

# Hierarchical structure

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# Homework

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What are the two meanings of *I'm a big dog man*?

1. I'm a man who likes big dogs ('big' = LARGE)
2. I'm a man who is keen on dogs ('big' = KEEN)

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What are the two meanings of *I'm a big dog man*?

1. I'm a man who likes big dogs ('big' = LARGE)
2. I'm a man who is keen on dogs ('big' = KEEN)

Each different meaning corresponds to a different syntactic structure.

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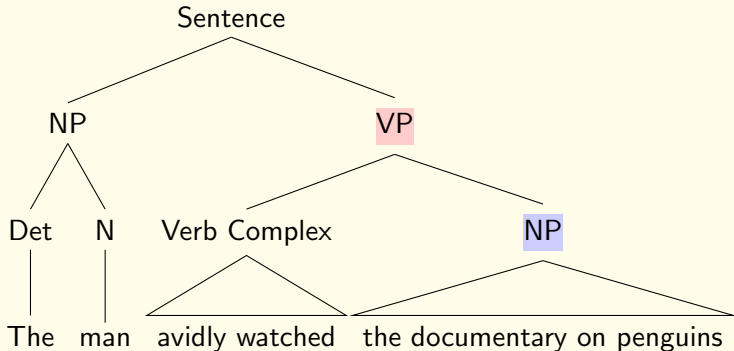
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(1) The man <sub>VP</sub> [avidly watched <sub>NP</sub> [the documentary on penguins] ]

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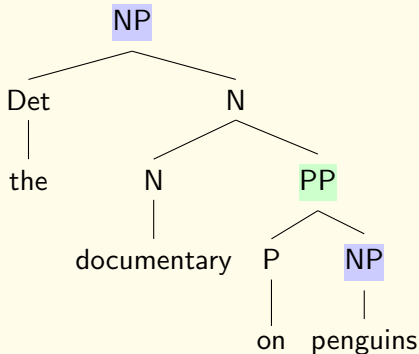


# Hierarchical phrase structure

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The **NP** [documentary **PP** [on [NP Penguins] ] ]



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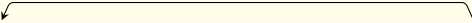
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Embedding of one phrase inside another

If we move a phrase we have to move all embedded phrases.

It was [<sub>NP</sub>the documentary [<sub>PP</sub>on penguins]] that the man watched *t*



\*It was [the documentary] that the man loved *t* [on penguins]



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un- touch -able -s

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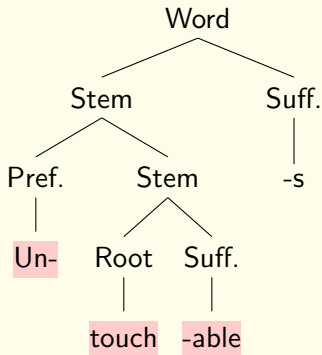
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un- touch -able -s  
un- root -able -s  
un- root suff. -s  
pref. stem -s  
stem suff.

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Multiple syntactic presentations

(3) I'm a big dog man

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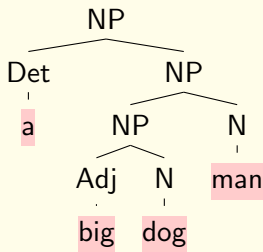
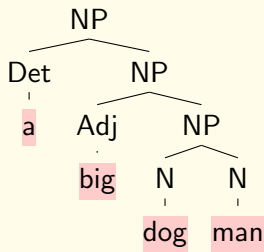
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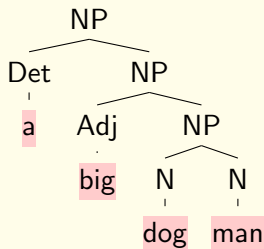
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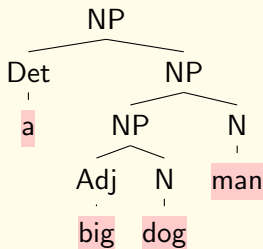
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Keen on all dogs



Likes big dogs only

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Another example

(4) The man saw the woman with the binoculars

How is this ambiguous?

