

# ASL IX to locus as a modifier

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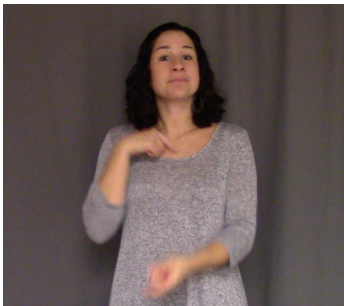
*Harvard University*

NELS 50

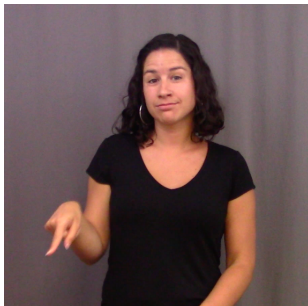
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## IX and Loci



IX<sub>1</sub>



IX<sub>A</sub>

- **IX**: pointing handshape used to refer to entities
- **Loci**: abstract location in signing space associated with referents not present in context

[Friedman 1975]

## IX and Loci

IX<sub>A</sub>: IX to locus A

vs. IX ('neutral IX' , IX<sub>NEUT</sub>)

(1) I MEET BOY IX<sub>A</sub> GIRL IX<sub>B</sub>. IX<sub>A</sub> TIRED.

'I met a boy and a girl. The boy was tired.'

(2) I MEET BOY. IX<sub>NEUT</sub> TIRED.

'I met a boy. He was tired.'

IX analyzed as:

- Definite determiner [Irani 2016; MacLaughlin 1997; Neidle et al. 2000]
- Demonstrative [Koulidobrova & Lillo-Martin 2016]
- Pronoun [Lillo-Martin & Klima 1990; MacLaughlin 1997]

## Loci as indices

Loci analyzed as overt instantiations of **indices** (Lillo-Martin & Klima 1990) that occur with pronouns.

(3) Jin<sub>1</sub> met Jimin<sub>2</sub>. He<sub>1</sub> sang for him<sub>2</sub>.

- $g = \{ \langle 1, jin \rangle, \langle 2, jimin \rangle \}$
- $\llbracket he_1 \rrbracket = \llbracket x_1 \rrbracket^g = g(1) = jin$

$IX_A$  is like  $he_1$

Implications:

- Indices in semantic models? [cf. Jacobson 1999, Schlenker 2018]

## IX as demonstratives

Koulidobrova & Lillo-Martin 2016:

IX should be analyzed as **demonstratives**.

- Similar kind of markedness detected (Hinterwimmer & Bosch 2016; Roberts 2002; Wolter 2006)

- (4) MOTHER<sub>i</sub> PERSUADE MARY<sub>j</sub> MAKE SANDWICH<sub>k</sub>.  
a-IX<sub>j,k,\*i</sub> GOOD  
'My mother persuaded my sister to make a sandwich.  
{She<sub>j</sub>/it<sub>k</sub>} is good.'

# Preview

## Loci as indices

[Lillo-Martin & Klima 1990]

- $IX_A$  is like *she*<sub>7</sub>
- $IX$  is a pronoun

## $IX$ as demonstratives

[Koulidobrova & Lillo-Martin 2016]

- not definite determiner or pronoun
- $IX$  is marked in distribution

Proposal:  **$IX_{LOC}$  is a modifier.**

- Not a pronoun with an index. →  $IX_{LOC}$  tracks with contrast
- Not a demonstrative. → Introductory use is not definite
- $IX_{NEUT}$  is a pronoun. →  $IX_{NEUT}$  lacks both of these properties

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## Main advantages

- Uniform treatment of the introductory use
- Straightforward link to exophoric demonstratives in spoken languages

Preview:

1.  $[\rightarrow_A]$  is a modifier in spoken languages
2. DEM in spoken languages takes  $[\rightarrow_A]$  as an additional argument
3. ASL  $IX_{LOC}$  is basically this modifier

## **Anaphoric expressions in ASL**

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## Anaphoric expressions in ASL

- Null argument [Bahan et al. 2000; Koulidobrova 2012; Lillo-Martin 1986]

(5) I MEET GIRL. TIRED.  
'I met a girl. She was tired.'

