Indexicals and Anaphora

- Indexicals
  - Expressions whose reference is a function of the context of their utterance.
  - Interpretation requires inference and assumptions about the speaker's beliefs and/or intended referents
  - Pragmatics thus can't just be the narrow study of the role of contextual indices in meaning (Bar-Hillel 1954):

    $[[I\ left]]^{s,a,\ p,n,t} = 1$ iff leave'(s) = 1 at some t < n.

Indexical Pronouns

- I am dead.
  - Bar-Hillel: *I* refers to whoever utters it.
  - Bar-Hillel: So, above sentence is universally absurd.
  - But an agent can speak for a counterpart in another "world"
  - Actor of his character, ghost in a story.
  - The reference is determined (largely) as a <u>function</u> of the utterer of the form *I*.

- *You*
  - Referent is the individual(s) the speaker is addressing.
  - Does not have to be physically present.
  - Does not have to exist at utterance time.
- I'm glad that all of you received my invitation.
  - Might not include all hearers
- I'm glad that you received my invitation.
  - Might be whole group or subset
- You$_1$ can vacuum while you$_2$ wash the dishes, and--keep your$_3$ hat on--I'll get the groceries.

- *We*
  - Can refer to the speaker and any number of other individuals, present or not, existing or not at utterance time.
  - Inclusive
    - When addressee is included.
  - Exclusive
    - When address is not included.
- In all these cases, interpreter relies on knowledge and/or beliefs about the speaker and his beliefs and intentions; the inference is constrained by spatio-temporal coordinates of the utterance but is not uniquely entailed by them.

Tenses

- I am hungry.
  - Time could be a moment or interval.
- I was hungry.
  I will be hungry.
  - Refer vaguely to some time before or after utterance time.
- There are thousands of Alpha Centaurians among you, disguised as trucks, tripods and tape recorders.
  - Could be written long before the situation came to pass.

Adverbs

- *today*, *now*, *yesterday*, *last month*, *next week*
  - All could be indexed to the assumed time of reception.
- *here*
  - Vague
  - Can't be indexed to the assumed place of reception.
    - An invasion force from Alpha Centauri will land here in the next 24 hours.
- *there*
  - A place which not include what *here* would refer to in the same utterance situation.

– It may refer **deictically** (visual or gestural pointing)
  - Hand me that pen over there, will you?
  - There comes the bus.
  - Put 'er there [invitation to shake hands]

– It may refer **anaphorically** (mentioned or implied in previous discourse.
  - Sandy wants to go to the park, but doesn't know how to get there.

– Japanese has three place indexicals: close to speaker, close to hearer, places distant from both (*yonder*).

Demonstratives

- *This*
  - Deictic
    - This proves that the earth is round.
  - Anaphoric
    - This proves that the earth is round
  - Cataphoric
    - OK, this'll prove that Eks is irresponsible: when we were on a committee together, he fell asleep during every meeting.
  - Meta-phoric
    - [indicating a part of a photograph of a wall papered with dust jackets] Oh, I've read this.

- *That*
  - Deictic and indexical
    - Put that in the wastebasket, please.
    - Gesture required and object must be outside speaker's domain.
  - If speaker assumes addressee will take responsibility, the referent can be treated as outside speaker's domain
    - This needs to be washed.
    - That needs to be washed.
  - Anaphoric
    - Columbus reached the New World in 1492, but this/that did not convince anyone that the earth was round.
  - Meta-phoric
    - [photo of wall papered with dust jackets] Oh, I've read that!

Anaphoric Reference

- What the speaker intends to be understood as referring to determines the reference of an anaphoric expression.
- Elements of the external context (indices) only provide clues as to that intention.
  - The dean expelled John because *he* discovered his secret.
- Explicit reference need not precede a pronoun:
  - Before *he* got out of bed, James decided that today would be a good day to leave for Crisfield.
- The referent of a form is an entity in some world; a pronoun does <u>not</u> refer to its antecedent.
- Much research has been done on linguistic constraints on antecedent-anaphor relations:
  - *He* decided that today would be a good day to leave for Crisfield before James got out of bed.