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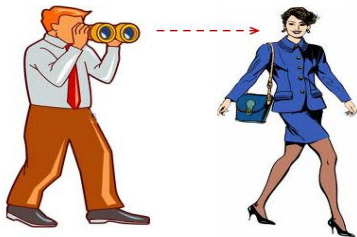
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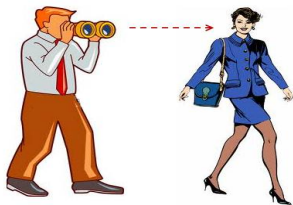
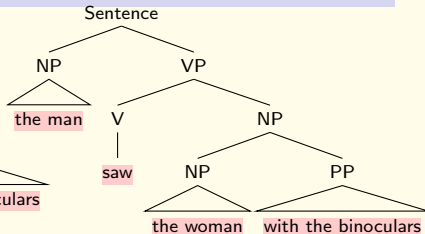
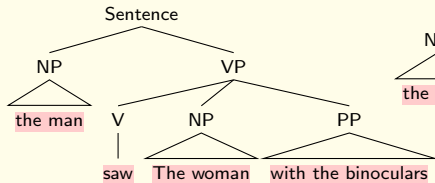
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# Syntactic ambiguity in sentences

The man saw the woman with the binoculars



# Syntactic ambiguity in sentences



# Syntactic ambiguity in sentences

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The following sentences are syntactically ambiguous. In what way?

1. I saw her duck.
2. The chickens are too hot to eat
3. I said I would see you on Tuesday.
4. Sue adores men who love women who don't smoke.
5. The parents of the bride and the groom were waiting outside.

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- ▶ I saw her duck  
I saw [NP her duck] / I saw [NP her] [VP duck]
- ▶ The chickens are too hot to eat  
Interpretation A; the chickens are the subject of *eat*,  
Interpretation B; the chickens are the object of *eat*.
- ▶ I said I would see you on Tuesday.  
Does *on Tuesday* modify the verb *see* or the verb *say*?

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- ▶ Sue adores men who love women who don't smoke

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- ▶ Sue adores men who love women who don't smoke  
Sue adores non-smoking men who love women  
Sue adores men who love non-smoking women  
Ambiguity stems from *who don't smoke* - does this refer to *men* or *women*?
- ▶ The parents of the bride and the groom were waiting outside.



# Syntactic ambiguity in sentences

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- ▶ Sue adores men who love women who don't smoke  
Sue adores non-smoking men who love women  
Sue adores men who love non-smoking women  
Ambiguity stems from *who don't smoke* - does this refer to *men* or *women*?
- ▶ The parents of the bride and the groom were waiting outside.  
[NP The parents of the bride] and [NP the groom] were waiting outside  
[NP The parents of the bride and the groom] (i.e. both sets of parents) were waiting outside

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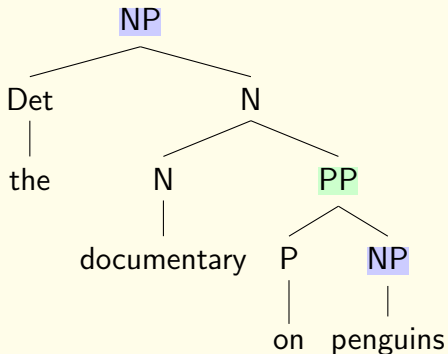
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It was [<sub>NP</sub>the documentary [<sub>PP</sub>on penguins]] that the man loved *t*



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# What is recursion?

Recursion is a very important property of language.

It refers to constructions where phrases are embedded in phrases **of the same type**.

