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July 3, 2023

<center>Anaphora in Formal Pragmatics
LSA Summer Institute at UMass, Summer 2023

**Lecture I
Anaphora, RETRIEVABILITY and Weak Familiarity**</center>

Quick preview of the content of the four lectures in this course:

1. **The regular contribution of a constituent to compositional interpretation is its s content.** Constituents by themselves have no meaning in the Gricean sense: meaning$_{nn}$. For any given utterance, there is typically a significant gap between semantic content and meaning$_{nn}$.

2. **Gricean RETRIEVABILITY is at the heart of interpretation in context**. Cooperative speakers aim to facilitate interlocutors' rapid, effective retrieval of their intended meanings$_{nn}$ for what they utter, their communicative intentions. RETRIEVABILITY is a guarantee that interlocutors can grasp the intended *meaning$_{nn}$* of an utterance in context. Speakers aim for it, addressees expect it.

3. **The architecture of interpretation is designed to permit us to solve for interpretation efficiently and effectively: to quickly RETRIEVE the speaker's intended meaning$_{nn}$.** Pragmatics is often treated as a grab-bag of subjects, reflecting a variety of relatively unconnected ways in which world knowledge and the context of utterance influence compositional (truth conditional) interpretation. This approach misses the essential character of pragmatics. Linguistic pragmatics aims to characterize the properties and influence on interpretation of a specific, non-grammatical component of our linguistic competence, an interface between syntax-semantics (and hence, compositional semantics) and more general cognitive competence.

4. **Compositional semantics is static**, a rule-by-rule system built on a syntactic analysis and the semantic contents of the sub-constituents. **But the pragmatic update of context is dynamic**, so that the local context of interpretation for a given sub-constituent may be richer than the global context of utterance.

5. **Use of anaphoric triggers, like any semantically incomplete constituents, triggers a presupposition of RETRIEVABILITY**. For most definite nominals, this amounts to familiarity plus informational uniqueness.

> **inattentional blindness:** the recognition of intentions constrains the referential domain of possible antecedents to mask ir**RELEVANT** entities, thereby guiding anaphora resolution.
> **Right Frontier Constraint**: Strategies of inquiry (the evolving QUD) give a **hierarchical structure to discourse, which yields salience, thereby constraining** anaphora resolution.

6. **Indexicals are a special type of anaphoric trigger. They are perspectival**, presuppositionally anchored to a **discourse center** representing a salient modal perspective.

<center>1</center>

We'll start today with ##1, 2, and an introduction to 5, ending with some interesting puzzles to dwell on.

This Thursday we'll focus on ##3, 4, and begin to explore the application of this framework to the study of anaphora, focusing on cases involving anaphora between regular semantic content and the auxiliary content that gives rise to Pottsian (2005) conventional implicatures.

Next Monday we'll continue to use the tools introduced in the second lecture, plus an closely related approach to salience, to explore our puzzles about anaphora, and argue that this approach is both empirically and explanatorily superior to others on the market.

Finally, as time permits, we'll consider indexicals, a sub-type of anaphoric triggers with the special property of being perspectival.

1.   Anaphora and RETRIEVABILITY in discourse

The anaphoric relation between nominals is sometimes said to be one of co-reference:

>   If NP x serves as antecedent for anaphoric NP y, then x and y co-refer.

However, Strawson (1950) famously pointed out that it is not linguistic expressions themselves that refer, but speakers who refer in using them. So:

(1)   Joyce has a cat and a dog. The dog barks a lot.
1.
Clearly here the speaker is using the definite description *the dog* to refer to a particular animal, her pet. But the incomplete description *the dog* by itself arguably doesn't refer to anything. One can only understand it that way in the context of her utterance.

If NPs themselves do not refer, then presumably they cannot *co*-refer *except when used by a speaker to make an utterance.* Following Bar-Hillel (1971), take an utterance to be an ordered pair <s,c> of a linguistic constituent s and a context of utterance c.

>   An **utterance** is an ordered pair <s,c> of a linguistic constituent s (under an analysis)
>   and a context of utterance c.   (Bar-Hillel 1971)

We can generalize Strawson's observation. Take *meaning* in something like Grice's (1957) sense:

>   "U meant$_{nn}$ something by uttering x" is true if and only if, for some audience A, U uttered
>   x intending:
>   (1)   A to produce a particular response r
>   (2)   A to think (recognize) that U intends (1)
>   (3)   A to fulfill (1) on the basis of his fulfillment of (2).   (Grice 1957)

Thus, a *meaning$_{nn}$* is a particular kind of complex intention on the part of a speaker in making an utterance. Then we have the following extension of Strawson's truism:

