after semantically and pragmatically processing (32a), the context is in the same state as after the semantic processing of the same sentence according to DPL.

```
c2 == [[3],[4],[5]]
```

(32b) will trigger the normal intersective update. Its content is the set of assignment functions that assign x to something that ordered lunch. Since all the the assignment functions in its input context assign x to a woman who walked in, the resulting output context will include only assignments that assign x to a woman who walked in and ordered lunch.

```
c3 == [[3],[4]]
```

Same example run through the DPL evaluator from week 2:

```
-- Lewis 2012 example
woman = Precedes (Num 1)    -- 2,3,4,5
cameIn = Precedes (Num 2)   -- 3,4,5
lunch = Follows (Num 5)     -- 1,2,3,4
c13 = evalFor (Exists 1 (And (woman (Var 1)) (cameIn (Var 1
-- c13 == [[3],[4],[5]]
c14 = evalFor (lunch (Var 1)) c13
-- c14 == [[3],[4]]
```

Dekker 2004: Predicate Logic with Anaphora

- ▶ Dekker 1994: PLA as a dynamic update semantics
- ▶ Dekker 2004: PLA as a static semantics with Tarskian witnesses

$$\vec{e} \models_{M,g} Rt_1 \ldots t_m \text{ iff } \langle [t_1]_{g,\vec{e}}, \ldots, [t_m]_{g,\vec{e}} \rangle \in E(R)$$
$$\vec{e} \models_{M,g} \exists x \phi \quad\quad \text{ iff } \vec{e}-1 \models_{M,g[x/\vec{e}_1]} \phi$$
$$\vec{e} \models_{M,g} \neg\phi \quad\quad \text{ iff } \neg\exists\vec{c} \in D^{n(\phi)}: \vec{c}\vec{e} \models_{M,g} \phi$$
$$\vec{e} \models_{M,g} \phi \wedge \psi \quad\quad \text{ iff } \vec{e}-n(\psi) \models_{M,g} \phi \text{ and } \vec{e} \models_{M,g} \psi$$
where $\vec{e}-m$ is the sequence $\vec{e}_{m+1}, \vec{e}_{m+2}, \ldots$
ϕ is true wrt M, g and $\vec{e}$ iff $\exists\vec{c} \in D^{n(\phi)}: \vec{c}\vec{e} \models_{M,g} \phi$

Figure 3: Dekker's PLA (2004 static version)

- ▶ $n(\phi)$ is the number of indefinites in ϕ

PLA details (zoom to read)

The *PLA*-interpretation of terms is defined relative to a variable assignment and a sequence of individuals. Variables are assigned the value which the current variable assignment assigns to them, and a pronoun $\mathbf{p}_i$ selects the i-th individual from the sequence, thus indicating that it is coreferential with the i-th potential antecedent in preceding discourse:[22]

(6) $[x]_{g,\vec{e}} = g(x)$ $[\mathbf{p}_i]_{g,\vec{e}} = \vec{e}_i$

Satisfaction is defined relative to a first order model M, a variable assignment g and a sequence of individuals $\vec{e}$. A model $M = \langle D, E \rangle$ consists of a domain of individuals D and an interpretation E for the non-logical constants. If a sequence $\vec{e}$ satisfies a formula relative to a model M and an assignment g we will write $\vec{e} \models_{M,g} \phi$. Satisfaction is defined as follows:

(7) $\vec{e} \models_{M,g} Rt_1 \ldots t_m$ iff $\langle [t_1]_{g,\vec{e}}, \ldots, [t_m]_{g,\vec{e}} \rangle \in E(R)$
     $\vec{e} \models_{M,g} \exists x \phi$ iff $\vec{e}{-}1 \models_{M,g[x/\vec{e}_1]} \phi$
     $\vec{e} \models_{M,g} \neg \phi$ iff $\neg \exists \vec{c} \in D^{n(\phi)} \colon \vec{c}\vec{e} \models_{M,g} \phi$
     $\vec{e} \models_{M,g} \phi \wedge \psi$ iff $\vec{e}{-}n(\psi) \models_{M,g} \phi$ and $\vec{e} \models_{M,g} \psi$
     where $\vec{e}{-}m$ is the sequence $\vec{e}_{m+1}, \vec{e}_{m+2}, \ldots$

(8) ϕ is true wrt M, g and $\vec{e}$ iff $\exists \vec{c} \in D^{n(\phi)} \colon \vec{c}\vec{e} \models_{M,g} \phi$

Given a model-theoretic interpretation of relational constants, atomic formulas are evaluated relative to variable assignments, as in ordinary predicate logic, and relative to sequences of individuals, as in, e.g., (Tarski 1956). Any pronoun $\mathbf{p}_i$ in such a formula puts constraints on the i-th individual in such a sequence, and— by our dynamic notion of conjunction—this implies that it puts constraints on the possible referent of the i-last existential.