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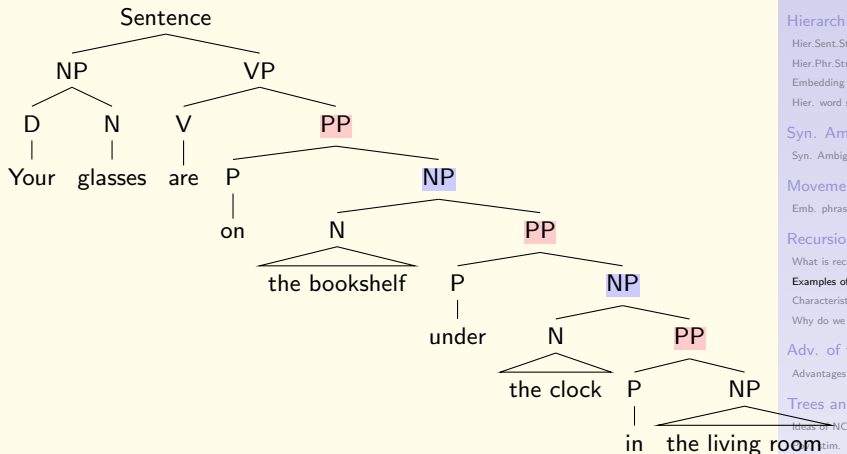
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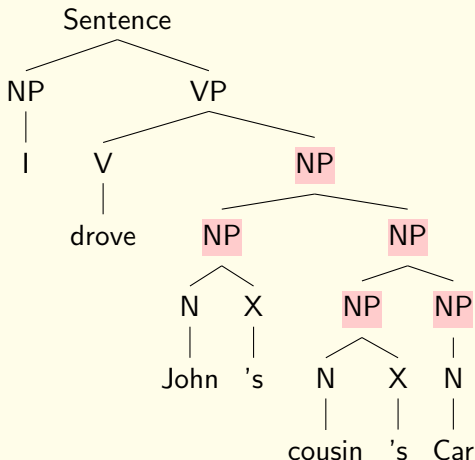
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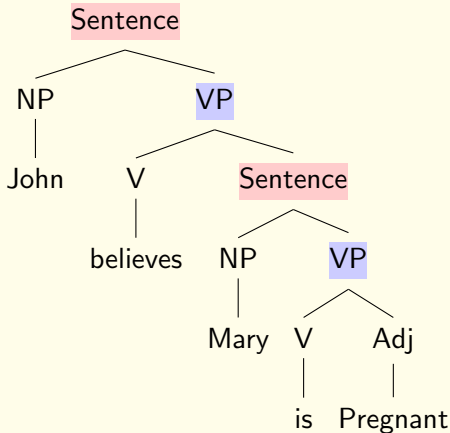
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# Characteristics of recursion

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And again and again. . .

- *It is on the bookshelf under the clock in the living room at number 10 Grosvesnor street in the East End of London*

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# Characteristics of recursion

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And again and again. . .

- *It is on the bookshelf under the clock in the living room at number 10 Grosvesnor street in the East End of London*
- *I drove John's cousin's auntie's builder's hairdresser's car*

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# Characteristics of recursion

Hierarchical  
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Nick Riches

And again and again. . .

- *It is on the bookshelf under the clock in the living room at number 10 Grosvesnor street in the East End of London*
- *I drove John's cousin's auntie's builder's hairdresser's car*
- *John believes that Sally believes that Cassandra believes that Rufus believes that Mary is pregnant.*

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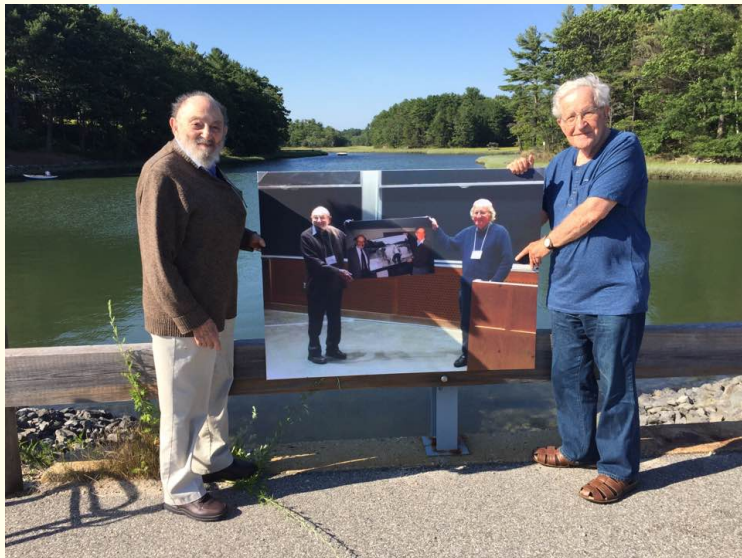
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# Why do we need recursion?

- Your glasses are on the bookshelf under the clock in the living room  $\Rightarrow$

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# Why do we need recursion?

- Your glasses are on the bookshelf under the clock in the living room  $\Rightarrow$   
There is a clock in the living room. The bookshelf is under this. Your glasses are on that bookshelf.

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# Why do we need recursion?

- Your glasses are on the bookshelf under the clock in the living room  $\Rightarrow$   
There is a clock in the living room. The bookshelf is under this. Your glasses are on that bookshelf.
- I drove John's cousin's car  $\Rightarrow$

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- Your glasses are on the bookshelf under the clock in the living room  $\Rightarrow$   
There is a clock in the living room. The bookshelf is under this. Your glasses are on that bookshelf.
- I drove John's cousin's car  $\Rightarrow$   
I drove a car. John has a cousin. The car belongs to the cousin.

