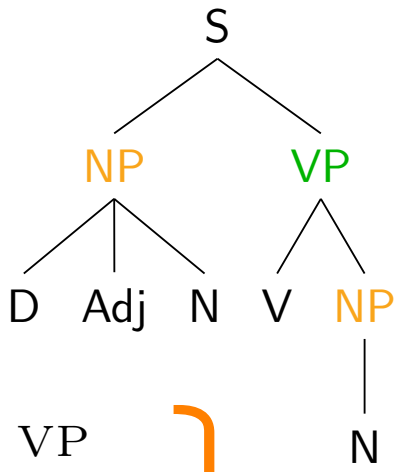
Patterns in Word Order

Constituents & Phrase-Structure Rules



$$\left\{ \begin{array}{c} S \rightarrow NP\ VP \\ NP \rightarrow (D)\ (Adj)\ N \\ VP \rightarrow V\ (NP) \end{array} \right\}$$

Frame Sentences

ELC 231: Introduction to Language and Linguistics

Morphology and Syntax

Dr. Meagan Louie

Core Subdomains

Linguistics: The study of Language

- Phonetics
- Phonology
- Morphology
- Syntax
- Semantics
- Pragmatics

Core Subdomains: Last Week - Semantics and Morphology

Linguistics: The study of Language

- Phonetics
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- Syntax
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Core Subdomains: This Week - Morphology and Syntax

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2 CONCATENATION & COMPOSITIONALITY

3 MORPHEME CATEGORIES

- **Distributional Categories:** roots, stems, prefixes, suffixes
- **Lexical Categories:** N, N, Adj, P, Det

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5 etc....

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We'll focus on MORPHEME CONCATENATION
(but we'll discuss differences in meaning predictability next week)

The LEXICON: The Repository of MORPHEMES

Definition: MORPHEME

A MORPHEME is the smallest unit of language that **has/contains** meaning - i.e., it is a systematic $\langle form, meaning \rangle$ mapping

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- The LEXICON is our mental dictionary of $\langle form, meaning \rangle$ mappings
- **Q:** But are morphemes JUST $\langle form, meaning \rangle$ pairings?
  is that all we need to explain how morpheme concatenation works?

REVIEW: Restrictions on Morpheme Concatenation

Observations: Affixes can't attach to just *any* kind of stem

(1) a. /nâa-rák/ น่ารัก
b. /nâa-jùu/ น่าอยู่
c. /nâa-mɔɔŋ/ น่ามอง
d. /nâa-kʰít/ น่าคิด

(2) a. */nâa-híw/ น่าหิว
b. */nâa-rɔ́ɔn/ น่าร้อน
c. */nâa-pʰèt/ น่าเผ็ด
d. */nâa-lék/ น่าเล็ก

(3) a. */nâa-pʰaasǎa/ น่าภาษา
b. */nâa-mɛɛw/ น่าแมว
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- What determines when the morpheme ⟨/nâa/, -WORTHY[a] ⟩ can combine with another morpheme?

[a] Hahahaha, as if I actually know what this means.

Morphemes consist of ⟨form, meaning, category⟩

Observation: Affixes have SELECTIONAL RESTRICTIONS

- they can only attach to certain LEXICAL CATEGORIES,
  eg., N, V, Adj, Adv, Prep, ...

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⟨*nâa*-, VERB-worthy, [__ - VERB]$_{\text{ADJ}}$⟩

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$$\langle nâa\text{-}, \text{VERB-worthy}, [\ \_\_\text{- VERB}]_{\text{ADJ}} \rangle$$

- i.e., lexical entries also contain information about lexical category

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- This sort of lexical entry makes **predictions** about
  1. **grammaticality**
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  Evidence that falsifies these predictions?

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- **What do we mean by “pattern like an adjective”?**

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- "patterns like an X" refers to both of these kinds of patterns

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Adjectives in ATTRIBUTIVE position

Observation: Only some words can occur in the _____position of the following FRAME SENTENCE:

"The _____duck quacked.":

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Observation: These are the same words that can occur with superlative morphology *-est*:

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Adjectives in ATTRIBUTIVE position

Observation: These are also the same words that can occur with comparative morphology *-er*:

"The _____ duck quacked.":

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Adjectives in PREDICATIVE position

Observation: These are also the only words that can occur in this other FRAME SENTENCE

"Howard the duck is _____":

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Adjectives in PREDICATIVE position

Idea: This is not a coincidence!

These words belong to a specific LEXICAL CATEGORY (adjective) that English grammar (both morphology and syntax) are sensitive to

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Proposal: There is a LEXICAL CATEGORY ADJECTIVE that behaves differently from other words

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→ The syntactic patterns provide
independent evidence for lexical categories

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Observation: Each LEXICAL CATEGORY has distinct morphological and syntactic distributions

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- **Morphological Diagnostics:** (word-internal patterns/distribution)
  - Occurs with morpheme X
  - Often ends in morpheme Y

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"DET fluffy duck quacked in the water."

(See website for English diagnostics for N, V, Det, P, etc)

Evidence for Lexical Categories: Frame Sentences

Evidence for lexical categories

Observation: DETERMINERS have distinct morphological and syntactic distributions

- **Morphological Diagnostics:** (word-internal patterns/distribution)
  - Occurs with morpheme X (N/A)
  - Often ends in morpheme Y (N/A; often agrees with following N)
- **Syntactic Diagnostics:** (word-internal patterns/distribution)
  - Occurs in the _____position of a particular kind of FRAME SENTENCE

"DET fluffy duck quacked in the water."

→ If a word occurs in this position, that's evidence it's a DETERMINER

Evidence for Lexical Categories: Frame Sentences

Evidence for lexical categories

Observation: ADJECTIVES have distinct morphological and syntactic distributions

- **Morphological Diagnostics:** (word-internal patterns/distribution)
  - Occurs with morpheme X (un-, -er, -est, -ish)
  - Often ends in morpheme Y (-ic, -ish, -al, -ful, -ive, -ous, -able)
- **Syntactic Diagnostics:** (word-internal patterns/distribution)
  - Occurs in the _____position of a particular kind of FRAME SENTENCE

"The ADJ duck quacked in the water."

→ If a word occurs in this position, that's evidence it's an ADJECTIVE

Evidence for Lexical Categories: Frame Sentences

Evidence for lexical categories

Observation: NOUNS have distinct morphological and syntactic distributions

- **Morphological Diagnostics:** (word-internal patterns/distribution)
  - Occurs with morpheme X (-s_{PL}, -ish,)
  - Often ends in morpheme Y (-ity, -ness, -er, -ism, -ment, -tion)
- **Syntactic Diagnostics:** (word-internal patterns/distribution)
  - Occurs in the _____position of a particular kind of FRAME SENTENCE

"The fluffy N quacked in the water."

→ If a word occurs in this position, that's evidence it's a NOUN

Evidence for Lexical Categories: Frame Sentences

Evidence for lexical categories

Observation: VERBS have distinct morphological and syntactic distributions

- **Morphological Diagnostics:** (word-internal patterns/distribution)
  - Occurs with morpheme X (-$s_{3.sg.pres}$, -ed_{past}, -ing)
  - Often ends in morpheme Y (-ize, -ate, -ify)
- **Syntactic Diagnostics:** (word-internal patterns/distribution)
  - Occurs in the _____position of a particular kind of FRAME SENTENCE

"The fluffy duck V in the water."

→ If a word occurs in this position, that's evidence it's a VERB

Evidence for Lexical Categories: Frame Sentences

Evidence for lexical categories

Observation: PREPOSITIONS have distinct morphological and syntactic distributions

- **Morphological Diagnostics:** (word-internal patterns/distribution)
  - Occurs with morpheme X (N/A)
  - Often ends in morpheme Y (N/A)
- **Syntactic Diagnostics:** (word-internal patterns/distribution)
  - Occurs in the _____position of a particular kind of FRAME SENTENCE

"The fluffy duck quacked P the water."

→ If a word occurs in this position, that's evidence it's a PREPOSITION

Evidence for Lexical Categories: Frame Sentences

Evidence for lexical categories

NOTE: Different languages often have different lexical categories and diagnostics

- **Morphological Diagnostics:** (word-internal patterns/distribution)
  1. Occurs with morpheme X
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Evidence for Lexical Categories: Frame Sentences

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NOTE: Different languages often have different lexical categories and diagnostics

- **Morphological Diagnostics:** (word-internal patterns/distribution)
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(→ Assignment/Problem Set 004)

Evidence for Syntactic Constituents: Frame Sentences

- **Q**: Where do the FRAME SENTENCE patterns come from?