- Pronoun can refer to what an antecedent NP referred to, or to what a preceding clause refers to, or even an entire line of thought.
    - And so I had to scream at them all week long. And *it* was really awful. [NH example]
- Demonstrative phrases, epithets, definite descriptions can be used anaphorically.
    - Philip stopped by yesterday. *That man/the idiot/the man* can't seem to keep from fooling around with other people's wives.
- Only pronouns in complement clauses can have antecedents in main clause:
    - Sandy realized that *he* could get into serious trouble.
    - Philip doubted that *the man/bastard* would be caught.

Other "anaphoric" expressions

- Pro-predicate: *so*, *as*
    - Sandy was afraid of the dark, as was Dana.
- *Such*
    - Amidst such depravity, the salons flourished.
- *Thus*, *therefore*, *nonetheless*, *notwithstanding,* etc.
    - Therefore Socrates is mortal.
- *And*, *but*, *or*, *yet* at the beginning of a clause
    - And hard on the heels of that thought came another.
- Ø: ellipsis
    - If Dana volunteers, Jan will Ø.

Prince: The ZPG Letter

- Syntactic form of the ZPG letter
  - Passive, parenthetical, complement clauses, relative clauses, free relatives, indirect question, adverbial clauses, comparative subdeletion (segment 23).
  - Several types of nonfinite clauses.
  - Noncanonical word order: preposed adverbial phrases, preposed infinitivals, preposed finite adverbial clauses, extraposed relative clause.
  - No noncanonical arguments: no topicalization, inversion, dative-shift, particle-shift, heavy NP-shift, or there sentences.

Properties of Subjects: Definite, 'Old'

- Li & Thompson 1976:
  - tendency of subjects to be definite and 'old' corresponds to a categorical requirement for topics.
- Canonical (preverbal) subject is meant:
  - *Lee* bought a book.
    The book was written by a Russian.
    Tomorrow *she*'ll buy another book
  - There was *a book* on the shelf.
    On the table was lying *a pamphlet*.
    Nothing else did *I* see.

Definiteness

- What definition of 'old' information is relevant to subjecthood?
- Can we tease apart the importance of 'old' information from that of definiteness?
- Formal definiteness: the marking of the NP
  - Definite article, demonstrative articles, possessive adjectives, personal pronouns, proper names, universal quantifiers
  - Indefinite articles, other quantifiers including numerals.

- Information status
  - Only indefinites may occur in *there*-sentences
    - There was *a/#the man* in the room.
  - Not true:
    - There were *the same people* at both conferences.
      There was *the usual crowd* at the beach.
    - I love *bagels*. [generic]
      I bought *bagels* [non-generic]
      There are *bagels* with cinnamon nowadays [non-generic only]

- In this study: 'definiteness' is a formal category.

Information-status

- Focus-presupposition constructions
    - It's John that I like.
      I like X
      X = John
  - The open proposition is generally taken to be 'old' information, already in the discourse-model or at least known or inferrable, while the focus is taken to be 'new' information.
  - There are virtually no focus-presupposition constructions in the ZPG letter
    - Except for free relatives.

- Hearer-Old/Hearer-New
    - I'm waiting for it to be noon so I can call *Sandy Thompson.*
    - I'm waiting for it to be noon so I can call *someone in California.*
  - Hearer-old entities are typically definite, and hearer-new entities are typically indefinite; but not always:
    - Both indefinites and definites may represent inferrables.
    - Some definites represent Hearer-new entities.
      - There sentences do not require indefinites, rather Hearer-new entities.
        - » Nine hundred people attended the Institute and the same people were at both conferences.
        - » Nine hundred people attended the Institute and there were the same people at both conferences.
    - Some indefinites represent Hearer-old entities:
      - generics

- Discourse-Old/Discourse-New
  - Discourse newness tells us nothing about hearer status; Hearer-New entails Discourse-New.
  - In English there is no marking of discourse status, except pronouns have to be salient and thus Discourse-Old; but salient entities are only a subset of Discourse-Old entities.
- Inferrables
    - He passed by the door of the Bastille and *the door* was painted purple.
    - He passed by the Bastille and *the door* was painted purple.
  - S must have a warrant for believing that H already has a belief that the entity is plausibly related to some other 'trigger' entity, and can thereby infer its existence.
    - #I passed by the Bastille and *the trunk* was painted purple.