An existentially quantified formula $\exists x \phi$ behaves like an ordinary quantifier as it governs free occurrences of the variable x in its scope. However, it also behaves like a free variable itself. Possible witnesses for the quantified statement come from the first individual in the sequence relative to which the quantified formula is evaluated. So if $\vec{e}$ is a sequence satisfying ϕ under an assignment of d to x, then $d\vec{e}$ satisfies $\exists x \phi$. It is precisely because these sequences thus keep track of the possible witnesses d of x, that they can be (re-)addressed by subsequent pronouns.[23]

Figure 4: PLA details

PLA view on what's dynamic in language

The *PLA*-notion of conjunction is meant to account for the fact that when we extend our evaluation of an utterance of ϕ with that of a subsequent utterance of ψ, we take into account that $n(\psi)$ more terms with referential intentions have been used after the conjunction of ϕ with ψ. The *PLA*-satisfaction of a conjunction $\phi \wedge \psi$ thus is stated in terms of the satisfaction of both ϕ and ψ, while it bears witness of the fact that satisfaction of ϕ is evaluated $n(\phi)$ terms before that of ψ is assessed. This notion of conjunction clearly shows the indexical nature of *PLA*'s system of interpretation. The satisfaction of $\phi \wedge \psi$ is stated in terms of the satisfaction of ψ, and the satisfaction of ϕ *before all of the indefinites of ψ have been used*, and this is why pronouns in ψ may pick up intended referents mentioned before. Thus conceived, all that is dynamic about the *PLA*-notion of conjunction—and, hence, about the *PLA*-notion of interpretation—is that it accounts for the intuition that in a succession of two assertions, one assertion literally precedes the other.[27]

Figure 5: PLA pitch

Mandelkern 2021

- *Variables, definites*: $[\![x]\!]^{g,w} = [\![\iota x p]\!]^{g,w} = g(x)$ provided g is defined on x.

- *Atoms*: $[\![A(\tau_1, \tau_2, \ldots \tau_n)]\!]^{g,w} = 1$ iff $\langle [\![\tau_1]\!]^{g,w}, [\![\tau_2]\!]^{g,w}, \ldots [\![\tau_n]\!]^{g,w} \rangle \in \mathfrak{I}(A, w)$.

- *Conjunction*: $[\![p \& q]\!]^{g,w} = 1$ iff $[\![p]\!]^{g,w} = [\![q]\!]^{g,w} = 1$.

- *Disjunction*: $[\![p \vee q]\!]^{g,w} = 1$ iff $[\![p]\!]^{g,w} = 1$ or $[\![q]\!]^{g,w} = 1$.

- *Negation*: $[\![\neg p]\!]^{g,w} = 1$ iff $[\![p]\!]^{g,w} = 0$.

- *Indefinites*: $[\![\exists x p]\!]^{g,w} = 1$ iff $\exists a \in D : [\![p]\!]^{g[x \rightarrow a], w} = 1$.

These are, again, just the standard interpretation rules for classical predicate logic under the translation which takes indefinites to existential quantifiers, and definites to variables.[12]

Figure 6: Mandelkern fragment basic semantics

Mandelkern witness presupposition

The centerpiece of my proposal is that indefinites have a *witness presupposition* which says that if their scope is true relative to *any* assignment, then their scope is true relative to the starting assignment. In other words:[14]

- *Witness presupposition*: ɜxp presupposes at $\langle g, w \rangle$ that $(\exists a \in D : [\![p]\!]^{g[x \to a], w} = 1) \to [\![p]\!]^{g, w} = 1$

So, for instance, an indefinite with the form ɜ$x(cat\ x)$ presupposes that, if *anything* is a cat in w, then $g(x)$ is. This will be our way of ensuring that indefinites 'open up a file' on x: they do so by ensuring that, throughout the context, x is assigned to a witness of the corresponding existential quantifier.

Figure 7: Mandelkern witness presupposition

Mandelkern update assumptions

satisfied at any point in c, then the update will fail. If we took on this Stalnakerian assumption, then updating with indefinites would lead to constant crashes: when we update a context with, say, $\exists x F x$, we don't want to have a crash just because there are some points $\langle g, w \rangle$ in the context where $g(x)$ is not in F_w (the extension of F at w). This is why I assume that when we update c with p, we simply keep all the points from c where p is true and satt. This raises the important question of how to integrate theories of semantic presupposition into my theory: an important question, but not one I will address here.

Figure 8: Mandelkern update assumptions

- ▶ The witness condition strikes me as more of a *post*supposition than presupposition
- ▶ *A^x woman walked in*: true iff there is a woman who walked in
- ▶ $\langle g, w \rangle$ survives update only if $g(x)$ is a woman
- ▶ Summary examples work smoothly

Final thought: internal vs. external

▶ Summary uses all involve multiple assertions.
▶ Perhaps novelty is part of the sentence-internal dynamics
▶ Are there intra-sentential cases in which novelty is suspended?

1. If a bishop meets a bishop
2. If a bishop and a(nother) bishop meet
3. If a senator nominates a woman, it is usually herself.
4. If a senator nominates a senator, is it usually herself.
5. If a senator nominates another senator, it is usually herself.

▶ The simple indefinites can corefer, but when *another* is present, the indefinties must refer to different people as a matter of semantics.
▶ So it must be possible for the semantics to enforce novelty