- Bare noun [Koulidobrova 2018]

(6) I MEET GIRL. GIRL TIRED.

- IX [Lillo-Martin & Klima 1990; Neidle et al. 2000; Steinbach & Onea 2015]
  - IX in the neutral position **IX<sub>NEUT</sub>**

(7) I MEET GIRL. IX<sub>NEUT</sub> TIRED.

- IX to a locus **IX<sub>LOC</sub>**

(8) I MEET GIRL IX<sub>A</sub>. IX<sub>A</sub> TIRED.

## A lot of focus on IX<sub>LOC</sub>

How frequent is IX<sub>LOC</sub>?

- Referent tracking studies: not very frequent.

[Czubek 2017; Frederiksen & Mayberry 2016]

	Null Arg	CL	N	<b>IX</b>	F-S	Total
Maintained	.73 (219)	.20 (63)	.07 (21)	<b>.02 (6)</b>	.04 (1)	310
Reintroduced	.67 (20)	0 (0)	1 (10)	<b>0 (0)</b>	0 (0)	30

## **Use of $IX_{LOC}$ tracks with contrast**

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## Testing semantic factors

Ahn, Kocab, & Davidson 2019:

Naturalness rating with 3 native signers

IX<sub>LOC</sub> is not obligatory:

- when there are no competing referents

BOY ENTER CLUB. SEE GIRL READ → IX<sub>A</sub> DANCE

BOY ENTER CLUB. → (IX<sub>NEUT</sub>) DANCE

- when context tells you who did what

MARY HANG-OUT SUE. → IX<sub>A</sub> PUSH IX<sub>B</sub>

MARY HANG-OUT SUE. → (IX<sub>NEUT</sub>) PUSH (IX<sub>NEUT</sub>)

SUE SAY SOMETHING BAD.

MARY ANGRY.

# Results

Simplified (for details, see Ahn, Kocab, & Davidson 2019)

- When it is obvious who the referent is:
  - One referent
  - Narrative tells you who
  - **IX<sub>LOC</sub> not obligatory.**
  - **null or IX<sub>NEUT</sub> preferred.**
- When not obvious:
  - **IX<sub>LOC</sub> and bare noun preferred.**
- With inanimates
  - **IX<sub>LOC</sub> not licensed.**

(9) MARY IX<sub>A</sub> BUY BOOK ?IX<sub>B</sub>. ?IX<sub>B</sub> EXPENSIVE.  
(intended) 'Mary bought a book. The book was expensive.'



## What we learn

**ASL IX<sub>LOC</sub> is sensitive to contrast and animacy.**

Not like the indices we use in formal representations of language:

- Indices are not sensitive to animacy.
  - Indices are not sensitive to contrast.
- **Main role of IX<sub>LOC</sub> is in DISTINGUISHING between competing referents rather than ANAPHORICALLY referring to referents.**

## Demonstrative?

The distribution and interpretation of  $IX_{LOC}$  align with demonstratives.

Koulidobrova & Lillo-Martin 2016:  $IX$  is a demonstrative.

- $IX_{NEUT}$  is different

Is  $IX_{LOC}$  a demonstrative?

What are demonstratives?

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# Demonstratives

## Approach 1: Exophoric approach

[Kaplan 1977; Roberts 2002]

- Demonstratives denote deictic reference only

## Approach 2: Markedness approach

[Hinterwimmer & Bosch 2018; Wolter 2006]

- Demonstrative pronouns are pronouns with markedness constraint (anti-perspective holder, etc.)

## Approach 3: Extended Definite approach

[Elbourne 2008; King 2008; Nowak 2014]

- Demonstratives are definites plus another property

$\llbracket \text{the } P \rrbracket = \iota x. P(x)$

$\llbracket \text{that } P \rrbracket = \iota x P(x) \wedge Q(x)$

## Demonstratives in Ahn 2019

Ahn 2019: Demonstratives realize a binary maximality operator.