- Inferrables are like Hearer-old entities (rely on assumptions about what H knows); like Discourse-old entities (rely on a Discourse-old trigger); and like Hearer-new entities (H not expected to already have entity in his head).
- Should they be collapsed with one of the two categories, form a third category, or be the middle point on a continuum?
  - Not a continuum: how can there be a continuum between what is in a speaker's head or not?
  - Here: third category, see how it behaves.
- Inferrables may be indefinite:
  - I picked up that book I bought and *a cockroach/#the cockroaches* fell out.
  - I picked up that book I bought and *a page/the pages* fell out.

- Containing Inferrables
  - *The door of the Bastille* was painted purple.
  - *The pages of that book I bought* fell out.

  - Require inferencing on the basis of background knowledge, but trigger is within the NP itself.
    - #*The trunk on the Bastille* was painted purple.
    - #*The cockroach in that book I bought* fell out.

  - What is a containing inferrable for one hearer (reader) can serve as a Hearer-old, Discourse-new entity for another.
    - Containing inferrables are thus useful for multi-receiver discourse, in particular formal written prose.

Quantitative Study of ZPG Letter

- Goals
  - Are subjects significantly more likely than nonsubjects to be definite?
  - Are subjects significantly more likely than nonsubjects to be Hearer-old entities?
  - Are subjects significantly more likely than nonsubjects to be Discourse-old entities?
  - If the answer to any two of the above is affirmative, are they independent tendencies, or is one a reflex of the other?
- Multivariate analysis program: VARBRUL

- Coding
  - Prince used herself as a prior recipient of ZPG letters to determine Hearer-new versus Hearer-old.
    - The Urban Stress Test translates *complex, technical data* into…
    - …from reporters eater to tell *the public* about…
  - Collapsed Hearer-old/Discourse-New (Unused) with Containing Inferrables.
    - When we released *the results of ZPG's 1985 Urban Stress Test…*
- Analysis
  - Taken separately, Hearer-status and Discourse-status are both significant; both Hearer-old and Discourse-old are more likely to be subjects than Hearer-new or Discourse-new respectively; inclusion or exclustion of Inferrables has no effect.

  - Given both statuses, however, the variance is accounted for by Discourse-status, with the effect of Hearer-status completely losing statistical significance.
  - Pronominal form makes subjecthood significantly more likely.
  - Inferrables are collapsible with Discourse-old Nonpronominanls.
  - Definiteness by itself is significantly correlated with subjecthood; but when Discourse status is taken into account, the favoring of subjects for definiteness is no longer statistically significant.
  - SUM: Discourse-status accounts for the subject-nonsubject distinction; three-way partition best fits: Discourse-old pronominal, Discourse-old Nonpronominal+inferrable, Discourse-new.

Discussion

- The apparent tendency for subjects to be Hearer-old or Definite is simply a reflex of a real tendency for them to be Discourse-old.
  - Definiteness may be a grammaticization of Hearer-status.
- Topics
  - Reinhart 1981: all subjects can be topics
  - Gundel 1985: subjects that are topics must be Hearer-old
    - But Hearer-status is not a significant variable.
  - Horn 1986: subjects/topics must be 'salient' or 'presuppositional'
    - But then subjects should be Hearer-old/Discourse-new rather than Hearer-New, but this is not statistically significant.

Afterthoughts: form of Inferrables

- …our phones started to ring. *Calls* jammed our switchboard all day.
- *Staffers* stayed late into the night.

- These referents are inferrable, thus, Prince thinks the definite would be somewhat more natural.
- She had the text translated into Russian and then translated back into English and found that definiteness marking showed up.
- "I am now fairly confident that these indefinites in the original letter are more marked than definites would have been."

Gundel, Hedberg & Zacharski 1993

- Different determiners and pronominal forms conventionally signal different cognitive statuses (information about location in memory and attention state).