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- John believes Mary is pregnant  $\Rightarrow$

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- Your glasses are on the bookshelf under the clock in the living room  $\Rightarrow$   
There is a clock in the living room. The bookshelf is under this. Your glasses are on that bookshelf.
- I drove John's cousin's car  $\Rightarrow$   
I drove a car. John has a cousin. The car belongs to the cousin.
- John believes Mary is pregnant  $\Rightarrow$   
John has a belief. The following is his belief... Mary is pregnant.

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We can see that trees are extremely useful means of representing sentences;

1. They can represent hierarchical structure
2. They can represent syntactic ambiguity
3. They can represent movement processes and how these apply to embedded phrases
4. They can represent recursion

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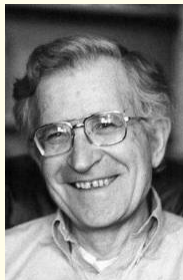
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# The ideas of Noam Chomsky



## Generative syntax

The main assumption of this approach is that there is a **poverty of the stimulus**

Language input is not sufficiently rich to account for children's linguistic knowledge

i.e. the *stimulus* is too *poor*

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# The Poverty of the Stimulus

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Nick Riches

At aged  $2\frac{3}{4}$  children are capable of forming very complex structures such as questions and negatives

But rudimentary mathematical abilities

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At aged  $2\frac{3}{4}$  children are capable of forming very complex structures such as questions and negatives

But rudimentary mathematical abilities

⇒ we are born with an innate knowledge of language, sometimes called **Universal Grammar**.



# Universal Grammar and trees

Hierarchical  
structure

Nick Riches

According to Chomsky, Universal Grammar is a system which is optimised for building trees

So, the trees we have drawn above provide an insight in our innate knowledge of language

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# The importance of recursion

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In a recent article (Hauser, M. D., Fitch, W. T., & Chomsky, N. (2002). The faculty of language: what is it, who has it, and how did it evolve? Science, 298. [Click Here.](#)) Chomsky "lets go" of a number of different components of Universal Grammar

But they insist that recursion is a key principle.

# A language without recursion?

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Daniel Everett

Pirahã language does not actually contain recursion

# Recursion in other domains?



Marilyn Monroe's character thinks [ that Tony Curtis's character (Joe) is a woman called Josephine ]

We therefore mentally represent the situation described by the recursive sentence *Marilyn believes that Josephine is a woman*

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Concepts involving recursion

*Pregnancy* (a person inside a person)

*Russian dolls* (a doll inside a doll inside a doll inside a doll, etc.)

Postal addresses (1 Smith Street, Covington, Berkshire, England, Europe, the Northern Hemisphere, the World, the Solar System, the Milky Way, the Universe, the Multiverse).

# Presence of multiple recursion in spoken language

Hierarchical  
structure

Nick Riches

*Theoretically, we can say John believes that Sally believes that Cassandra believes that Rufus believes that Mary is pregnant*

*I drove John's cousin's auntie's builder's hairdresser's car*

But do we actually do this?

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Rice & Wexler's "ATOM" model; Universal Grammar mechanisms governing realisation of tense and case-marking are 'broken' (Rice, Wexler & Redmond, 1999)

(7) Him go there

Van der Lely's Computational Grammatical Complexity Account (van der Lely & Pinker, 2014)

(8) The dog was chased by the cat

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What grammatical characteristic do the following song lyrics have in common.

When I fall in love, it will be forever (sung by Nat King Cole)

Wherever I lay my hat, that's my home (sung by Marvin Gaye)

Whenever/wherever we're meant to be together, I'll be there and you'll be near (sung by Shakira)

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Rice, M. L., K. Wexler, and S. M Redmond. Grammaticality Judgments of an Extended Optional Infinitive Grammar: Evidence from English-Speaking Children with Specific Language Impairment. *Journal of Speech, Language, and Hearing Research* 42, no. 4 (1999): 943-61.

Lely, Heather K.J. van der, and Steven Pinker. The Biological Basis of Language: Insight from Developmental Grammatical Impairments. *Trends in Cognitive Sciences* 18, no. 11 (November 2014): 586-95.  
<https://doi.org/10.1016/j.tics.2014.07.001>.