- Pronouns and definites use regular unary maximality operator

$$\llbracket \text{sup} \rrbracket = \lambda P \iota z: \forall x [\forall y [P(y) \rightarrow y \sqsubseteq x] ] \rightarrow z \sqsubseteq x$$

'smallest individual  $x$  s.t. all individuals  $y$  that is  $P$  form part of  $x$ '

$$(10) \quad \llbracket \text{she} \rrbracket = \text{sup} [\lambda x. \phi(x)]$$

$$(11) \quad \llbracket \text{the } P \rrbracket = \text{sup} [\lambda x. \phi(x) \wedge P(x)]$$

- Demonstratives lexicalize a binary maximality operator

$$\llbracket \text{bi-sup} \rrbracket = \lambda P \lambda R \iota z: \forall x [\forall y [R(y) \wedge P(y) \rightarrow y \sqsubseteq x] ] \rightarrow z \sqsubseteq x$$

$$(12) \quad \llbracket \text{that}_R \rrbracket = \text{bi-sup} [\lambda x. \phi(x)] [R]$$

$$(13) \quad \llbracket \text{that}_R P \rrbracket = \text{bi-sup} [\lambda x. \phi(x) \wedge P(x)] [R]$$

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# Demonstratives

R occupied by: Relative clauses and  $[[\rightarrow]]$   
(and a familiar index as last-resort)

Accounts for:

## 1. Only demonstratives allow exophoric reference.

(14) That $\rightarrow$  paper looks interesting.

(15) \*It $\rightarrow$  / The paper $\rightarrow$  looks interesting.

## 2. Only demonstratives allow restrictive relative clauses.

(16) That **which rolls** gathers no moss.

(17) \*It which rolls gathers no moss.

## What is $\rightarrow$ ?

$\llbracket \rightarrow \rrbracket = \lambda a. \lambda x. x \text{ is at } a$

- Modifier that takes a location variable  $a$  (always saturated) and individual  $x$  and returns true iff  $x$  is at  $a$ .

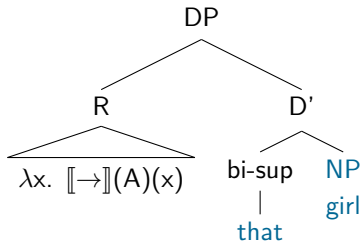
Different modality: visual-manual modality, gestural

- Claim: In spoken languages, only demonstratives readily allow composition with gestural information.  
as opposed to backgrounded information (cf. Esipova 2019; Schlenker 2018)
- This is possible because of the binary supremum operator.

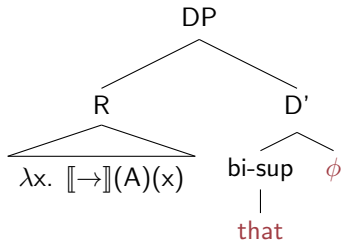


# That $girl_{\rightarrow}$

$\llbracket \text{that } girl_{\rightarrow A} \rrbracket =$



$\llbracket \text{that}_{\rightarrow A} \rrbracket =$



$\text{bi-sup } [\lambda x. \llbracket \text{girl} \rrbracket(x)] [\lambda x. \llbracket \rightarrow \rrbracket(A)(x)]$

'the maximal individual  $x$  that is a girl and at  $A$ '

## Going back to $IX_A$

$IX_{LOC}$  as a demonstrative?

$$\llbracket IX_A \rrbracket = \text{bi-sup } [\lambda x. \phi(x)] [\lambda x. \llbracket \rightarrow \rrbracket(A)(x)]$$

$$\llbracket IX_A P \rrbracket = \text{bi-sup } [\lambda x. \phi(x) \wedge P(x)] [\lambda x. \llbracket \rightarrow \rrbracket(A)(x)]$$

'the maximal individual  $x$  that is an entity (and  $P$ ) and at  $A$ '

Not quite!

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## IX<sub>LOC</sub>

Unique property of IX<sub>LOC</sub>: **it has to be introduced first!**

(18) GIRL IX<sub>A</sub> SIT-IN CLASS. IX<sub>A</sub> DANCE.

'A girl<sub>i</sub> was sitting in class. She<sub>i</sub> danced.

(19) GIRL SIT-IN CLASS. ?IX<sub>A</sub> DANCE.