- The Givenness Hierarchy

in focus	>	activated	>	familiar	>	uniquely identifiable	>	referential	>	type identifiable
{*it*}		{*this, that, this* N}		{*that* N}	{*the* N}	{indefinite *this* N}		{*a* N}		

- Each status is a necessary and sufficient condition for appropriate use of the forms under it.

- Each status entails all lower statuses. If a referent has a particular status then the form under it or any lower form can be used.

- Type Identifiable
  - The addressee is able to access a representation of the type of object described by the expression.
  - *I couldn't sleep last night. A dog (next door) kept me awake.*

- Referential
  - The speaker intends to refer to a particular object or objects.
  - *I couldn't sleep last night. <u>This dog (next door)</u> kept me awake.* (indefinite *this*).

- Uniquely Identifiable
  - The addressee can identify the speaker's intended referent on the basis of the referent alone.
  - Addressee will construct a representation of the referent if he doesn't already have one in memory.
  - *I couldn't sleep last night. <u>The dog (next door)</u> kept me awake.*

- Familiar
  - The addressee is able to uniquely identify the intended referent because he already has a representation of it in memory.
  - *I couldn't sleep last night. <u>That dog (next door)</u> kept me awake.*

- Activated
  - The referent is represented in current short-term memory.
  - Includes the speech participants as well as other entities in the immediate discourse context.
  - *I couldn't sleep last night. <u>That</u> kept me awake.*

– Speaker activation condition: proximal demonstratives have to be activated in the speaker's context space.
  - A: *Have you seen the neighbor's dog?*
    B: *Yes. And <u>that dog</u>/?? <u>this dog</u> kept me awake last night.*

- In Focus
  - The referent is not only in short-term memory, but is also at the current center of attention.
  - *I couldn't sleep last night. <u>It</u> kept me awake.*
  - The partially ordered subset of activated entities that are likely to be continued as topics of subsequent utterances, e.g. subjects & objects of matrix sentence.
    - *My neighbor's bull mastiff bit a girl on a bike. <u>That/It's</u> the same dog that bit Mary Ben last summer.*
    - *Sears delivered new siding to my neighbors with the bull mastiff. #<u>It's/That's</u> the same dog that bit Mary Ben last summer.*

Inferrables

- Prince 1981 Familiarity Scale:

Evoked;			Containing	Brand	Brand
Situationally	> Unused	> Inferrable	> Inferrable	> New	> New
Evoked					Anchored

- GHZ: Inferrable isn't a separate status, rather a way that an entity can come to have a particular status.

- *…The nurse was called in on June 21st, and during that day the doctors visited the patient three times. His condition grew steadily worse. . . On the day after, the 22nd, he was worse still--in great pain, the pulse growing weaker, and the skin about the mouth getting dry and peeling off.* [D. Sayers]
  - #*that pulse, #it.*
  - Inferrables should have different statuses, depending on the nature and strength of the link between the inferrable and its associated discourse entity.
    - *We went to the Minnesota Orchestra last night. That conductor was very good.*
    - *There was not a man, woman or child within sight; only a small fishing-boat, standing out to sea some distance away. Harriet waved wildly in its direction, but they either didn't see her or supposed that she was merely doing some kind of reducing exercises.*

Chinese

- In focus > Activated > Familiar > Uniquely > Referential > Type

In focus	Activated	Familiar	Uniquely Identifiable	Referential	Type Identifiable
Ø	*zhe* 'this'		*nei* N		*yi* N 'a N'
ta 's/he,it'	*nei* 'that'				Ø N
	zhe N				

  - *Ta zai bisai zhong huo jiang.*
    He in   game during win prize   'He won a prize in a/the game'
  - *Zuotian wanshang wo shui-bu-zhao. Gebi-de nei tiao gou jiao de lihai.*
    Yesterday evening I sleep-not-achieve. Next.door that CLF dog bark ADV extremely
    'I couldn't sleep last night. The [lit. that] dog next door was barking.'
  - A: Wo juede wode xiaoshuo bi luxun xie-de hao.
       I think my novel than Luxun write-NOM good
       'I think my novels are better than Luxun's'

    B: *Zheige/?Neige wo chengren.*
              I admit.   'I agree with this/that.'