> It isn't constituents that mean$_{nn}$ something, but speakers who do so in uttering those constituents. (follows from Grice 1957, extends Strawson's claim)

In general the conventionally given, compositionally determined semantic content of an utterance radically underdetermines the meaning of the utterance, as intended by the speaker and grasped by the addressee. If you have any doubts about the truth of the last statement, see Ginzburg (2012), as well as Sperber & Wilson (1986): Ellipsis and non-sentential utterances abound in actual human discourse, as do anaphoric elements, domain restriction, implicatures which bear on truth conditional content, and interactions between all these factors. But in view of our notable communicative success through language, it seems intuitively correct that competent speakers must have good reason to expect that our interlocutors can grasp our intended meanings. In fact, on the assumption that one can only rationally intend to do something if it is rational to believe that it can be achieved, the following principle follows from Grice's definition:

> RETRIEVABILITY: In order for an utterance to be a rational, cooperative act in a discourse interaction *D*, it must be reasonable for the speaker to expect that the addressee can grasp the speaker's intended meaning in so-uttering in *D*. (Roberts 2010)

In view of the gap between conventional content and conveyed meaning, this is a strong principle, since it requires that cooperative speakers expect that their *uniquely* intended meaning$_{nn}$ can be recognized as such by an addressee. RETRIEVABILITY leaves no room for felicitous ambiguity (thereby, one might argue, entailing Grice's Manner implicature).

> **Compositional semantics** takes a syntactic structure with its lexical content and derives semantic content: The content of the whole is a function of the content of the parts and the way they're put together.

> **Linguistic pragmatics** takes an utterance (semantic content+other aspects of lexical CHARACTER, in a context) and derives the speaker's meaning$_{nn}$ in that context.

Back to anaphora:

As usual, we assume that a context of utterance specifies a speaker. Then we could capture the traditional characterization of anaphora like this: [1]

> An NP *x* is anaphorically dependent on NP *y* in an utterance <[…x...y…],c>, if speaker(c) uttered […x...y…] intending for audience(c) to take *x* and *y* to co-refer.

This works pretty well for (1) and seems to capture what Strawson meant.

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[1] Here's the Merriam Webster on-line second sense of *anaphora*: "use of a grammatical substitute (such as a pronoun or a pro-verb) to refer to the denotation of a preceding word or group of words".

But, of course, we have:

(2)   Every dog$_i$ dug a hole to bury it$_i$s bone.

In (2), the quantificational antecedent *every dog* doesn't refer. Instead, it binds the pronoun *it*, both syntactically and semantically.

So in formal semantics, we borrow the treatment of anaphora from logic:

> In natural language, **anaphors** are constituents that contain free variables in their semantic content, introducing them to logical form via compositional semantics.

terminological note:

Some (e.g. recently K. Lewis 2022) use *anaphoric* to describe only those proforms that have overt linguistic antecedents, characterizing the others as *deictic*. Others (e.g. Nouwen 2021) tacitly assume that the targets of his investigation are e-type pronouns that have overt antecedents, describing those without antecedents as "inferential" and offering no account of how anaphora is resolved in those cases.

But I have argued that:
(a) All proforms and other definites that have deictic uses are anaphoric, so that we need a unified account of anaphora that includes deixis, as well. Uses of anaphoric elements that have no overt linguistic antecedent involve both the same semantic content and the same presupposed conditions on felicity as those that do not.
(b) Not all anaphoric proforms can be used deictically: *it* (Maclaran 1982); see the discussion in my Brazil Lecture Notes, Lecture 1, examples below. I.e., deixis is a specific type of anaphora that imposes additional constraints on antecedence.

To see that *it* cannot be demonstrative, first consider the difference between demonstrative and definite descriptions:

(3)   [Butler directing two porters A and B about which parcels *c* and *d* to bring:]
        You [nodding at A] get that parcel [pointing at c in the corner] and you [nodding at B] get that parcel [pointing at d under the window].
(4)   [same situation as (4):]
        You [nodding at A] get the parcel [pointing at c in the corner] and you [nodding at B] get the parcel [pointing at d under the window].

Though (3) with *that parcel* is perfectly felicitous, (4) with *the parcel* is not, a contrast pointed out (with other examples) by Maclaran (1982). We complete the paradigm in (3) and (4) by considering demonstrative *him* in (5) and *it* in (6):

(5)   [Relief worker A to another B at a bomb site with victims *c* and *d*:] You (nodding at B) help him (nodding at c), and I'll get him (nodding at d).
(6)   [same situation as (4):] You [nodding at A] get it [pointing at c] and you [nodding at B] get it [pointing at d].