- IX<sub>LOC</sub> cannot be analyzed as an anaphoric expression.
  - Introductory use would need a separate account.

Proposal: **IX<sub>LOC</sub> is a modifier.**

## $IX_{LOC}$

Proposal:

$$\llbracket IX_A \rrbracket = \sup [\lambda x. \phi(x)] [\lambda x. \llbracket \rightarrow \rrbracket(A)(x)]$$

'the maximal entity that meets  $\phi$ -features and is at A'

'is at A'

$$\llbracket IX_{LOC} \rrbracket = \llbracket \rightarrow \rrbracket = \lambda a. \lambda x. x \text{ is at } a$$

$IX_A$  DANCE.

$\emptyset$   $IX_A$  DANCE.

'the entity that is at A danced.'

$$\sup [\lambda x. \text{entity}(x) \wedge \text{at-A}(x)]$$

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## Introductory use: supplementary

JIN IX<sub>A</sub> SIT-IN CLASS. ∅ IX<sub>A</sub> DANCE.  
 supplemental restrictive  
 ‘Jin (who is at A) .. The entity that is at A ..’

$$\llbracket \text{JIN IX}_A \rrbracket = [\text{jin} \text{ [who is at A] } ] \quad \text{'Jin'}$$
$$[\![X_A]\!] = [\![\emptyset \mid X_A]\!] = \iota x. x \text{ is at } A \quad \text{'the one at } A\text{'}$$

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- Non-restrictive and restrictive modifiers not distinguished overtly in languages like Japanese (cf. Kuno 1973)
- Null-head relative clauses found in Mandarin

(20) Wo mai-de hen gui.  
I buy-RC HEN expensive  
'The thing I bought was expensive.' [Yuyin He, pc]

## Supplementary nature of JIN IX<sub>A</sub>

[[JIN IX<sub>A</sub>]] = [*jin* [who is at A] ]

‘Jin’

What does it mean for [who is at A] to be supplemental?

- Supplements can be new information
- Addressee can accommodate
- Similar uses:
  - There is this boy, *Jin*, who...
  - My friend, *A*, decided to call my other friend, *B*, but B didn't pick up because B didn't want to talk to A.
  - There is this woman, {let's call her *A* / who I'll call *A*}

**$IX_{\text{LOC}}$  across modalities**

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## IX<sub>LOC</sub> in spoken languages

IX<sub>LOC</sub> also exists in spoken languages.

Without demonstratives, often supplemental:

(21) Jin<sub>→A</sub> looks happy. 'Jin looks happy; he is at location A'

(22) One woman is my friend. She<sub>→A</sub> plays soccer.  
'The friend plays soccer; she is at A' [Ahn & Davidson 2018]

With demonstratives, obligatorily restrictive:

(23) That boy<sub>→A</sub> looks happy. 'The boy at A looks happy.'

## Signed vs. Spoken languages

Extension to anaphoric uses:

**Spoken languages:** the pointing gesture removed

That<sub>→A</sub> linguist is happy.

I met a linguist<sub>7</sub>. That<sub>7</sub> linguist was happy.

(marked, acquired later [Ahn & Arunachalam 2019])

\*If you point, anaphoric link breaks! [Ahn & Davidson 2018]

**Signed languages:** pointing to abstract locus

IX<sub>R</sub> TIRED

'The person at R is tired.'

I MEET LINGUIST IX<sub>A</sub>. IX<sub>A</sub> TIRED

'The person at A is tired.'

## Conclusion

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## Summary

1.  $IX_{LOC}$  traditionally analyzed as pronouns carrying indices.
2. Properties of  $IX_{LOC}$  that are incompatible:
  - Low frequency
  - Tracking with contrast
  - Not licensed with inanimates
3.  $IX_{LOC}$  must be introduced, making it less like a demonstrative.
4. Analyzing  $IX_{LOC}$  as a modifier (relative clause) better accounts for distribution and interpretation.



# Advantage

## 1. Simpler analysis

- $IX_{LOC} = \rightarrow$
- Can be applied to both introductory and anaphoric  $IX_{LOC}$ .

## 2. Accounts for markedness.

- Highest in the scale
- Used only when other anaphoric expressions are not available.