Evidence for Syntactic Constituents: Frame Sentences

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  $\langle$[N/ADJ]-ish]$_{\text{ADJ}}$, PROPERTY OF BEING SIMILAR TO N/ADJ$\rangle$

  $\rightarrow$ This *predicts* the patterns we use as morphological diagnostics

  ...but we don't have anything in our theory that
  predicts the patterns we use as syntactic diagnostics (yet)

Evidence for Syntactic Constituents: Frame Sentences

Adjectives in ATTRIBUTIVE Position

FRAME SENTENCES patterns are patterns in WORD ORDER

- "The fluffy duck quacked."
- "A funny student smiled."
- "This cheap teacup cracked."
- "I heard the fluffy duck."
- "I broke this cheap teacup."

Evidence for Syntactic Constituents: Frame Sentences

Adjectives in ATTRIBUTIVE Position: Occur between D and N

FRAME SENTENCES patterns are patterns in WORD ORDER

- "The fluffy duck quacked." D ADJ N V
- "A funny student smiled." D ADJ N V
- "This cheap teacup cracked." D ADJ N V
- "I heard the fluffy duck." Pro V D ADJ N
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Evidence for Syntactic Constituents: Frame Sentences

Adjectives in ATTRIBUTIVE Position: Occur between D and N

Question: Why is [D Adj N] such a common sequence?

- "The fluffy duck quacked." — D ADJ N V
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Evidence for Syntactic Constituents: Frame Sentences

Adjectives in ATTRIBUTIVE Position: Occur between D and N

Question: Why is [D Adj N] such a common sequence?

- "The angry lion roared." — D ADJ N V
- "A sad song played." — D ADJ N V
- "This dangerous dog bites." — D ADJ N V
- "I sold the new car." — Pro V D ADJ N
- "I ate a gigantic burger." — Pro V D ADJ N

Evidence for Syntactic Constituents: Frame Sentences

Question: Why is [D Adj N] such a common sequence in sentences?

- **Syntactic Theory:**
  (i) Words are combined to form
  CONSTITUENTS

Evidence for Syntactic Constituents: Frame Sentences

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  - (ii) The combination $[\text{D Adj N}]_{\text{NP}}$ is a constituent called a NOUN PHRASE (NP)
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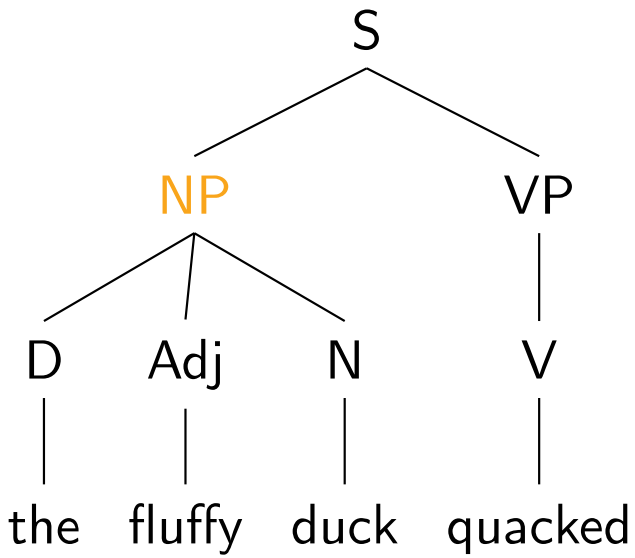

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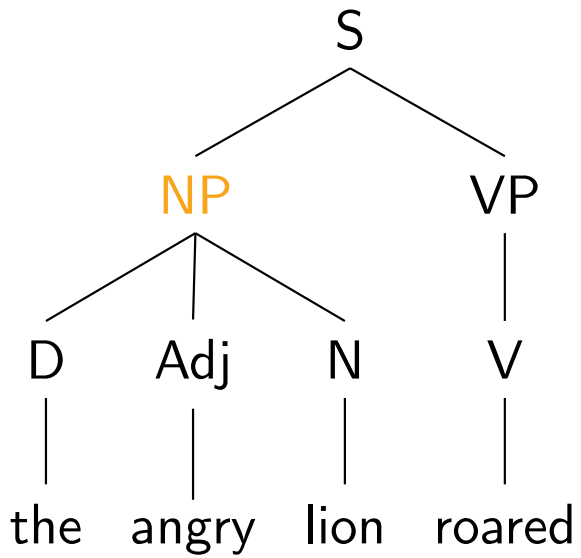

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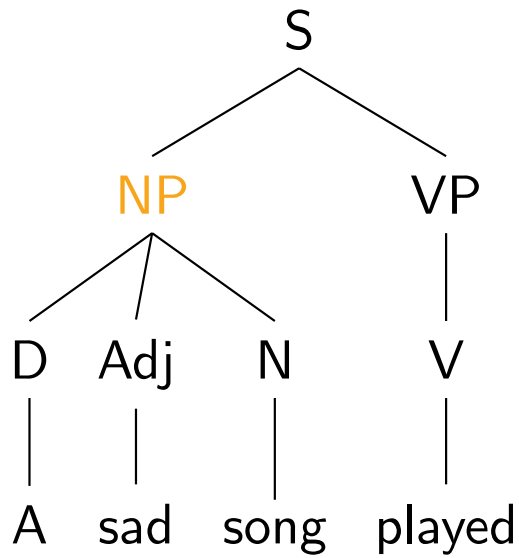

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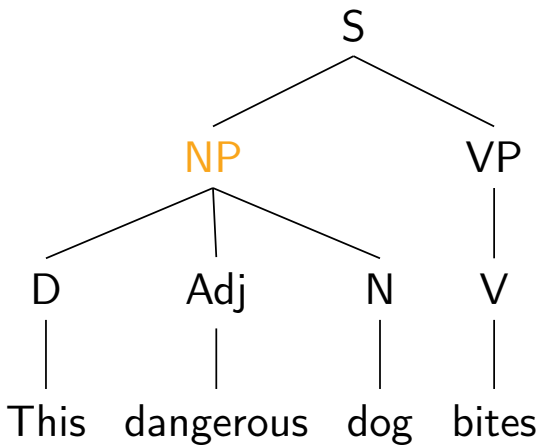
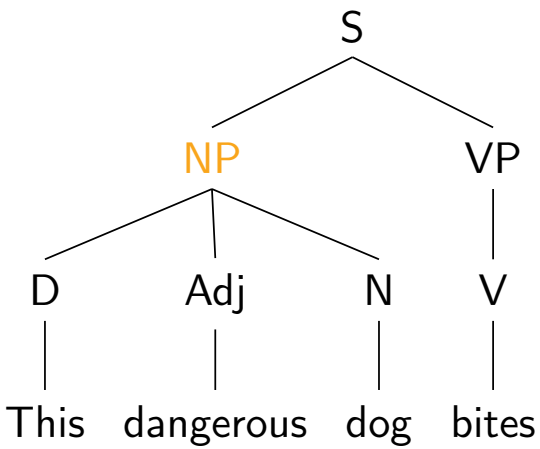


Evidence for Syntactic Constituents: Frame Sentences

Q: Where do the FRAME SENTENCE word-order patterns come from?