Native speakers agree that the non-coreferential use of two tokens of *it* in (6) is very odd, much like the similar use of *the* in (4); while the non-coreferential use of two tokens of demonstrative *him* in (5) is fine. This contrast argues for the claim made above, that *it* does not have a demonstrative use, as argued in Maclaran (1982).

But even these proforms can sometimes be used without explicit prior antecedents.

(7)   [Context: looking together at a house:] <u>It</u> needs a coat of paint.

So failure to have an antecedent doesn't make an anaphor deictic.

End Terminological note.

Though we'll largely focus here on pronouns and definite descriptions, it should be noted that there are many more types of anaphoric elements:
- non-demonstrative pronouns
- definite descriptions
- demonstratives and demonstrative descriptions
- indexicals of all logical types
- domain restriction (von Fintel 1994)
- ellipses: VP ellipsis, sluicing, gapping, etc.
- tense and RT (Partee 1984)
- *too*, *again*, etc.
- *thus*, a variety of other discourse particles

Like variables in logic, natural language anaphors may occur free or be quantificationally bound. In natural language, binding is syntactically constrained, in virtue of syntactic constraints on the scope of the operators that are potential binders:

(8)   **Syntactic Constraint on Semantic Binding**:[2] For indices i and k, NP_i in a given syntactic structure S can only be understood to semantically bind NP_k if NP_i syntactically binds NP_k at LF, i.e. if NP_i commands NP_k in S at LF (in the relevant syntactic sense) and $i = k$.

There are tons of prima facie counterexamples to (8), several which we'll consider below. But I'll stick to my guns: these are only apparent counterexamples. (8) is universally valid.

Of central interest here: Free variables, those not syntactically and semantically bound at LF.

When a logical formula or a linguistic LF contains a free variable, by itself the expression is essentially incomplete: E.g., if it's the LF of an indicative sentence, by itself it fails to determine a proposition. Then, in view of RETRIEVABILITY, when a speaker uses such an expression

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[2] Büring (2005) takes a different tack in defining the scope constraint. The issues are quite complex. But something like this is clearly required. See my Lecture Notes from the 2017 Brazil course on anaphora, §3.

evidently intending to cooperatively assert something, the addressee understands that this use carries a presupposition:

> In uttering an expression whose semantic content contains a free variable, the cooperative speaker conveys that she assumes that the addressee can **RETRIEVE** the intended content of the free variable, since otherwise one could not RETRIEVE the utterance's intended meaning$_{nn}$ for the utterance as a whole.

That is, use of an expression with a free variable always presupposes that the addressee can retrieve its intended interpretation. Thus, by their nature, anaphoric elements impose a Strong Contextual Felicity constraint on the context of utterance (the +SCF of Tonhauser et al. 2012).

Retrieving a value for a free variable is not just required cross-sententially. Rather, the anaphoric relations in question may occur intra-sententially. We see this in sentences like the following:

(9)   If Pedro$_i$ owned a donkey$_k$, he$_i$ would beat it$_k$.

(10)   [Every professional man I polled]$_1$ said that while [his$_1$ wife]$_2$, who had earned a bachelor's degree$_3$, had no work experience, he$_1$ thought she$_2$ could use it$_3$ to get a good job if she$_2$ needed one.   [Amaral, Roberts & Smith 2007]

Again, examples like these cannot just involve co-reference, because other than the proper name *Pedro*, none of the nominals in such examples refers. They range over arbitrary donkeys or professional men's wives.

2. Discourse Referents as antecedents

Simple idea developed by Heim (1982):

> We can use Tarskian assignment functions to track, in a given context, the contextually available ways of giving values to free variables, rather than simply assigning them arbitrarily chosen values.

The classic Tarskian use of assignment functions is to range over values for bound variables. In MG and subsequent accounts of compositional semantics, semanticists also use assignment functions to give values to free variables: whatever assignment function g is (arbitrarily) chosen, for a given free x, the value x contributes to composition will be $g(x)$. Thus, g acts like a sky hook to just grab a value for x out of thin air.

In fact, you can think of the meaning of an indicative clause with one free variable v, like *he's hungry*, as not just a set of worlds—the proposition expressed—but a set of world-assignment pairs: those pairs of an assignment function g and world w such that the indicative is true in w under the assignment of values to v given by g.

Then consider the simple cross-sentential anaphora in (11):

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(11)   Sam$_i$ is married. He$_i$ has three children$_k$. They$_k$ are bright and happy.

