Binding Theory
Describing Relationships between Nouns
Describes the conditions on the structural relations between nouns.

Concerned with three types of nouns:
- **R-expressions** (proper names, common nouns)
- **Pronouns**. (he, she, it, his, one, them, him etc)
- **Anaphors**. (eg. himself, herself, themselves)

These NPs are semantically distinct, but they also have different syntactic distributions.
R-expressions

- Express content

- An NP that gets it meaning by referring to an entity in the world.

- e.g. Bill Clinton, William, The woman in the blue suit, a teddy bear, purple shoes.
Anaphor

- An NP that obligatorily gets its meaning from another NP in the sentence.

- Heidi bopped herself on the head with a zucchini.

- myself, yourself, himself, herself, itself, oneself, ourselves, yourselves, themselves, each other.
Pronouns

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Pronoun: An NP that may (but need not) get its meaning from another word in the sentence. It can also get its meaning from a noun previously mentioned in the discourse, or by context.

- Art said that he played basketball
- Art said that Art played basketball
- Art said that David played basketball

- I, me, you, he, him, she, her, it, one, we, us, they, them, his, her, our, my, its, your, their.
Pronouns

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Art said that he played basketball
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Art said that David played basketball

I, me, you, he, him, she, her, it, one, we, us, they, them, his, her, our, my, its, your, their.

Category D, but count as pronouns.
Antecedent
Antecedent

Antecedent: An NP that gives its meaning to a pronoun or anaphor.
Antecedent

- **Antecedent**: An NP that gives its meaning to a pronoun or anaphor.

- Heidi bopped *herself* on the head with a zucchini.
Antecedent

- **Antecedent**: An NP that gives its meaning to a pronoun or anaphor.

- Heidi bopped herself on the head with a zucchini
Antecedent

- **Antecedent**: An NP that gives its meaning to a pronoun or anaphor.

- Heidi bopped **herself** on the head with a zucchini

  - antecedent
  - anaphor
Indexing
Indexing

Means of representing the meaning of an NP
Indexing

Means of representing the meaning of an NP

Each **index** (plural: indices) represents a different reference.

a) [Colin]_i gave [Andrea]_j [a basketball]_k
b) [Art]_i said that [he]_j played [basketball]_k in [the dark]_l
c) [Art]_i said that [he]_i played [basketball]_k in [the dark]_l
d) [Heidi]_i bopped [herself]_i on [the head]_j with [a zucchini]_k
Indexing

Means of representing the meaning of an NP

Each **index** (plural: indices) represents a different reference.

a) [Colin]₁ gave [Andrea]₂ [a basketball]₃
b) [Art]₁ said that [he]₂ played [basketball]₃ in [the dark]₄

c) [Art]₁ said that [he]₁ played [basketball]₃ in [the dark]₄

d) [Heidi]₁ bopped [herself]₁ on [the head]₂ with [a zucchini]₃

Start at the left and assign each NP an index starting with ₁ and working down the alphabet.
Co-indexing & Co-reference
Co-indexing & Co-reference

Two NPs that have the same index are said to be co-indexed.
Co-indexing & Co-reference

Two NPs that have the same index are said to be co-indexed.

Two NPs that are co-indexed are said to co-refer (that is, refer to the same entity in the world)

a) [Art]_i said that [he]_j played [basketball]_k in [the dark]_l

b) [Art]_i said that [he]_i played [basketball]_k in [the dark]_l
Syntactic Restrictions on Anaphors

Heidi$_i$ bopped herself$_i$ on the head with a zucchini:
Syntactic Restrictions on Anaphors

- Heidiₗ bopped herselfₗ on the head with a zucchini:

- [Heidiₗ's mother]ₖ bopped herselfₖ on the head with a zucchini.
Syntactic Restrictions on Anaphors

- Heidi\(_i\) bopped herself\(_i\) on the head with a zucchini:

- [Heidi\(_i\)'s mother]\(_k\) bopped herself\(_k\) on the head with a zucchini.

- *[Heidi\(_i\)'s mother]\(_k\) bopped herself\(_i\) on the head with a zucchini.
Syntactic Restrictions on Anaphors

- Heidi\textsubscript{i} bopped herself\textsubscript{i} on the head with a zucchini:
- [Heidi\textsubscript{i}'s mother]\textsubscript{k} bopped herself\textsubscript{k} on the head with a zucchini.
- *[Heidi\textsubscript{i}'s mother]\textsubscript{k} bopped herself\textsubscript{i} on the head with a zucchini.