## 3. Cross-modal picture

- Composition with exophoric pointing gesture

# Thank you!

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## Alternate analyses

**MacLaughlin 1997:** post-nominal IX is an adverbial

- current proposal is only for IX<sub>LOC</sub> and not IX<sub>NEUT</sub>
- not restricted to post-nominal IX

**Kuhn 2015:** loci are features

- current proposal different because Kuhn's features are mostly syntactic features that trigger agreement
- IX<sub>LOC</sub> as a whole could be seen as notional features, but Kuhn analyzes loci only as features.
- Similar challenge in analyzing the introductory use

# Competition-based mechanism for anaphoric expressions

**Ahn 2019:** *THAT thesis: A Competition-based mechanism for anaphoric expressions*

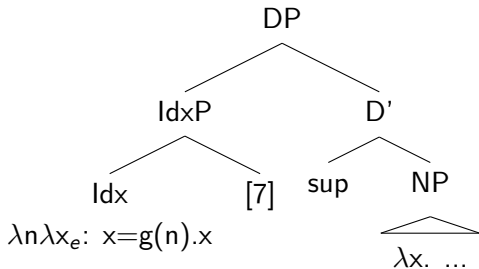
- The interpretive and distributional properties of an anaphoric expression is a result of **semantic/pragmatic competition**.
  - The interpretation and the distribution of an anaphoric expression **depends** on the presence of other anaphoric expressions in the language.



## Main idea

1. Anaphoric expressions share one basic structure.

$\llbracket \text{she}_7 \rrbracket =$



$\llbracket \text{DP} \quad \llbracket \text{n} \rrbracket \quad \llbracket \text{sup} \quad \llbracket \text{NP} \quad \lambda x: \text{entity}(x) \wedge \text{female}(x) \dots \rrbracket \rrbracket$
index      supremum      restrictions

## Main idea

2. They differ on how much information they carry.

$$\llbracket \text{she} \rrbracket = \sup [\lambda x. \text{entity}(x) \wedge \text{female}(x)]$$

$$\llbracket \text{the girl} \rrbracket = \sup [\lambda x. \text{entity}(x) \wedge \llbracket \text{girl} \rrbracket(x)]$$

$$\llbracket \emptyset \rrbracket = \sup [\lambda x. \text{entity}(x)]$$

Semantically primitive properties that are universally available,  
for language-specific realizations

# Main idea

## 3. An economy principle requires that the **minimally informative / redundant form be used.**

Derivable from Grice's Brevity, Efficiency (Meyer 2014),

Related to *Minimize DP!* (Patel-Grosz & Grosz 2017)

A boy walked in. {**He**, The boy, That boy} looked happy.  
{ j<sub>1</sub> }

A boy invited a man. {He, **The boy**, That boy} looked happy.  
{ j<sub>1</sub>, k<sub>2</sub> }

Use of a higher element has consequences!

- Domain widening as accommodation
  - covert vs. overt pronouns in Romance [Mayol 2010]
  - dem. pro. in German [Hinterwimmer & Bosch 2018; Wiltschko 1998]

# ASL

The subset of properties realized in ASL:

$$\llbracket \emptyset \rrbracket = \sup [\lambda x. \text{entity}(x)]$$

$$\llbracket IX_{\text{NEUT}} \rrbracket = \sup [\lambda x. \text{entity}(x) \wedge \phi(x)]$$

$$\llbracket NP \rrbracket = \sup [\lambda x. \text{entity}(x) \wedge NP(x)]$$

What about  $IX_{\text{LOC}}$ ?

$$- \llbracket IX_{\text{LOC}} \rrbracket = \sup [\lambda x. \text{entity}(x) \wedge \phi(x) \wedge R(x)]$$

What is  $R$ ?

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**What is R?**

# What is $R$ ?

Ahn 2019:  $R$  is an additional property demonstratives carry.

Extension of Extended Definite Approach (Elbourne 2008; King 2008)

**Observation:** Demonstratives allow exophoric reference.

(24) That $\rightarrow$  paper looks interesting.

(25) \*It $\rightarrow$  / The paper $\rightarrow$  looks interesting.