Suppose that when we encounter *Sam$_i$* in the first sentence, we put a constraint on assignments used in subsequent utterances: Whatever values they assign to other indices, they have to assign the individual named Sam to the variable *x$_i$*. We're **treating the referential index on the NP— the same referential index used to track grammaticality under syntactic Binding Theory— as the address of an associated variable**: NP$_i$ is associated with x$_i$. Now we put constrain the interpretation of subsequent sentences to only involve appropriate assignment functions—those that track the addresses of NPs encountered in previous discourse, and assign variables with that address to values that accord with those of the previously encountered NPs. Thus, we choose the assignment function used for interpretation of the indicative clause not arbitrarily, but because it reflects the values assigned to those indices already used in prior discourse, values chosen because they verified the relevant utterances. Call those variables with previously encountered addresses the **familiar** variables, and any assignment function which verifies the previous utterances a **discourse appropriate** assignment function. Then in interpreting a new utterance, we only choose one of the discourse appropriate assignment functions.

In (11), the first sentence leads us to introduce a constraint on appropriate assignment functions for this discourse: The value of the ith variable thereafter should be the individual Sam. When we encounter the free variable associated with *he*, its referential index tells us to assign it the value of the ith variable, which is Sam. And if we take the second sentence to be true, the referential index on the indefinite *three children* tells us to assign a value to the kth variable which is the group of three children whose father is Sam. When we encounter *they* in the third sentence, it picks up the value we just assigned to the kth variable. Etc.

In constraining assignment functions in this way, we want our procedure to respect an important constraint on anaphoric antecedence:

(12)   **Generalized ROOFING**: In anaphora resolution in discourse, including that involving
         elliptical constructions, the antecedent constituent(s) cannot be semantically "roofed" by
         (under the scope of) an operator OP unless OP also has scope over the anaphoric trigger—
         the overt anaphoric element or elided constituent. I.e.,
                 in felicitous anaphora or ellipsis, if the antecedent is roofed by an operator OP,
                 then the anaphoric element must be ROOFED by OP as well.

We find evidence for ROOFING across a wide range of constructions, including ellipses as well as nominal anaphors. Consider this example involving inverse linking:

(13)   Guinevere met a representative$_i$ from [every city in Ohio]$_k$.
         The representative$_i$ was new to the legislature.

The indefinite object *a representative from every city in Ohio$_i$* in (13) is free—it is not semantically bound. But on the most natural interpretation of (13), it takes narrow scope relative to the QP *every city at Ohio*. What this means is that the value of *a representative from x$_k$* will co-vary in value with a given city in the domain of *every city in Ohio$_k$*. That is, *a representative* is ROOFED by *every city in Ohio*. So there is no reference to a particular representative in the first

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sentence: The value of the indefinite is, in that sense, an arbitrary individual, as logicians call it. But then, intuitively, there should be no appropriate available antecedent for the indefinite subject of the second sentence. So we want our assignment function management system to respect roofing: When it encounters indefinites under the scope of a quantifier, it only assigns values to the indefinite's referential index variable temporarily, while considering the operator's domain and scope. Even if we co-index the indefinite with *the representative* in the second sentence, the former shouldn't be an available antecedent for the latter. And if we do understand the discourse with this anaphoric relation, the first sentence has only the odd, non-inverse interpretation where one and the same representative is from every city in Ohio.

That is, if our management of available values for free variables is handled correctly, the ROOFING constraint on anaphoric antecedence should fall out; it needn't be stipulated as a constraint on co-indexation in this discourse.

But indefinites that are quantificationally ROOFED may, indeed, serve as anaphoric antecedents to pronouns under the same roof. We already saw this in the classic conditional donkey sentence (9), and its quantificational counterpart (14):

(14)   Every farmer$_i$ who own a donkey$_k$, beat it$_k$.

Indefinite *a donkey* is roofed by the modal operator associated with *would* in (9), the quantificational subject *every farmer* in (14), but so is *it* in the consequent or VP. So within the scope of the roofing operator, the value of the kth variable should be the arbitrary donkey that is picked out in ranging over the operator's domain: In any given (possibly irrealis) circumstance where Pedro/the arbitrary farmer owns some donkey or other, he beats that (arbitrarily chosen) donkey.

Examples like (9), (13), and (14) illustrate how some things in the referential domain at a given point in discourse may be arbitrary—the arbitrary city or donkey, and even irrealis, i.e. this is not the set of entities that have been *referred to*. It makes no sense to talk about the anaphora in these examples as ensuring co-reference, because no particular entities are referred to. Instead, **the anaphoric relation indicates that the values of the anaphor and antecedent *co-vary*, as a function of the value assigned to the antecedent**.