The antecedent for an anaphor can be the subject of the sentence, but not an NP inside the subject.
Syntactic Restrictions on Anaphors

- Heidi\textsubscript{i} bopped herself\textsubscript{i} on the head with a zucchini:
- \texttt{[Heidi\textsubscript{i}'s mother]\textsubscript{k} bopped herself\textsubscript{k} on the head with a zucchini.}
- \texttt{*[Heidi\textsubscript{i}'s mother]\textsubscript{k} bopped herself\textsubscript{i} on the head with a zucchini.}

The antecedent for an anaphor can be the subject of the sentence, but not an NP inside the subject.

Let's look at this distinction in terms of structural relations.
Heidi bopped herself.

mother bopped herself.

Heidi’s bopped herself.
Heidi bopped herself

mother bopped herself
Heidi bopped herself

Heidi’s mother bopped herself
NP_i

TP

N
Heidi

VP

V
bopped

NP_i

...

N
herself


NP_i

TP

NP

V
bopped

VP

NP_i

...

N
mother

Heidi’s

N
herself_i

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Heidi bopped herself.

Heidi’s mother bopped herself.

C-commanded by [\text{NP}\text{Heidi}]
Heidi bopped herself

C-commanded by [NPHeidi]

mother bopped herself

Not C-commanded by [NPHeidi]
Binding
Binding

This fact is captured by binding.
This fact is captured by binding.

Binds:

- A binds B if and only if
- A c-commands B AND
- A and B are co-indexed.
Binding

This fact is captured by binding.

**Binds:**

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**Note:** binding is not the same as co-indexing!!! (co-indexing has same index; binding requires a c-command relationship between the co-indexed elements.)
Binding

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Binding is a SPECIAL kind of c-command. It is c-command with co-indexing.
The Principle that deals with anaphors

Principle A (to be revised): An anaphor must be bound

In other words: An anaphor must be c-commanded and co-indexed by an antecedent.
Heidi bopped herself.

mother bopped herself.

Heidi’s herself.
Coindexed?
Coindexed? yes
Coindexed?  yes

C-command?
Coindexed? yes
C-command? yes
Coindexed? yes
C-command? yes
∴ Bound
Coindexed? yes
C-command? yes

:: Bound
Coindexed?  yes
C-command?  yes

∴ Bound
Coindexed? yes
C-command? yes
∴ Bound

Coindexed? yes
C-command?
Coindexed? yes  Coindexed? yes
C-command? yes  C-command? no

∴ Bound
Coindexed? yes
C-command? yes
∴ Bound

Coindexed? yes
C-command? no
∴ NOT Bound
Coindexed? yes  Coindexed? yes  :: Bound
C-command? yes  C-command? no  :: NOT Bound

VIOLATES PRINCIPLE A
Locality restrictions on anaphor binding

Heidi\textsubscript{i} danced with herself\textsubscript{i}

*Heidi\textsubscript{i} said that Art danced with herself\textsubscript{i}
  (cf. Heidi\textsubscript{i} said that Art danced with her\textsubscript{i}.)

*Heidi\textsubscript{i} said that herself\textsubscript{i} danced with Art
  (cf. Heidi\textsubscript{i} said that she\textsubscript{i} danced with Art)
Heidi danced with herself.

Heidi said ...

herself...
Heidi danced with herself.

*TP

Heidi said ... herself...

important difference!
Binding domain
Binding domain

 Binding domain: The clause containing the anaphor
Binding domain

**Binding domain**: The clause containing the anaphor

This definition is overly simplistic; we’ll talk about this later in the semester, but the above will be your definition for the purposes of homework and exams for now.
Binding domain

**Binding domain**: The clause containing the anaphor

This definition is overly simplistic; We’ll talk about this later in the semester, but the above will be your definition for the purposes of homework and exams for now.

**Binding Principle A**: An anaphor must be bound in its binding domain.
Heidi danced with herself.

*Heidi said... herself...
Binding domain for anaphor

Coindexed?