Japanese

- In focus > Activated > Familiar > Uniquely > Referential > Type

			Identifiable		Identifiable
Ø	*kare* 'he'	*ano* N			Ø N
	kore 'this'	'that N'(D)			
	sore 'that' (M)				
	ano 'that' (D)				
	kono N 'this' N				
	sono N 'that' N (M)				

- *Kinoo wa hitobanjuu nemurenakatta. <u>Tonari no ie no ano inu</u> no sei da.*
  Yesterday TOP all.night couldn't.sleep. Neighbor GEN house GEN that dog GEN reason is.
  'I couldn't sleep last night. That dog next door kept me awake.'

- A*: Watashi no hon wa Mishima no yyori ii.*
  I   GEN book TOP Mishima GEN than good.   'My book is better than Mishima.'
  B: *<u>Sore/#Kore</u> wa honto da.*
  　　　　　　TOP true be　　　　　'That/this is true.'

Spanish

- In focus > Activated > Familiar > Uniquely > Referential > Type

			Identifiable		Identifiable
Ø	ÉL	*ese* N	*el* N		Ø N
él 'he'	*éste* 'this'(P)	'that N'(M)			*un* N 'a N'
	ése 'that'(M)	*aquel* N			
	aquél 'that'(D)	'that N'(D)			
	este N 'this N'				

- *No pudo dormir anoche. <u>Ese/Aquel perro de al lado</u> no me dejó dormir.*
  Not could sleep last.night.　　　　　dog of to.the next.door not me let sleep.
  'I couldn't sleep last night. That dog next door kept me awake.'

- A: *Mis cuentos son majores que los de Ortega.*
  My stories are better than those of Ortega.
  B*: Estoy de acuerdo con <u>eso/??esto</u>.*
  Am   in agreement with　　　　　'I agree with that/this'

- *El quiere <u>(una) gaseosa</u> pero no encuentre.*
  He wants   a   soft.drink but not find.   'He wants a soft drink, but can't find (one).'

Russian

- In focus > Activated >   Familiar > Uniquely > Referential > Type
                                                   Identifiable   Identifiable
    Ø   ON   *èto* N   Ø N
    on   *èto* 'this'   *to* N
                  to 'that'

- *Èto/To sobaku u soseda* mne vsju noch'   ne davala spat'.
            dog   at neighbor me   all night   not allow to.sleep'
    'That dog next door kept me awake all night.'

- A: *Moi rasskazy luchshe chem ego rasskazy.*
    My stories   better   than his stories
      'My stories are better than his stories.'
    B: *Ja s ètim/?tem soglasen.*
      I with   agree.
      'I agree with this/that.'

Quantitative Study

- Data from a variety of spoken and written sources, including goldfish stories and Frederickson tapes.

- 240 (Chinese) - 655 (English) noun phrases.

- All but a few expressions met the predicted necessary conditions:

    M: *These. Do these go in here or there?*
    K: *These?*
    M: *The ones I just got done writing.*

- More typically, addressee accommodates:
  - *K: Barb got it.*
    N: Catmopolitan?
    K: Yeah.
    N: Catmopolitan.
    K. She got it.
    N: I suspicion she was a cat in her other life.
    K. Oh did I tell you that they have a cat, <u>they</u> have two cats;
       one is Maynard and one's Dudley.
- Pro-drop varies:
  - Japanese: Ø 87 *kare* 4
  - Spanish Ø 63 *él* (subj) 30 *él* (nonsub) 57
  - Chinese: Ø 25 *ta* 40
  - Russian: Ø 18 *ono* 51

- There are forms to the left used for particular cognitive statuses.
- This is especially true for definite articles in Spanish and English and for the null determiner in the other three languages:

	FOC	ACT	FAM	UID	REF	TID
– Chinese Ø N	12	17	14	49	2	10
– English *the* N	30	95	47	108		
– Japanese Ø N	14	32	20	71	45	44
– Russian Ø N	25	29	22	66	21	28
– Spanish *el* N	23	45	22	42		

- What explains the choice among forms when necessary conditions for use of more than one form are met?