**Claim:** Demonstratives realize a binary supremum.

- sup with two arguments [NP restrictions] and [ $\rightarrow$ ]
- What is  $\rightarrow$ ?

# Data points

## I. Loci are not obligatory.

All anaphoric expressions felicitous when there is only one referent.

- Assigning a locus is possible.

(26) BOY  $IX_A$  ENTER CLUB. MUSIC-ON.  $IX_A$  DANCE.

- But null, bare noun, and neutral IX are also possible.
- Neutral IX was the preferred choice with one referent.

(27) BOY ENTER CLUB. MUSIC-ON. {  $\emptyset$ , BOY, IX }  
DANCE.



## Data points (cont.)

### II. Loci are not always licensed.

$IX_{LOC}$  is bad for inanimate referents.

(28) GIRL  $IX_A$  BUY BOOK  $IX_B$ .  $IX_A$  HAPPY.

'A girl bought a book. She was happy.'

(29) GIRL  $IX_A$  BUY BOOK  $IX_B$ .  $IX_B$  ABOUT PIRATES.

'A girl bought a book. It was about pirates.'

- Assigning a locus for an inanimate referent was unnatural.
- Not just for small items; for buildings too.

## Data points (cont.)

### III. $IX_{LOC}$ is licensed in contexts of contrast.

- (30) BOY ENTER CLUB. SEE GIRL READ. MUSIC-ON. ?{  
 $\emptyset$ ,  $IX$  } DANCE.
- (31) BOY ENTER CLUB. SEE GIRL READ. MUSIC-ON. {  
 $BOY$  } DANCE.
- (32) BOY  $IX_A$  ENTER CLUB. SEE GIRL  $IX_B$  READ.  
MUSIC-ON.  $IX_A$  DANCE.

## Data points (cont.)

IV.  $IX_{LOC}$  is licensed in contexts with no narrative.

(33) SUE HANG-OUT MARY.  $\{ \emptyset, IX \}$  PUSH  $\{ \emptyset, IX \}$ .

(34) SUE  $IX_A$  HANG-OUT MARY  $IX_B$ .  $IX_A$  PUSH  $IX_B$ .

- With a narrative, neutral IX or null is okay:

(35) SUE HANG-OUT MARY. MARY SAY SOMETHING.  
SUE ANGRY.  $\{ \emptyset, IX \}$  PUSH  $\{ \emptyset, IX \}$ .

## Data points (cont.)

V.  $IX_{NEUT}$  marks animacy?



forward pointing



downward/index pointing

# Summary of Data

Anaphoric expressions differ in their licensing conditions

- With no contrast,  $\emptyset$  or IX okay.
- With contrast, bare noun or IX<sub>LOC</sub> is licensed.

→ **IX<sub>NEUT</sub>  $\neq$  IX<sub>LOC</sub>**

Locus is neither obligatory nor licensed in all anaphoric contexts.

- Not the preferred choice when there is no competing referent.
- Not felicitous for inanimates

→ Locus is not necessary when it is clear who did what.

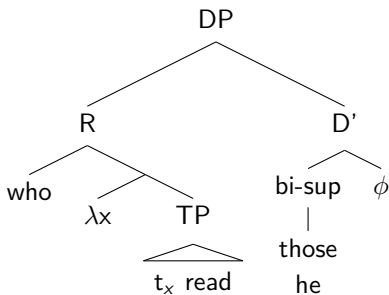
→ **Implications for loci=indices analysis!**

# Advantages

1. A single DP structure with parallel semantics for all anaphoric expressions
  - Only differ in the kind and number of restrictions
2. Competition is naturally derived from the meaning
3. Unified account for a wide range of anaphoric expressions without having to stipulate a lexically-specific restrictions
  - Avoid Pronoun Constraint [Chomsky 1981] PRO
  - Little pro in Romance that compete with overt pronouns
  - Disjoint reference effects
  - Demonstratives
  - Loci (use of space for referent tracking)

## Demonstratives with RRC

[[those who read/he who reads]] =



bi-sup ( $\lambda x$ . entity(x)) ( $\lambda x$ . [[read]](x))]

'the maximal individual  $x$  that reads'