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Binding domain for anaphor

Coindexed? yes

Heidi danced with herself

*TP

Heidi said herself
Coindexed? yes
C-command?
Coindexed? yes
C-command? yes \(\because\) Bound
Coindexed? yes
C-command? yes : Bound
Bound in domain? 
Coindexed?  yes
C-command?  yes \( \therefore \) Bound
Bound in domain?  yes
Coindexed? yes
C-command? yes \( \Rightarrow \) Bound
Bound in domain? yes
**Binding domain for anaphor**

- **Coindexed?** yes
- **C-command?** yes \(\therefore\) Bound
- **Bound in domain?** yes

```
Heidi danced with herself
```

```
Heidi said herself
```

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Binding domain for anaphor

Coindexed? yes  Coindexed? yes
C-command? yes ∴ Bound C-command?
Bound in domain? yes

Heidi danced with herself

*TP

Heidi said... herself...
Heidi danced with herself.

Heidi said... herself...
Coindexed? yes  
C-command? yes \(\therefore\) Bound  
Bound in domain? yes
Coindexed? yes
C-command? yes . Bound
Bound in domain? yes

Coindexed? yes
C-command? yes . Bound
Bound in domain? no
Coindexed? yes  
C-command? yes \( \therefore \) Bound 
Bound in domain? yes 

VIOLATES PRINCIPLE A
A (more) intuitive characterization???

Principle A imposes TWO restrictions:

1) The anaphor must be bound
   = both c-commanded and coindexed

2) AND The anaphor must be bound (find its antecedent)
   within its own clause (the binding domain)

Note that the restriction is not that an anaphor needs
to be simply bound. An anaphor can be bound, yet the
sentence still ungrammatical if it isn’t bound **locally**.
Pronouns
Pronouns

\( \text{Heidi}_i \) bopped \( \text{her}_k \) on the head with the zucchini
Pronouns

- Heidi$_i$ bopped her$_k$ on the head with the zucchini
- *Heidi$_i$ bopped her$_i$ on the head with the zucchini
Pronouns

- Heidi$_i$ bopped her$_k$ on the head with the zucchini
- *Heidi$_i$ bopped her$_i$ on the head with the zucchini
- Heidi$_i$ said that she$_i$ danced with Art
Pronouns

- Heidi\textsubscript{i} bopped her\textsubscript{k} on the head with the zucchini
- *Heidi\textsubscript{i} bopped her\textsubscript{i} on the head with the zucchini
- Heidi\textsubscript{i} said that she\textsubscript{i} danced with Art
- Heidi\textsubscript{i} said that she\textsubscript{k} danced with Art.
Pronouns

- Heidi$_i$ bopped her$_k$ on the head with the zucchini
- *Heidi$_i$ bopped her$_i$ on the head with the zucchini
- Heidi$_i$ said that she$_i$ danced with Art
- Heidi$_i$ said that she$_k$ danced with Art.

Only restriction on pronouns: they cannot be bound within their clause
Pronouns

- **Free:** Not bound
- **Principle B:** Pronouns must be free in their Binding Domain.
Heidi danced with her.

Heidi said... she...
Heidi danced with her.

Heidi said … she …
Heidi danced with her

Heidi said... she...
Binding domain for pronoun

Coindexed? yes
C-command?
Coindexed?  yes
C-command?  yes ☐ Bound
Coindexed? yes
C-command? yes \[\therefore\] Bound
Free in domain?
Coindexed? yes
C-command? yes \( \therefore \text{Bound} \)
Free in domain? no
Coindexed? yes
C-command? yes ∴ Bound
Free in domain? no
VIOLATES PRINCIPLE B
Coindexed? yes

C-command? yes \(\vdash\) Bound

Free in domain? no

VIOLATES PRINCIPLE B
Coindexed? yes
C-command? yes ∴ Bound
Free in domain? no
VIOLATES PRINCIPLE B
Heidi danced with her. Heidi said... she...
 Binding domain for pronoun

Coindexed? yes  C-command? yes ∴ Bound
Free in domain? no

VIOLATES PRINCIPLE B
Coindexed? yes
C-command? yes \( \therefore \) Bound
Free in domain? no

VIOLATES PRINCIPLE B
Heidi danced with her

Heidi said...

Coindexed? yes  Coindexed? yes
C-command? yes \: Bound  C-command? yes \: Bound
Free in domain? no  Free in domain? yes

VIOLATES PRINCIPLE B
Heidi danced with her... said ... she...
Heidi danced with her ...