Proposal: Sentences are made up of CONSTITUENTS



- Constituents are formed from words with PHRASE-STRUCTURE RULES (PSRs)

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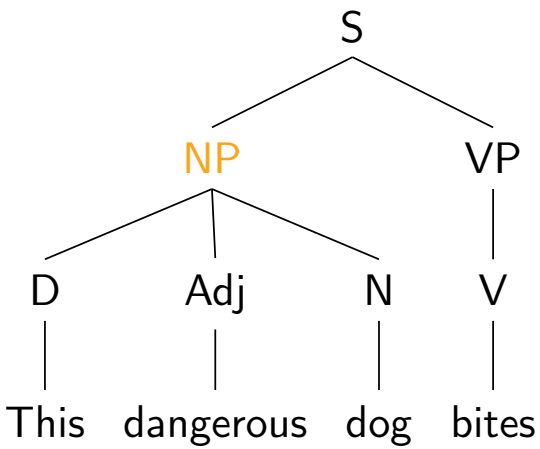

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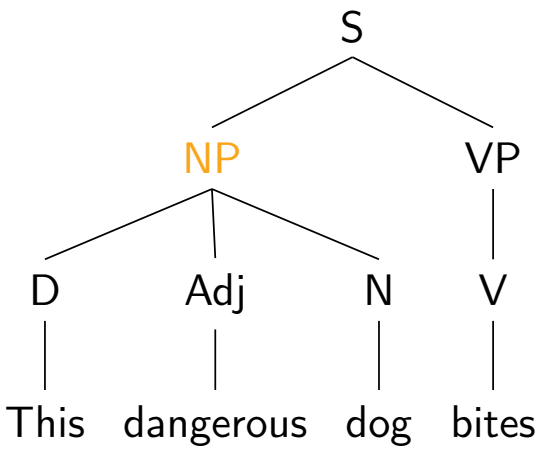

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$S \rightarrow NP\ VP$

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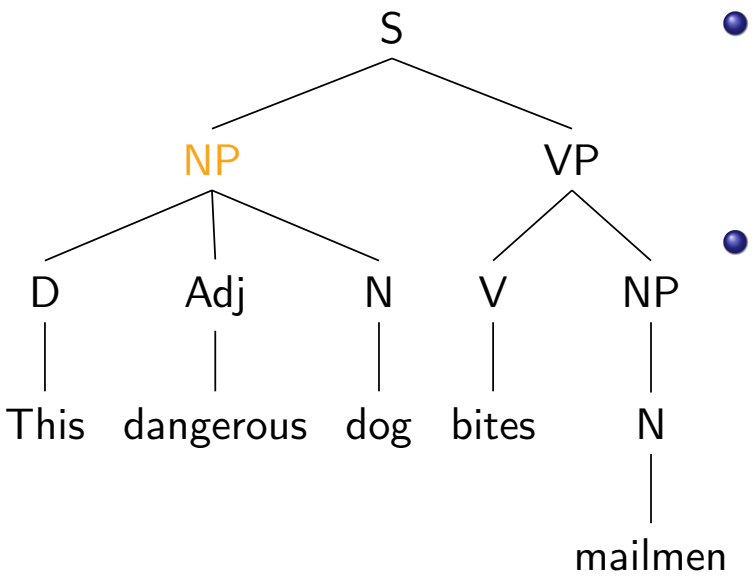

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Evidence for Syntactic Constituents: Frame Sentences

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REVIEW: Why is [D Adj N] such a common sequence in sentences?

1 Phrase-Structure Rules (PSRs)

(i) make constituents/phrases by combining words, and

(ii) make sentences by combining these constituents

Evidence for Syntactic Constituents: Frame Sentences

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REVIEW: Why is [D Adj N] such a common sequence in sentences?

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2 The NP rule (NP $\rightarrow$ (D) (Adj) N) makes [D Adj N] sequences

This is why we see so many [D Adj N] sequences in sentences

About Phrase Structure Rules (PSRs)

The NP Rule: NP $\rightarrow$ (D) (Adj) N

(4) a. [The girl]$_{\text{NP}}$ ate [the gigantic sandwich]$_{\text{NP}}$

b. [The girl]$_{\text{NP}}$ ate [the sandwich]$_{\text{NP}}$

c. [The girl]$_{\text{NP}}$ ate [sandwich**es**]$_{\text{NP}}$

d. [The girl]$_{\text{NP}}$ ate [gigantic sandwich**es**]$_{\text{NP}}$

The elements in parentheses in a PSR are OPTIONAL

About Phrase Structure Rules (PSRs)

The NP Rule: NP $\rightarrow$ (D) (Adj) N

(5) a. *[The girl]$_{\text{NP}}$ ate [the gigantic _____]$_{\text{NP}}$

b. *[The girl]$_{\text{NP}}$ ate [gigantic _____]$_{\text{NP}}$

c. *[The girl]$_{\text{NP}}$ ate [the _____]$_{\text{NP}}$

The elements without parentheses In a PSR are REQUIRED

About Phrase Structure Rules (PSRs)

The NP Rule: NP → (D) (Adj) N

(6) a. [The girl]$_{\text{NP}}$ ate [the gigantic sandwich]$_{\text{NP}}$

b. *[The girl]$_{\text{NP}}$ ate [sandwich the gigantic]$_{\text{NP}}$

c. *[The girl]$_{\text{NP}}$ ate [sandwich gigantic the]$_{\text{NP}}$

d. *[The girl]$_{\text{NP}}$ ate [the sandwich gigantic]$_{\text{NP}}$

The order of elements in the PSR is STRICT (unless otherwise stated)

About Phrase Structure Rules (PSRs)

Syntactic Theory:

Each language, X, has a set of **PSRs**:

- Any sentence that can be generated by the PSRs
  is grammatical in X
- Only the sentences that can be generated by the PSRs
  are grammatical in X

(The goal of a syntactician is to determine what these PSRs are)

Evidence for Syntactic Constituents: Frame Sentences

Question: Why is [V D Adj N] such a common sequence in sentences?

(7) a. I [ate a gigantic sandwich]$_{\mathrm{VP}}$

b. I [painted an ugly picture]$_{\mathrm{VP}}$

c. I [cooked a spicy meal]$_{\mathrm{VP}}$

d. I [read a mean e-mail]$_{\mathrm{VP}}$

e. I [wrote a long text-message]$_{\mathrm{VP}}$

Evidence for Syntactic Constituents: Frame Sentences

Question: Why is [V D Adj N] such a common sequence in sentences?

1 Phrase-Structure Rules (PSRs) make

(i) constituents by combining words, and

(ii) sentences by combining constituents

Evidence for Syntactic Constituents: Frame Sentences

Question: Why is [V D Adj N] such a common sequence in sentences?

1 Phrase-Structure Rules (PSRs) make
   (i) constituents by combining words, and
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2 The VP rule (VP $\rightarrow$ V (NP)) makes [V D Adj N] sequences
   (with help from the NP $\rightarrow$ (D) (Adj) N rule)

Evidence for Syntactic Constituents: Frame Sentences

Question: Why is [V D Adj N] such a common sequence in sentences?

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   (with help from the NP $\rightarrow$ (D) (Adj) N rule)

This is why we see so many [V D Adj N] sequences in sentences

About Phrase Structure Rules (PSRs)

The VP Rule: VP → V (NP)

The NP Rule: NP → (D) (Adj) N

(8) a. I [ate a gigantic sandwich]$_{\text{VP}}$

b. I [painted an ugly picture]$_{\text{VP}}$

c. I [cooked a spicy meal]$_{\text{VP}}$

d. I [read a mean e-mail]$_{\text{VP}}$

e. I [wrote a long text-message]$_{\text{VP}}$

Alternative Hypothesis: VP → V (D) (Adj) N

About Phrase Structure Rules (PSRs)

The VP Rule: VP → V (NP)

The NP Rule: NP → (D) (Adj) N

(9) a. I [ate gigantic sandwich**es**]$_{\text{VP}}$

b. I [painted ugly picture**s**]$_{\text{VP}}$

c. I [cooked spicy meal**s**]$_{\text{VP}}$

d. I [read mean e-mail**s**]$_{\text{VP}}$

e. I [wrote long text-message**s**]$_{\text{VP}}$

Alternative Hypothesis: VP → V (D) (Adj) N

About Phrase Structure Rules (PSRs)

The VP Rule: VP → V (NP)

The NP Rule: NP → (D) (Adj) N

(10) a. I [ate a sandwich]$_{\text{VP}}$

b. I [painted an picture]$_{\text{VP}}$

c. I [cooked a meal]$_{\text{VP}}$

d. I [read an e-mail]$_{\text{VP}}$

e. I [wrote a text-message]$_{\text{VP}}$

Alternative Hypothesis: VP → V (D) (Adj) N

About Phrase Structure Rules (PSRs)

The VP Rule: VP → V (NP)

The NP Rule: NP → (D) (Adj) N

(11) a. I [ate sandwich**es**]$_{\text{VP}}$

b. I [painted picture**s**]$_{\text{VP}}$

c. I [cooked meal**s**]$_{\text{VP}}$

d. I [read e-mail**s**]$_{\text{VP}}$

e. I [wrote text-message**s**]$_{\text{VP}}$

Alternative Hypothesis: VP → V (D) (Adj) N

About Phrase Structure Rules (PSRs)

The VP Rule: VP → V (NP)

The NP Rule: NP → (D) (Adj) N

(12) a. I [ate]$_{\text{VP}}$

b. I [painted]$_{\text{VP}}$

c. I [cooked]$_{\text{VP}}$

d. I [read]$_{\text{VP}}$

e. I [wrote]$_{\text{VP}}$

Alternative Hypothesis: VP → V (D) (Adj) N

Evidence for Syntactic Constituents: Frame Sentences

Question: Why is the sequence **[P V D]** never found in sentences?