Grice's Maxims and the G.H.

– *These incredibly small magnetic bubbles are the vanguard of a new generation of ultradense memory-storage systems. These systems/Those systems/The systems/New generation ultradense memory-storage systems are extremely rugged: they are resistant to radiation and are nonvolatile.* (Popular Science)

– *Simplified English disallows the use of passive, progressive, and perfective auxiliary verbs, among other things. It requires engineers to break up long compound nouns and technical expressions into chunks of three or less elements.* [electronic news group]
    /This requires engineers to break up long compounds...

- Maxim of Quantity (Grice 1975)
  Q1: Make your contribution as informative as required (for the current purposes of the exchange)
  Q2: Do not make your contribution more informative than is required.

- *I agree with all of what you said.*
  I agree with some of what you said. ++> not all.
  - Horn 1972: Use of a weaker form implicates negation of stronger form.

- *I'll give you a dollar if you mow the lawn.* ++> iff
  I'll give you a dollar if and only if you mow the lawn.
  - Atlas & Levinson 1981: Use of a weaker form implicates stronger form when the meaning associated with the stronger form is stereotypical.

- Since cognitive statuses form an implicational scale, we expect Quantity implicatures of both sorts.

Q1

– Use of an indefinite article conversationally implicates that the addressee can't uniquely identify the referent.

- *The senate on August 10 voted 50 to 48 to spend $736,400 for a third Senate Gymnasium due to be built in <u>the/a 137.7 million-dollar Host Senate office building</u> opening in January.* (US New & World Report)
- *Dr. Smith told me that exercise helps. Since I heard it from <u>a doctor</u>, I'm inclined to believe it.* (Dahl 1984)
- *I met a student before class. <u>A student</u> came to see me after class as well--in fact it was the same student I had seen before.*
- *...the Getty decided that the fake documents were not reason enough to ask Mr. Becchina, the Basel dealer who had sold the kouros, to take back the sculpture.... Then last April, an independent scholar in London...was shown a photograph of a fake torso of a kouros, belonging to a Basel dealer (not Mr. Becchina, that looked similar....* (NY Times)

– Use of a demonstrative pronoun often implicates by Q1 that the referent is not currently in focus, i.e. it signals a focus shift.

- *When Snepp makes a speech he has to submit a text to CIA censors first. When he wrote a book review for the Los Angeles Times, he had to show it to the agency before he sent it to the newspaper, and when the editor asked for a change, he had to show <u>that</u> to to the censors too.* (Minneapolis Star & Tribune).
- *Anyway going on back from the kitchen then is a little hallway leading to a window, and across from the kitchen is a big walk-through closet. On the other side of <u>that</u> is another little hallway leading to a window. ...* (personal letter).
- Simplified English example: Demonstrative refers to previous statement rather than a previous in-focus individual entity.

Q2

- Over 85% of full NPs whose referents were at least familiar were introduced by a definite article in English and Spanish, or by a bare noun in Russian.   Plus 47% of bare nouns in Chinese, and 59% in Japanese were at least familiar.
- Since pronominals have so little descriptive content, information about cognitive status is crucial in their interpretation, so Q1 is at work.
- With full NPs, signalling identifiability is often enough, and an explicit signal of a more restrictive status is unnecessary; hence, Q2 is at work.
- Moreover, familiarity is the most frequent reason for identifiability, so Q2 induces the stereotypical interpretation.

- Since Q2 predicts use of the weakest possible form for full definite NPs, when demonstrative determiners do occur there is often a good reason for conveying the stronger cognitive status information.
  - Reminder *that* uses explicitly signal that the referent is familiar and conversationally implicate by Q1 that the referent is not activated.
  - *Exxon Oil claims it will take several million dollars to clean up that oil spill off the coast of Alaska* (beginning of a radio newscast).