... she ...

Coindexed?
Coindexed? no :: not Bound
Coindexed? no :: not Bound

Free in domain?
Coindexed? no :: not Bound
Free in domain? Yes
**Coindexed?** no  •  not Bound  Coindexed?
Free in domain? Yes
Coindexed? no :: not Bound  Coindexed? no :: not Bound
Free in domain? Yes
Coindexed? no :: not Bound
Free in domain? Yes

Coindexed? no :: not Bound
Free in domain? Yes
Both meet condition B
R-expressions
R-expressions

*Heidi\textsubscript{i} kissed Miriam\textsubscript{i}
R-expressions

*Heidi\textsubscript{i} kissed Miriam\textsubscript{i}

*She\textsubscript{i} kissed Heidi\textsubscript{i}
R-expressions

*Heidi\_i kissed Miriam\_i

*She\_i kissed Heidi\_i

*She\_i said that Heidi\_i was a disco queen.
R-expressions

*Heidi\textsubscript{i} kissed Miriam\textsubscript{i}
*She\textsubscript{i} kissed Heidi\textsubscript{i}
*She\textsubscript{i} said that Heidi\textsubscript{i} was a disco queen.

Principle C: R-expressions must be free (everywhere)
Heidi danced with Heidi…

*TP

NP

i

N
Heidi

V

V
Heidi

PP

N
Heidi

P
with

NP

i

N
Heidi

VP

CP

C

TP

… Heidi i…
Heidi danced with Heidi said… Heidi… 

Coindexed?
Heidi danced with Heidi… Heidi

---

Coindexed? yes
Coindexed? yes
C-command?

Heidi danced with Heidi...

*TP
NP_i
I
N Heidi
V danced
PP with
NP_i
N Heidi

*TP
NP_i
I
N Heidi
VP said
CP
C TP

... Heidi_i...
Coindexed? yes

C-command? yes :: Bound

Heidi danced with Heidi

... Heidi...
Coindexed? yes
C-command? yes : Bound
Free?
Coindexed? yes
C-command? yes \(\Rightarrow\) Bound
Free? no
Coindexed? yes
C-command? yes ∴ Bound
Free? no
VIOLATES PRINCIPLE C
Coindexed? yes
C-command? yes \.: Bound
Free? no

VIOLATES PRINCIPLE C
Heidi danced with Heidi

Coindexed? yes
C-command? yes :: Bound
Free? no

VIOLATES PRINCIPLE C
Coindexed? yes
C-command? yes ∴ Bound
Free? no

VIOLATES PRINCIPLE C

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Coindexed? yes  
C-command? yes  \[\therefore \text{Bound}\]
Free? no  

VIOLATES PRINCIPLE C
Coindexed? yes
C-command? yes .: Bound
Free? no

VIOLATES PRINCIPLE C
Coindexed? yes  Coindexed? yes
C-command? yes \cdot Bound  C-command? yes \cdot Bound
Free? no  Free no

VIOLATES PRINCIPLE C
Coindexed? yes  yes
C-command? yes \(\vdash\) Bound yes \(\vdash\) Bound
Free? no no
VIOLATES PRINCIPLE C VIOLATES PRINCIPLE C
Summary

Antecedent, Anaphor, index, pronoun, R-expression, co-reference
Summary

- Antecedent, Anaphor, index, pronoun, R-expression, co-reference

- **Binds:**
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Summary

Antecedent, Anaphor, index, pronoun, R-expression, co-reference

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Summary

- Antecedent, Anaphor, index, pronoun, R-expression, co-reference

**Binds:**
- A binds B if and only if
- A c-commands B AND
- A and B are co-indexed

**Free:** not bound

**Binding domain:** The clause containing the anaphor/pronoun
Summary: The binding principles
Summary: The binding principles

Binding Principle A: An anaphor must be bound in its binding domain.
Summary: The binding principles

- **Binding Principle A:** An anaphor must be bound in its binding domain.
- **Binding Principle B:** Pronouns must be free in their binding domain.
Summary: The binding principles

- Binding Principle A: An anaphor must be bound in its binding domain.
- Binding Principle B: Pronouns must be free in their binding domain.
- Binding Principle C: R-expressions must be free.