(13) a. *[On run the] smiled.

b. *[On run the] bites.

c. *The dog ate [on run the].

d. *The dog [on run the] ate.

Evidence for Syntactic Constituents: Frame Sentences

Question: Why is the sequence **[P V D]** never found in sentences?

1 Phrase-Structure Rules (PSRs) make

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Evidence for Syntactic Constituents: Frame Sentences

Question: Why is the sequence **[P V D]** never found in sentences?

1. Phrase-Structure Rules (PSRs) make
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2. There is no PSR (or combination of PSRs) that makes [P V D] sequences

Evidence for Syntactic Constituents: Frame Sentences

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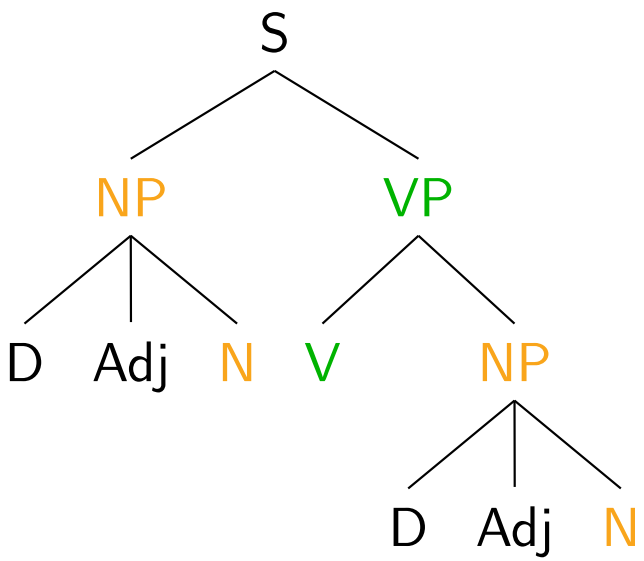
This is why we don't see **[P V D]** sequences in sentences

SYNTACTIC THEORY: Phrase-Structure Rules

Proposal: Sentences are made up of CONSTITUENTS



- Constituents are formed from words with PHRASE-STRUCTURE RULES (PSRs) that restrict WORD ORDER

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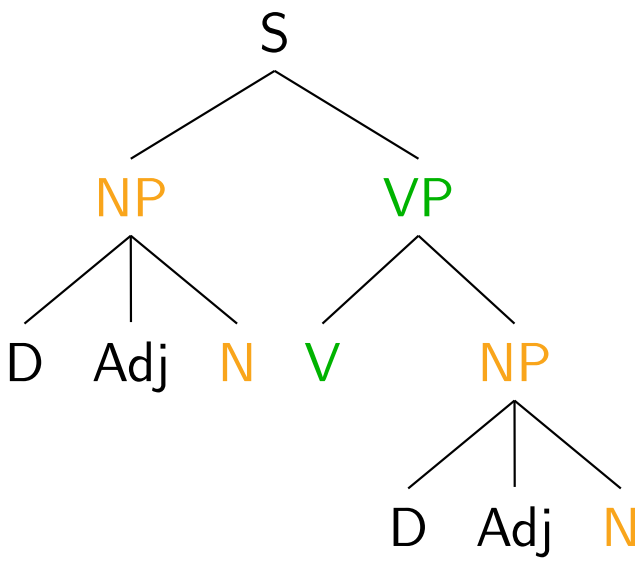

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  eg., English PSRs

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- Sequences that can't be formed from the PSRs are ungrammatical

SYNTACTIC THEORY: Phrase-Structure Rules

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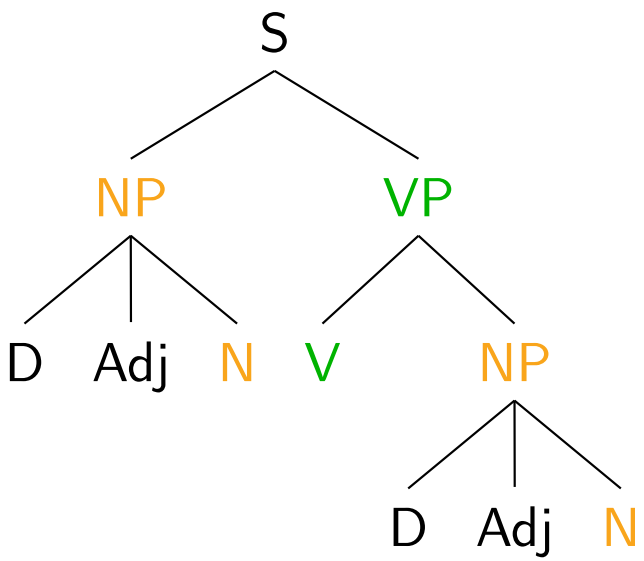

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- **Goal:** Propose a set of PSRs that can describe a language

Core Subdomains: Syntax

- **Syntax:** The study of **phrase-** and **sentence-formation** in language

1 **The key notion of Constituency and Structure**

2 **Phrase Structure Rules (PSRs)**

3 Productivity as a Design Feature

Core Subdomains: Syntax

- **Syntax:** The study of **phrase-** and **sentence-formation** in language

1 The key notion of Constituency and Structure

2 Phrase Structure Rules (PSRs)

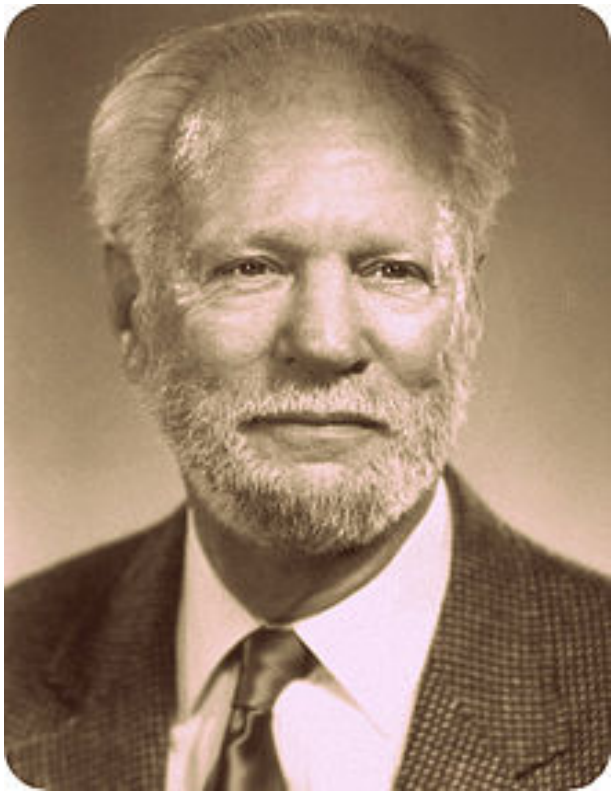
3 **Productivity as a Design Feature**

Hockett's Design Features of Language

Hockett (1959)

Q: What properties does LANGUAGE have?

i.e., what counts as a LANGUAGE (vs communication system)?



Hockett's Design Features

1. Discreteness
2. Semanticity
3. Arbitrariness
4. Productivity
5. Prevarication
6. Duality of Patterning
7. Displacement
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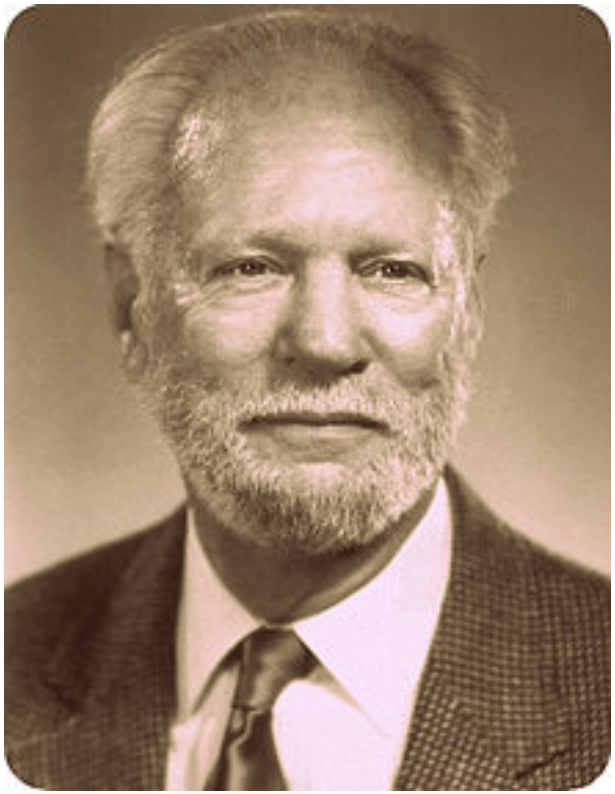