It was in view of such cases with non-referential antecedents that Karttunen (1976) introduced his notion of a **discourse referent**, permitting us to talk about anaphora without reference. Heim's use of assignment functions across discourse is a way of modeling discourse referents:

> A discourse referent d_i is a constraint on the values that can be assigned to variables bearing the referential index i.

We can keep track of the addresses of variables that have been constrained in prior discourse: These are the available discourse referent (dRef) antecedents, the **familiar dRefs** at that point in discourse.

3. **Familiarity and Retrievability**

Can the RETRIEVABILITY presupposition associated with anaphoric nominals and other elements (BHP's Reference Times, von Fintel's domains, etc.) generally be satisfactorily characterized as requiring a familiar, co-indexed antecedent dRef? i.e., does anaphora always carry a familiarity presupposition? (Heim 1982 and much subsequent work, including my own)?

Merely weak familiarity: (Roberts 2003)

If anaphora involves the presupposition of discourse familiarity, dRefs must be introduced non-linguistically. Anaphoric content is quite regularly felicitously retrieved with no overt antecedent:

(15)   [Context: looking together at a house:] <u>It</u> needs a coat of paint.
(16)   [Context: looking ogether at a house:] <u>The roof</u> needs fixing.
(17)   [Context: looking together at a house:] <u>That roof</u> needs fixing.

(18)   [Two women are standing at a bus stop on a rainy day. A car drives by, through a puddle, splashing one of the women with muddy water.]
          To the splashed woman: <u>One</u> splashed ME this morning, <u>too</u>.[1]

(19)   [A policeman on the beat turns a corner and sees a young kid with a rock, poised to throw it through the window of a school. The kid doesn't see him yet:]
          Policeman: I <u>wouldn't</u>, if I were you.

(20)   [A guy is standing in front of a make-shift monument on the sidewalk in front of a house where two neighborhood kids carried out a suicide pact earlier that week. Another neighbor comes up to stand beside him, also silently gazing at the monument. After awhile, one of them says:] I just cannot fathom <u>why</u>.

Most authors in the literature on *too*, VP ellipsis and Sluicing assume that generally an explicit antecedent constituent is required in all these cases. But (18), (19) and (20) show that on occasion that is not the case. Instead, in all these cases the existence and salience of the intended content of the anaphor is contextually evident to the interlocutors, all of whom as attending to a particularly striking circumstance.

And consider:

(21)   Frank is a beekeeper. He keeps <u>them</u> in the orchard.

In order to be a beekeeper, one must have bees. Knowing this, and given the salience of the beekeeping, the existence of the bees themselves is sufficiently salient (for many of us) to license the use of *them* to refer to the bees.

Contextually evident or entailed existence = weak familiarity
Weakly familiar entities which are salient and available (under ROOFING)
to an anaphor are RETRIEVABLE as anaphoric antecedents.

Note that salience is quite important. Cf. the difference in this famous pair due to Partee (p.c. to Heim 1982), uttered out of the blue:

(22)   I dropped ten marbles and found all of them, except for one. <u>It</u> is probably under the sofa.
(23)   I dropped ten marbles and found only nine of them. #<u>It</u> is probably under the sofa.

The first sentences in this pair are truth-conditionally equivalent, entailing the existence of exactly one missing marble. This is sufficient to license the definite description in (24), though the existence is merely entailed (I called this *weak familiarity* in my work on definites):

(24)   I dropped ten marbles and found only nine of them. <u>The missing marble</u> is probably under the sofa.

And compare (23) with (25):

(25)   [naturally occurring example (1992): Ed Keenan is giving a colloquium at the University of Amsterdam. During the talk, he twirls his reading glasses by the stem and the screw holding the stem to the frame falls out, so that the glasses drop to the table. He puts the stem down and continues his talk. At the break, he begins searching intently under the papers on the table.]
        Craige: <u>It</u>'s on the floor.

Weak familiarity doesn't guarantee salience, and this is why the pronoun is infelicitous in (24). When the missing marble is explicitly mentioned, and hence salient, in the first sentence of (22), just as when Keenan is evidently looking for the missing marble, use of the pronoun is felicitous.

<u>Bridging</u>:   (Clark 1977)

(26)   See that car? There's a statue on <u>the dashboard</u>.
(27)   Every car had a statue on <u>the dashboard</u>.
(28)   In every 1960s marriage it was understood that <u>he</u> should take out the garbage and she should wash the dishes.
(29)   [Pointing to an empty car that's taking up two parking spaces in a full lot:] <u>That driver</u> needs a courtesy lesson.

Cars are known to have unique dashboards (26), (27), marriages in the 1960s US involved a unique husband and a unique wife (28), and parked cars were parked by a unique driver (29)—a deictic version of bridging, involving what Nunberg (1993) called *deferred ostension*.