- Redescriptions of an activated entity provide a compelling example of a stronger than strictly necessary form being required:
  - *Nearly lost in the polemic was Judge Kennedy himself. That was ironic, because in many ways <u>this former small-city lawyer with the stable marriage and three attractive children and the fine reputation</u> appears to personify just those values that made the image of Ronald Reagan so attractive after the convulsions of the 1960's and 1970's.* (NY Times)
- Demonstratives are infrequent because they are weaker than unstressed personal pronouns (use due to Q1) and stronger than definite articles (use due to Q2).
  - Thus Q1 and Q2 conspire to make them infrequent.

Centering Theory

- Grosz, Joshi and Weinstein 1983, 1995
- Grosz and Sidner 1986
  - Attentional State, Intentional Structure, Linguistic Structure
- Brennan, Friedman and Pollard 1987
- Walker, Joshi and Prince 1998

Walker, Joshi and Prince 1998

(1)   a. Jeff helped Dick wash the car.
           b. He washed the windows as Dick washed the car.
           c. He soaped a pane.

(2)   a. Jeff helped Dick wash the car.
           b. He washed the windows as Dick washed the car.
           c. He buffed the hood.

- The center continues in (1), but shifts in (2), so (2) is more difficult to process.

Centers

- Centers are semantic entities that are part of the discourse model for each utterance in the discourse segment.
- The set of *forward-looking centers* $Cf(U_i, D)$, consists of the discourse entities evoked by an utterance U_i in discourse segment D.

- The *backward-looking center*, $Cb(U_i, D)$ is a special member of the Cf, which represents the discourse entity that the utterance U_i most centrally concerns. The Cb links the current utterance to previous discourse.
- The Cf is ranked according to discourse salience. The highest-ranked member of the Cf is the *preferred center*, Cp. The Cp represents a prediction about the Cb of the following utterance.

- Jeff helped Dick wash the car.
  Cf: Jeff, Dick, car; **Cb**: Ø; **Cp:** Jeff.

- He washed the windows as Dick washed the car.
  Cf: Jeff, windows Dick, car; **Cb:** Jeff; **Cp:** Jeff

(1) He soaped a pane.
   Cf: Jeff, pane; **Cb:** Jeff; **Cp**: Jeff
(2) He buffed the hood.
   Cf: Dick, hood; **Cb:** Dick; **Cp:** Dick

Transitions

	$Cb(U_i) = Cb(U_{i-1})$ OR $Cb(U_{i-1}) = \emptyset$	$Cb(U_i) \neq Cb(U_{i-1})$
$Cb(U_i) = Cp(U_i)$	CONTINUE	SMOOTH-SHIFT
$Cb(U_i) \neq Cp(U_i)$	RETAIN	ROUGH SHIFT

Examples of transitions (Taboada)

…He washed the windows as Dick waxed the car.
Cf: Jeff, windows, Dick, car; **Cb:** Jeff; **Cp:** Jeff

- Continue
  He soaped a pane (Cb = Cb-1, Cb = Cp)

- Retain
  Then Dick helped him clean the interior. (Cb = Cb-1, Cb $\neq$ Cp)

- Smooth Shift
  He buffed the hood. (Cb $\neq$ Cb-1, Cb = Cp)

- Rough Shift
  The water was really cold. (Cb $\neq$ Cb-1, Cb $\neq$ Cp)

Constraints

- For each utterance Ui in a discourse segment D consisting of utterances U_1, …, U_m.
1. There is precisely one backward-looking center $Cb(U_i, D)$.
2. Every element of the forward centers list, $Cf(U_i, D)$, must be realized in U_i.
3. The center, $Cb(U_i, D)$, is the highest-ranked element of $Cf(U_{i-1}, D)$ that is realized in U_i.