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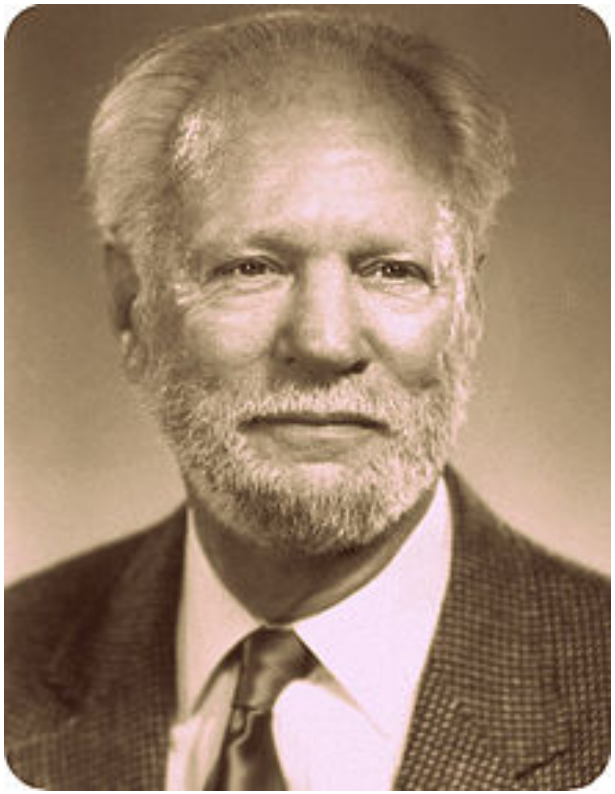

Hockett's Design Feature:
PRODUCTIVITY

Language-users can create and understand novel/original utterances

e.g., you can produce and understand utterances that you have never heard before

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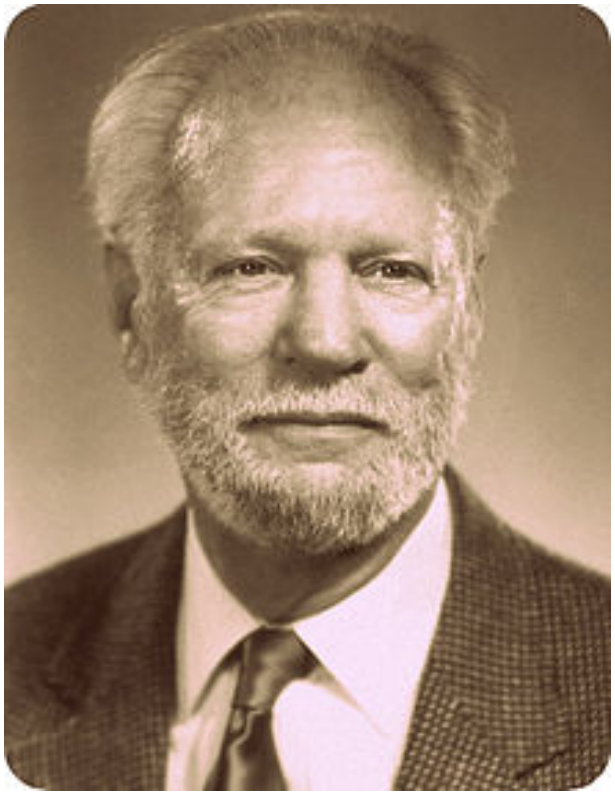


Hockett's Design Feature:
PRODUCTIVITY

Language-users can create and understand novel/original utterances

"Penny the polka-dotted dolphin learned to ride a motorcycle from a bear."

Language as a GENERATIVE System

Chomsky (1959)

Productivity: Language-users can CREATE and UNDERSTAND novel/original utterances)

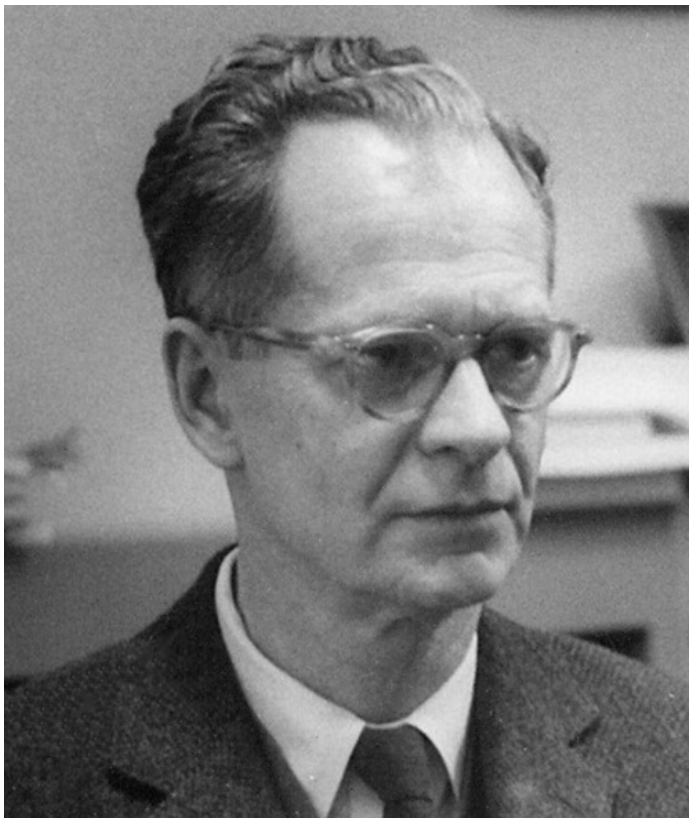
Noam Chomsky
Photo from biography.com]

This was one of Chomsky's main criticisms of **B.F. Skinner's BEHAVIOURIST approach** to language acquisition

B. F. Skinner's VERBAL BEHAVIOUR

Skinner (1957)

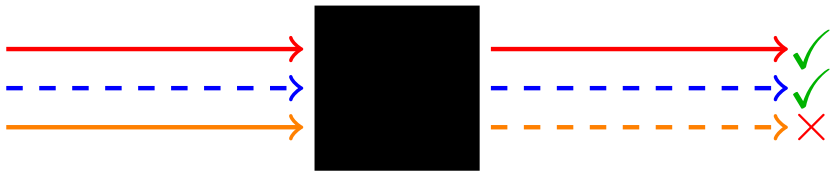
Productivity: Language-users can CREATE and UNDERSTAND novel/original utterances)



B.F. Skinner, circa 1950
Photo: Silly rabbit [GFDL]

According to **Skinner's**
BEHAVIOURISM

Children learn language via
(i) IMITATION and
(ii) OPERANT CONDITIONING
i.e., positive/negative feedback on their utterances



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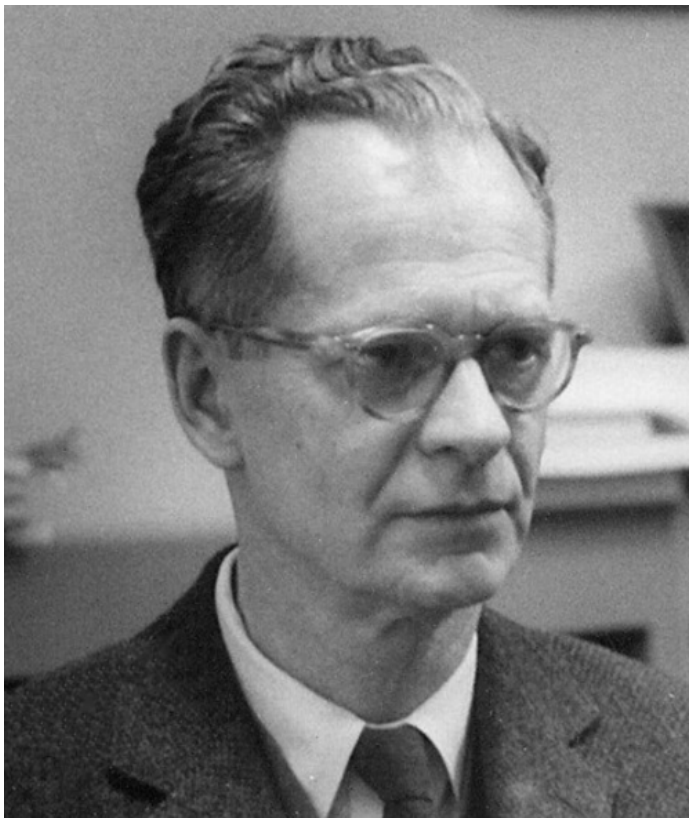