4. **Outline of a theory of anaphora in discourse**:

In discourse, with the logical forms of constituents constrained by a syntactic binding principle and the scope constraint:

I.   Pronouns are simple:
- They are interpreted as variables, represented by discourse referents (dRefs), constraints on variable assignment.
- Since variables yield an incomplete interpretation, their use carries an anaphoric presupposition (+SCF), which means that their interpretation must be RETRIEVABLE in the context of utterance.
- RETRIEVABILITY requires that there be a single, evidently intended interpretation. This presupposition must be satisfied in the local context of interpretation in order for the resulting utterance to be meaning$_{nn}$ful. Failure to satisfy RETRIEVABILITY results in infelicity.
- The most common way to guarantee RETRIEVABILITY is to identify a particular weakly familiar dRef antecedent, the uniquely most salient dRef to satisfy any descriptive content of the pronoun and the selectional restrictions of what is predicated of it.
        If there were more than one dRef which satisfied that content and these were equally salient, how could the addressee grasp the speaker's intended meaning? This is a requirement of **informational uniqueness**: the existence of a single most likely—salient, plausible in view of what's predicated of it, etc.—antecedent for the definite in question.
- As a consequence of the way that existential entailments work, and hence potential weak familiarity is guaranteed, pronominal anaphora is subject to ROOFING: only co-ROOFED dRefs are potential antecedents.

Other definite NPs (definite descriptions, demonstratives, indexicals, proper names) and non-nominal anaphoric triggers all have a free variable as part of their semantic content. We tell the same basic story. In all these cases what's at issue is not co-reference, but co-variance in interpretation.

- There is another way to guarantee RETRIEVABILITY: Even if a definite is explicitly novel in discourse, its intended meaning is informationally unique, and hence RETRIEVABLE just in case its descriptive content makes it semantically unique—the unique entity in the world (or situation under consideration) that satisfies its descriptive content. Since pronouns are descriptively very poor, they do not give rise to semantic uniqueness. But rich definite descriptions may do so, as in (30)-(34).

Explicit novelty: [Hawthorne & Manley critique]

(30)   The new curling facility here, which I assume you haven't heard of, is the first such facility of its kind in the nation.   [Horn & Abbott 2012]

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Explicit ignorance of existence (Coppock & Beaver, 2015):
(31)   (Context: dissecting an iguana in science class)
        a. I don't know if iguanas have hearts, but is that the heart?
        b. #I don't know if iguanas have bones, but is that the bone?

(32)   The King of England has two sons.
(33)   The sun is shining.
(34)   I climbed the tallest mountain in New Hampshire.

These and other kinds of examples are sometimes taken to be evidence that definite descriptions, somehow implicate (entail or presuppose) semantic uniqueness.

But note that the distribution of semantic uniqueness effects is extremely limited: It only shows up in examples with no weak familiarity. Then so long as the semantically entailed existence is plausible/true the semantic uniqueness itself guarantees RETRIEVABILITY.

5. **Challenges to the RETRIEVABILITY-based account**:

Many challenges have been issued to simple, familiarity-based accounts of anaphora. In the literature (some of which we'll touch on next week), various E-type and D-type accounts have been offered. Many authors take pronouns to be ambiguous, with different readings corresponding to dynamic vs. E-type readings, or even to different types of E-type interpretations. Some accounts deny ROOFING. Here are a few examples of the types noticed:

Functional interpretations of pronouns:
• pronouns of laziness (Cooper 1979) (see Nouwen 2021):
(35)   This year the president is a democrat. Next year, he will be a republican.

• paycheck pronouns   Karttunen (1969), Jacobson (1999)
(36)   The man who gave his paycheck to his wife was wiser than the man who gave it to his mistress.

Apparent violations of ROOFING:

Apparent quantificational antecedents:
(37)   Every student$_i$ picked up a notebook$_k$ exams from the pile. <u>They</u> took them back to <u>their</u> desks.

(38)   Most students wrote <u>an article</u>. They sent <u>it</u> to L&P. [after Krifka 1996]

• modal subordination (Roberts 1989)
(39)   A wolf might break in. It would eat you first. (Fred Landman, p.c. to Roberts)

- telescoping
(40)   Each graduate walked up to the stage. He shook hands with the Dean, took his diploma, and returned to his seat. (Barbara Partee, p.c. to Craige Roberts)

- Partee's anaphoric disjunction:
(41)   Either there's no bathroom here, or it's in a funny place.