- An utterance U realizes a center **c** if **c** is an element of the situation described by U, or c is the semantic interpretation of some subpart of U.
  - Pronouns, zero pronouns, explicitly realized discourse entities, and implicitly realized inferrables.
- Cf Ranking by Grammatical Function:
  - Subject > Object(s), Other

Rules

- For each U_i in a discourse segment D consisting of utterances $U_i,…U_m$:
1. If some element of $Cf(U_{i-1}, D)$ is realized as a pronoun in U_i, then so is $Cb(U_i, D)$.
2. Transition states are preferentially ordered: Continue > Retain > Smooth Shift > Rough Shift

Examples from GJW 1995

(1)a. John went to his favorite music store to buy a piano.
  b. He had frequented the store for many years.
  c. He was excited that he could finally buy a piano.
  d. He arrived just as the store was closing for the day.
             continue, continue, continue

(2) a. John went to his favorite music store to buy a piano.
  b. It was a store John had frequented for many years.
  c. He was excited that he could finally buy a piano.
  d. It was closing just as John arrived.

          smooth shift, smooth shift, rough shift

- Terry really goofs sometimes.
  Yesterday was a beautiful day and he was excited
      about trying out his new sailboat.
  He wanted Tony to join on a sailing expedition.
  He called him at 6 AM.
  He was sick and furious at being woken up so early.
  He told Terry to get lost and hung up.
  Of course, he hadn't intended to upset Tony.
- …
  Tony was sick and furious at being woken up so
      early.
  He told Terry to get lost and hung up.
  Of course, Terry hadn't intended to upset Tony.

discourse pragmatics: referring expressions   59

- Susan gave Betsy a pet hamster.
  She reminded her that such hamsters were quite shy.
  She asked whether Betsy liked the gift.
- Susan gave Betsy a pet hamster.
  She reminded her that such hamsters were quite shy.
  Betsy told her that she really liked the gift.
- Susan gave Betsy a pet hamster.
  She reminded her that such hamsters were quite shy.
  Susan asked her whether she liked the gift.
- Susan gave Betsy a pet hamster.
  She reminded her that such hamsters were quite shy.
  She told Susan that she really liked the gift.

discourse pragmatics: referring expressions   60

- My dog is quite obstreperous.
  I took him to the vet the other day.
  The mangy old beast always hates these visits.

- I'm reading *The French Lieutenant's Woman*.
  The book, which is Fowles's best, was a bestseller
      last year.

- All the natural world was go=ne in 1975, … His
  premise is basically this. [86 intonation units with
  no mention of the author.] … So, …that was <u>his</u> ..
  basic premise.   [Santa Barbara Corpus]

- The house appeared to have been burgled.
  The door was ajar.
  The furniture was in disarray.

- John has been having a lot of trouble arranging his
      vacation.
  He cannot find anyone to take over his
      responsibilities.
  He called up Mike yesterday to work out a plan.
  Mike has annoyed him a lot recently.
  He called John at 5 AM on Friday last week.

Japanese Centering (Walker, Iida and Cote 1994)

- CF Ranking for Japanese:
  (Grammatical or zero) topic > empathy > subject > object(s) > others

- Taroo hugged Saburoo.   empathy neutral
  Taroo hugged his son.   empathy Taroo
  Saburoo's father hugged him.   empathy Saburoo

- Taroo ga Ziroo ni hon o kureta. empathy OBJ2
  Taroo SUBJ Ziroo OBJ2 book OBJ gave
  Taroo ga Ziroo ni hon o yatta.   empathy SUBJ
  Taroo SUBJ Ziroo OBJ2 book OBJ gave

discourse pragmatics: referring expressions   63

- Hanako wa kuruma ga kowarete komatteimasita.
  Hanako TOP/SUBJ car SUBJ broken at a loss-was
  'Her car broken, Hanako was at a loss.'
  Cb: Hanako   Cf: Hanako, car

- Taroo ga Ø sinsetu-ni te o kasite-kuremasita.
  Taroo SUBJ OBJ2/EMP kindly hand OBJ lend-gave
  'Taroo kindly did (Hanako) a favor in helping her.'
  Cb: Hanako   Cf: Hanako, Taroo

- Tugi no hi Ø Ø eiga ni sasoimasita.
  Next   of day SUBJ OBJ movie to invited.
  'Next day (Hanako) invited (Taroo) to a movie.'
  Cb: Hanako
  Cf1: Hanako, Taroo   CONTINUE   16
  Cf2 Taroo, Hanako   RETAIN   2

discourse pragmatics: referring expressions   64