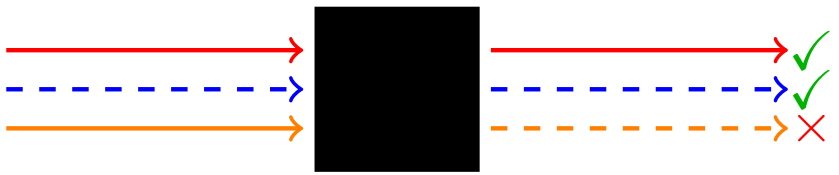
B.F. Skinner, circa 1950
Photo: Silly rabbit [GFDL]

According to **Skinner's**
BEHAVIOURISM

e.g., Children get

(i) POSITIVE FEEDBACK
if the imitation is correct ✓

(ii) NEGATIVE FEEDBACK
if the imitation is incorrect ✗



Language as a GENERATIVE System

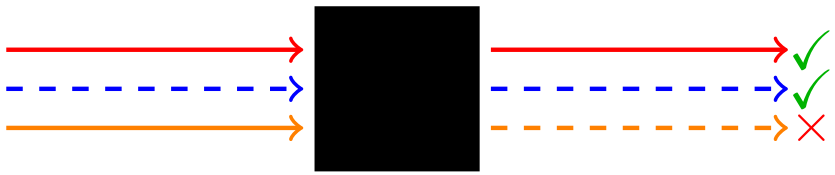
Chomsky (1959)

Productivity: Language-users can CREATE and UNDERSTAND novel/original utterances)

Noam Chomsky
Photo from biography.com]

According to **Chomsky's**
GENERATIVE approach

Children's linguistic output isn't merely *IMITATIONS* of their input ...



Language as a GENERATIVE System

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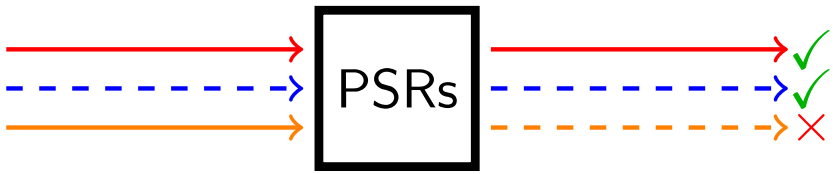
According to **Chomsky's**
GENERATIVE approach

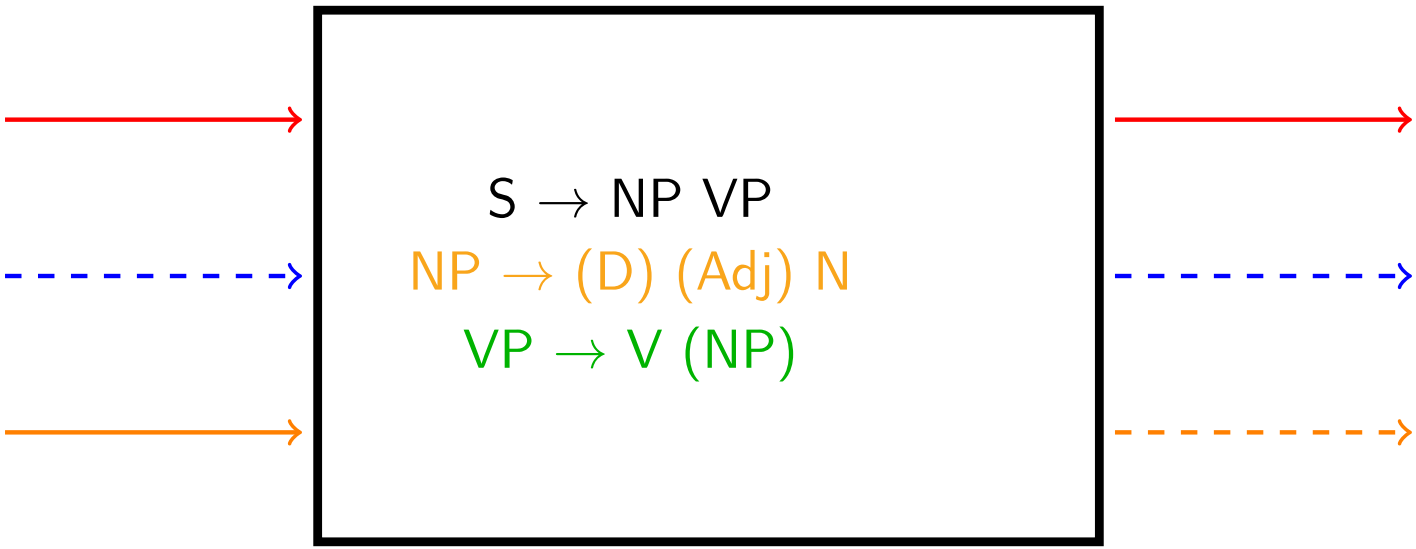
Children GENERATE their output using PRODUCTIVE RULES (shaped by their input)



The Generative Approach to Language

Chomsky (1957)

Q: What do you know, when you know a LANGUAGE?



→ Phrase-Structure Rules (how to create sentences)

The Generative Approach to Language

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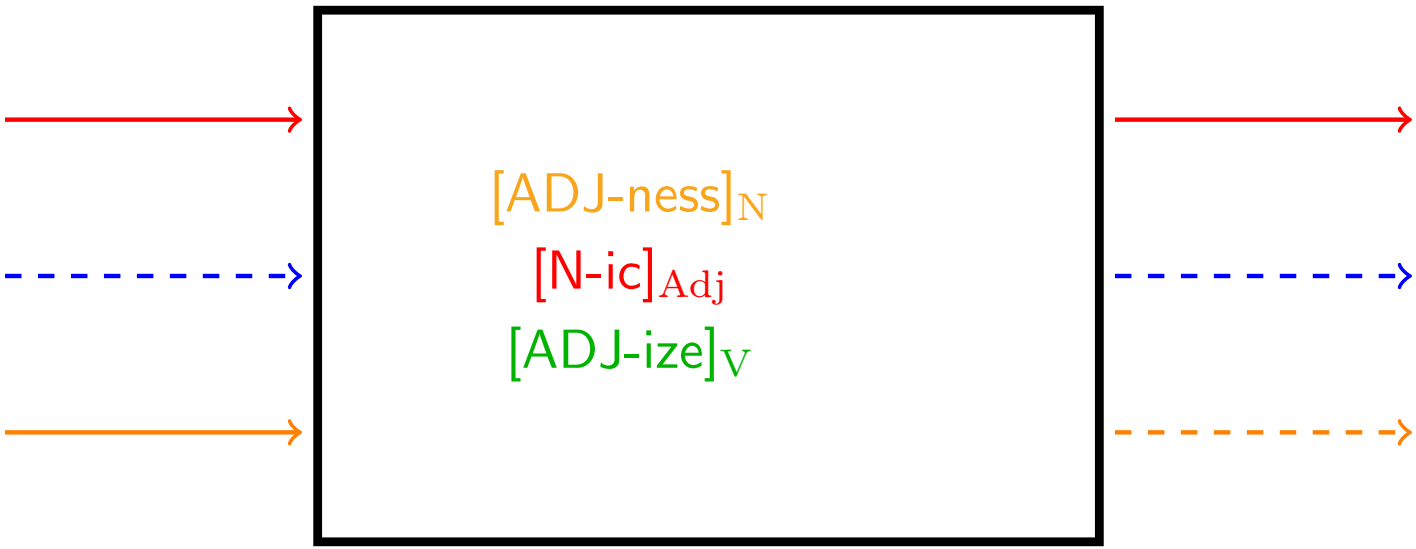

→ Morphological Rules (how to create words)