                                    [Barbara Partee, p.c. to Irene Heim]

- Elbourne (2005, 2009): contrast in donkey S-s with ellipsis between definite descriptions and pronoun objects in a first conjunct:

(42a)   Every farmer who owns a donkey beats the donkey he owns, and the priest does too

                                                    [sloppy, strict]
(42b)   Every farmer who owns a donkey beats it, and the priest does too. [*sloppy, strict]

- Anaphora across auxiliary content (Amaral, Roberts & Smith 2007)
(10)   [Every professional man I polled]$_1$ said that while [his$_1$ wife]$_2$, <u>who had earned a bachelor's degree</u>$_3$, had no work experience, he$_1$ thought she$_2$ could use it$_3$ to get a good job if she$_2$ needed one.

- Elliott's (2022) "Partee conjunctions"
Compare:
(43)   Few congressmen admire Kennedy. They think he's incompetent.
       [his interpretation of second sentence:]
       'the congressmen who don't admire Kennedy think he's incompetent'
(44)   #Few congressmen admire Kennedy and they think he's incompetent.
       Cannot mean: 'the congressmen who don't admire Kennedy think he's incompetent'

Given all these kinds of uses, some are prepared to assume that pronouns themselves are ambiguous.

But I want to resist this strategy. I think we can explain the wide variety of uses as a function of different contextual factors.

Anaphora is simple, but discourse is complicated.

This general approach reflects a view about complexity that we find in Simons' (1981) parable about the path made by an ant walking across a beach:[3]

> We watch an ant make his laborious way across a wind- and wave-molded beach. He moves ahead, angles to the right to ease his climb up a steep dunelet, detours around a pebble, stops for a moment to exchange information with a compatriot. Thus he makes

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[3] Simon, Herbert A. (1981) *The Sciences of the Artificial*. Chapter 3: The Psychology of Thinking: Embedding Artifice in Nature. MIT Press.

his weaving, halting way back to his home. So as not to anthropomorphize about his purposes, I sketch the path on a piece of paper. It is a sequence of irregular, angular segments--not quite a random walk, for it has an underlying sense of direction, of aiming toward a goal.

Viewed as a geometric figure, the ant's path is irregular, complex, hard to describe. But its complexity is really a complexity in the surface of the beach, not a complexity in the ant. On that same beach another small creature with a home at the same place as the ant might well follow a very similar path.

Along these lines, I think the complexity we find in the patterns of anaphora can be somewhat misleading:

II.   Any apparent complexity in the anaphoric data is a result of the complexity of:
    (i)   the constructions in which the pronouns themselves occur, and hence the compositional semantics in which they participate. E.g. they may occur in the scope of a quantifier with a modally subordinating domain; or they may occur in a member of the family of sentences which play a role in presupposition satisfaction.
    and
    (ii)   the discourse in which the utterance of the pronoun is embedded, which is complexly structured by the QUD, rhetorical relations/strategies of inquiry, FID (Free Indirect Discourse), etc.

So on this story, the different E-type interpretations do not involve different types of pronouns, or different ways of interpreting free variables, but instead reflect differences in their local contexts of interpretation (in turn a function of the context of utterance plus the compositionally given local context reflecting the syntactic structure in which they occur and the meanings of its other parts).

It is the complex way in which different factors interact in discourse that can help to explain the apparent complexity in types of anaphoric relations we have just so briefly observed.

If the anaphoric data seem very complicated, that complexity is emergent from the contingent interaction of relatively simple mechanisms interacting at run-time, their overall behavior a response to particularities of the context and the meanings of parts of the utterances themselves.

An example of how we can explain a whole class of problems (from Roberts 2004):

Generic antecedents:

(45)   Many women from the village came to the fair. They like that sort of thing. [Wyn Chao 1983]
(46)   Sam's dog got into my compost pile last night. They love rotten stuff.
        ['dogs love rotten stuff']

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The NP which appears to trigger the salience of the kind needn't entail existence of stages of that kind, as we see in (47), due to Webber, where *few* is generally taken to be a downward entailing operator without existential entailments:[4]

(47)   Few linguists smoke. They$_i$ know it$_k$ causes cancer.
             ['linguists know that smoking causes cancer']

Apparently, mention of an instance of a kind is generally sufficient to make the kind itself salient. We know that it is a kind that is referred to by the pronoun from the predicate in question (both its content and its tense and aspect) and the context in which it occurs. In (46), there is no salient group of individuals, and the property of loving rotten stuff is plausibly predicated of dogkind (in fact, we know they do), so we take it that way, as an explanation of Sam's dog's behavior. This is all pragmatics.

Key to these examples: In a sentence with a quantificational subject, the default Topic (Roberts 2021a) is the (non-null) quantificational domain—either a kind or a specific group. That Topic is then generally available to serve as an anaphoric antecedent.

We find this generic reading of pronouns in some donkey sentences, as well:

(48)   Every farmer that owns donkeys breeds <u>them</u>.

(48) as generally understood doesn't require that any given farmer breed all of his donkeys—some are surely too young or too old or otherwise unsuitable—but only some of them, though generally he would breed more than one. The simplest, most plausible way to interpret (12) is to take *them* to have a generic interpretation: 'every farmer that owns donkeys breeds donkeys'.

How do these generic interpretations arise? Carlson (1977) offers an extended argument that bare plural NPs have a generic interpretation, denoting the relevant natural kind. When such NPs appear to have an existential interpretation, this is because they occur as arguments of a verb or complex predicate that he called *stage-level*. E.g., in *Firemen are available*, the stage-level predicate *be available* takes the generic-denoting *firemen* and says of it that there are stages of that kind—roughly, spatio-temporal instances, individual people—that are available. He notes that plural pronouns can be anaphoric to generically interpreted bare plural NPs, and that one of these pronouns can appear to have either a generic or a stage-level interpretation, depending on the predicate that takes it as argument, whether that predicate is stage-level or kind-level, and its tense and aspect. In (48), though *breeds* is a stage-level predicate, it appears here in the bare present tense used in non-stative verbs to indicate the habitual or generic interpretation, as opposed to particular situations. Carlson also shows that kind interpretations of bare plurals are not equivalent to those of universally quantified NPs: we would expect exceptions, sometimes systematic ones, as with the systematic exception of the young and old or inform from breeding.

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[4] The pronoun *it* in (128) illustrates yet another respect in which pronominal anaphora depends more on pragmatic factors like salience and plausibility than on explicit mention (strong familiarity). Here, *it* arguably refers to a nominalization of the preceding predicate, *smoke*.

Carlson's account of the generic interpretation of bare plurals makes one more prediction. This is that when such plurals, denoting kinds, occur with a stage-level predicate, and without the bare present tense driving a habitual interpretation, the stage-level predicate takes the generic as argument and "lowers" it, entailing that the predicate holds of stages of the kind. This interpretation is equivalent to an interpretation of the plural as an existentially quantified NP, an indefinite. If plural pronouns have such an interpretation, they should be susceptible of this lowering, and (49) argues that they are:

(49)   A: Few teenagers are responsible.
        B: I know what you mean. <u>They</u> tore up my garden at Halloween!

They in (49) seems to mean 'some teenagers'. We can derive this in Carlson's theory by taking the pronoun to denote the kind 'teenagers'. This serves as argument to a stage-level predicate, 'the property of being a kind x such that there exist a (possibly plural) stage of x which tore up my garden at Halloween', combining to give the reading 'there is a (plural) stage of teenager-kind which tore up my garden at Halloween.'

What the generic examples show us is that the theories which treat pronouns as definite descriptions have overlooked a whole class of examples where a pronoun has an apparent quantificational antecedent in prior discourse, but where the pronoun seems to have either a generic or an indefinite, rather than a definite, interpretation. Would this motivate yet more ambiguity? Not if we treat all pronouns as simple definites with impoverished descriptive content. Variables, or discourse referents, can be mapped to all kinds of familiar entities—including natural kinds, as well as semantically unique individuals in the standard sense. If we make these separate cases, we fail to see that the same general principles govern the retrieval of the intended interpretation in all these cases, as in the retrieval of other kinds of context sensitive ellipsis in discourse (Rooth): These are pragmatic principles, and cannot be reduced to a purely structure-based algorithm, for they depend on context, background, and the perceived intent of the speaker, as well.

<u>To prepare for the next class, if you have the time and interest</u>:
•   the Brazil notes, if they haven't already
•   either Roberts (2012b) or (2004); plus Roberts (2013): an introduction to QUD theory
•   Roberts (2017): An introduction to the architecture of interpretation I'll talk about next time

<u>Suggested exercise</u> (optional):
Choose either
                one or more of the problematic examples considered above
        or
                another problematic type we haven't yet considered
and reflect on it carefully.
(a) characterize as precisely as possible the problem(s) this type of example poses for the simple
    account of anaphora proposed today, and
(b) how you might go about addressing it, either

in the kind of approach considered here, or

in another contemporary approach to discourse anaphora with which you're familiar, e.g. a dynamic semantics, or an E-type account.

In fact, it would be most interesting to *compare* different accounts for how they might deal with your example(s).

If you have any interesting puzzles or results (especially if you find some apparent difference in behavior across languages), write it up as briefly and concisely as possible and either send it to Craige or (even better) post it to share with class members. We'll try to get to any submitted write-ups during the course of our classes.