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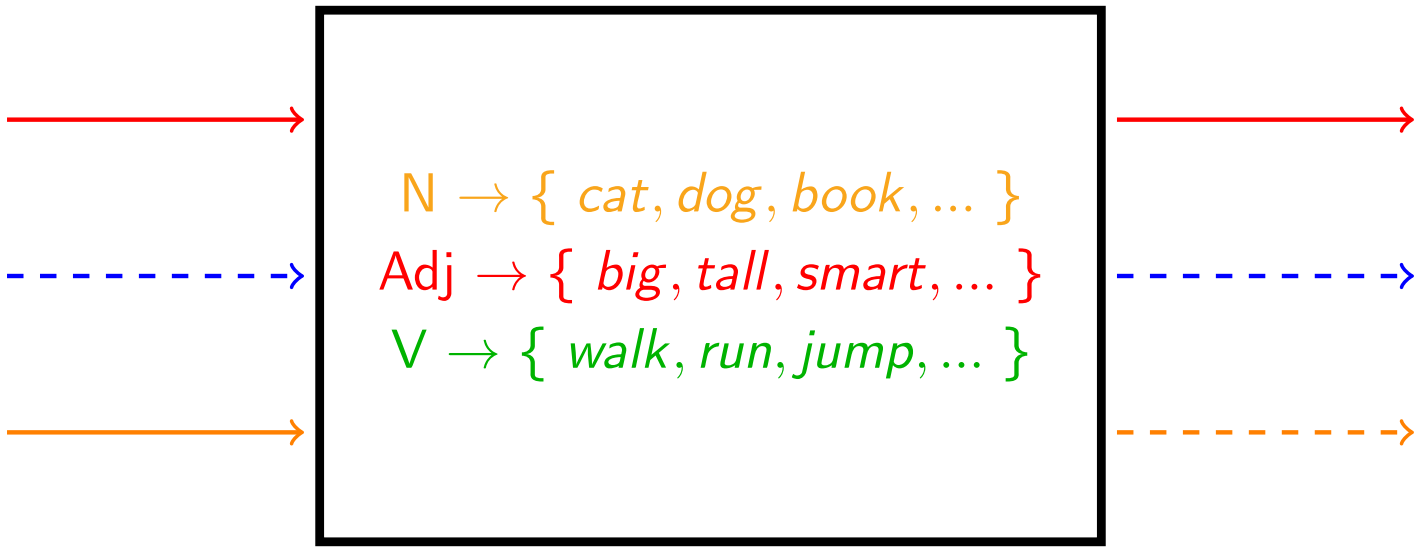

→ Lexical Rules (which morphemes are in which lexical category)

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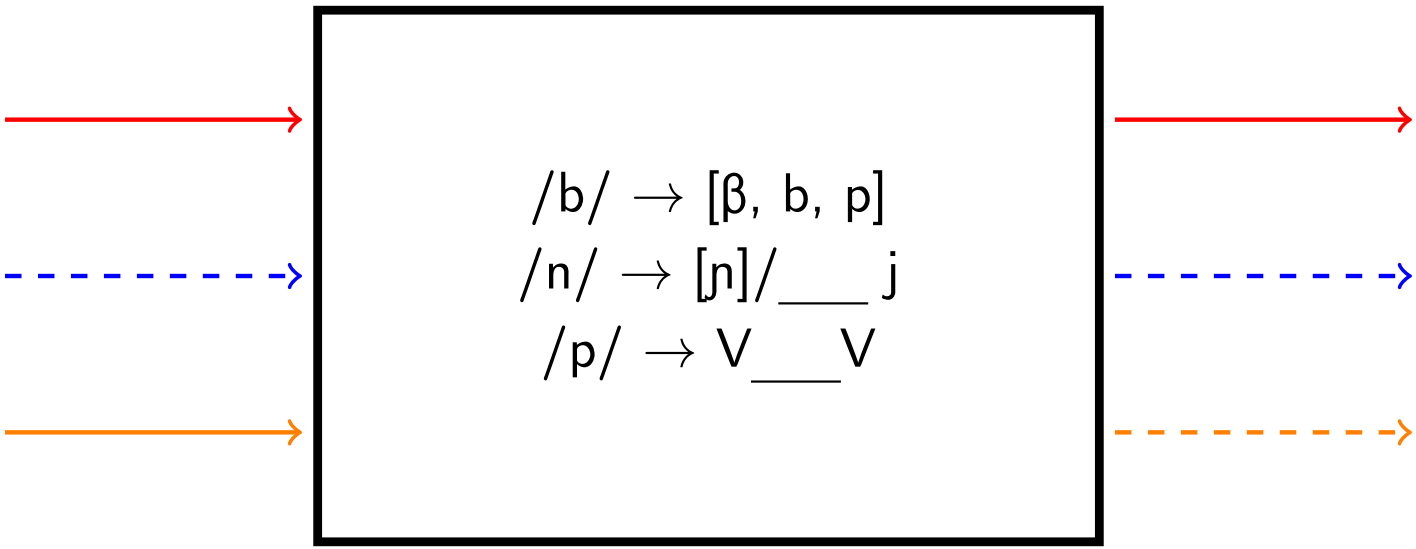

→ Phonological Rules (how phonemes are pronounced in context)

The Generative Approach to Language

Chomsky (1957)

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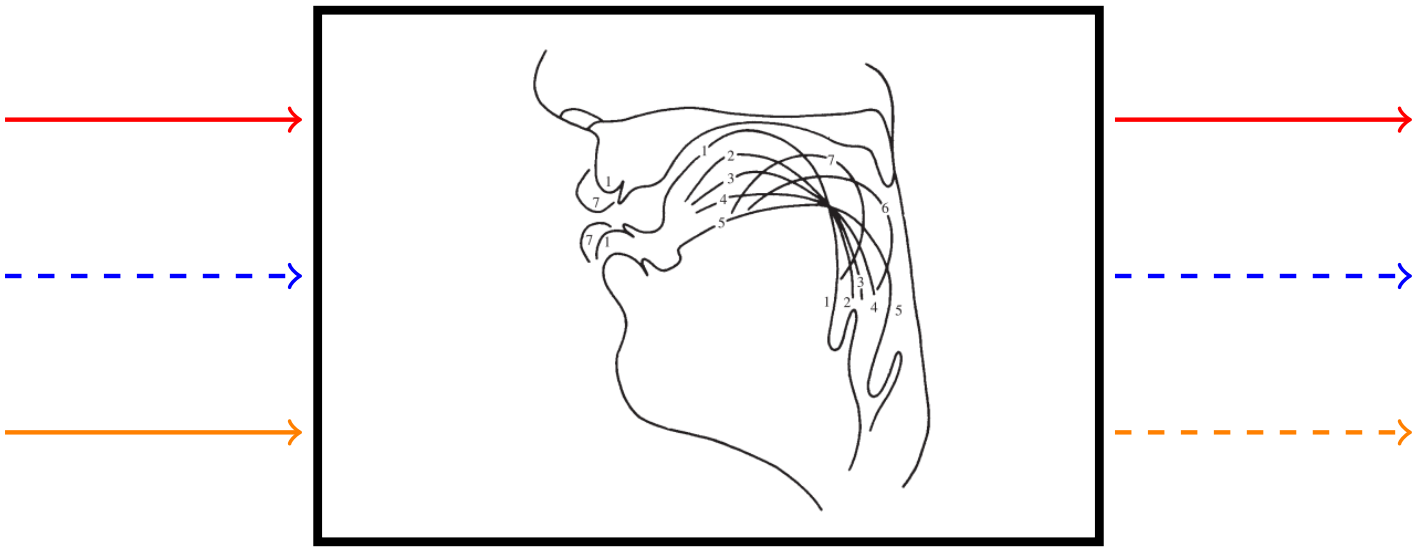

→ Phonetic/Articulatory Rules (how to produce speech sounds)

The Generative Approach to Language

Chomsky (1957)

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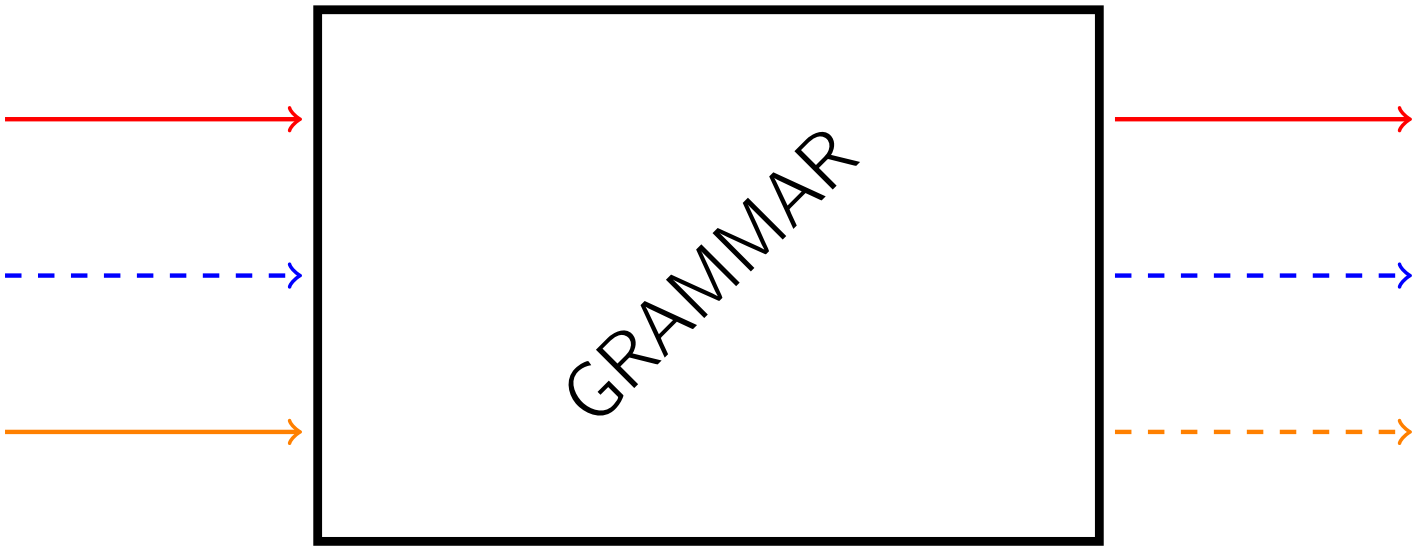

→ i.e., you know GRAMMATICAL rules that categorize utterances as acceptable or not acceptable in a given language

The Generative Approach to Language

Chomsky (1957)

Productivity: Language-users can CREATE

and UNDERSTAND novel/original utterances)

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According to **Chomsky's**
GENERATIVE approach

Children GENERATE their output
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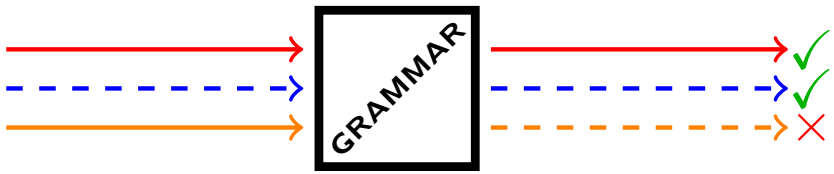

The Generative Approach to Language

Chomsky (1957)

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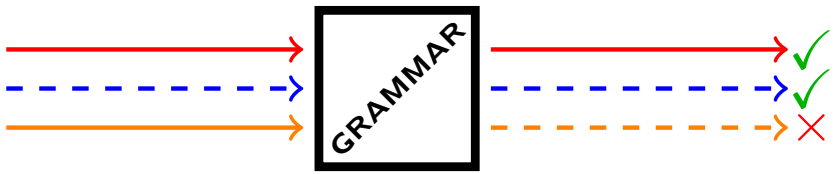
If children only IMITATED their input, we wouldn't be able to explain their **PRODUCTIVITY**

eg., boot-skates (roller blades);

one wug, two wugs

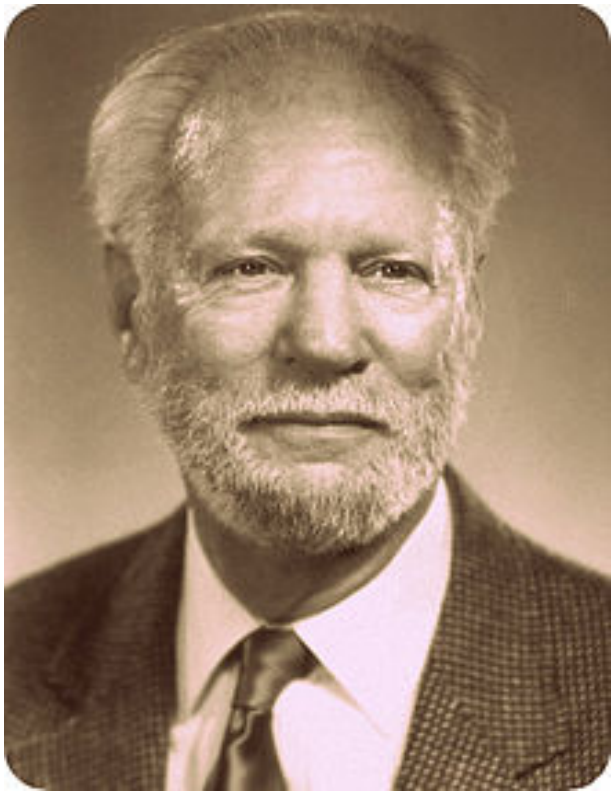


Hockett's Design Features of Language

Hockett (1959)

Q: What properties does LANGUAGE have?

i.e., what counts as a LANGUAGE (vs communication system)?



Hockett's Design Feature:

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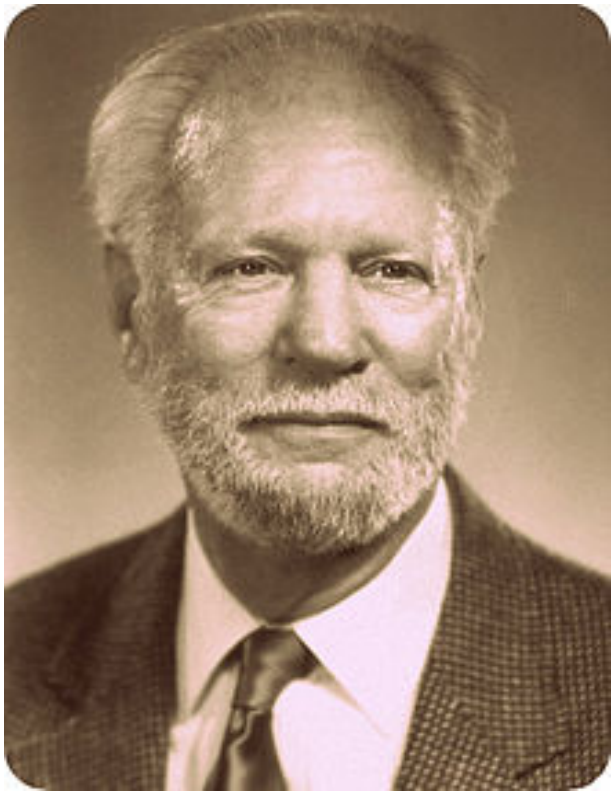

Hockett's Design Feature:
PRODUCTIVITY

Language-users can **CREATE** and UNDERSTAND novel/original utterances

→ PSRs allow us to
CREATE novel utterances

Hockett's Design Features of Language

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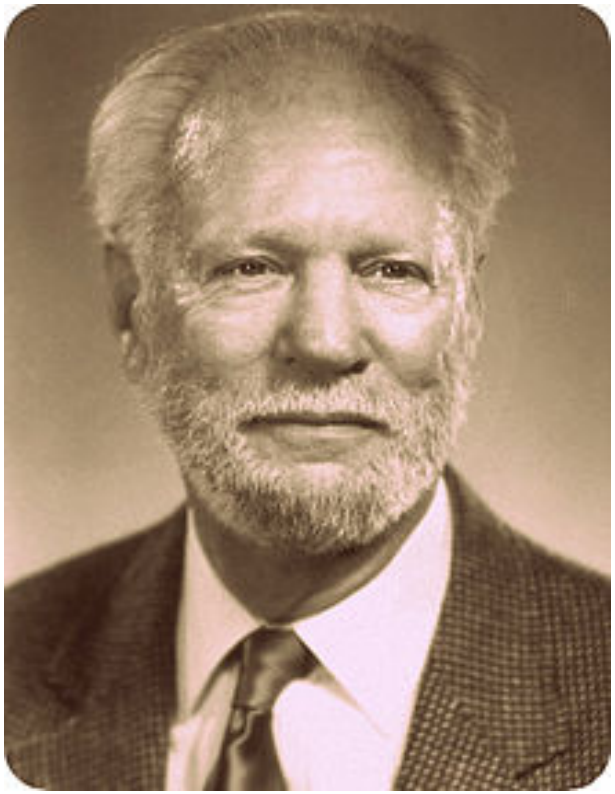

Hockett's Design Feature:
PRODUCTIVITY

Language-users can CREATE and **UNDERSTAND** novel/original utterances

...but we need SEMANTIC RULES to UNDERSTAND them

Next Time: Syntax and Semantics

Compositionality at the Phrase and Sentence-Level

1. **Homework:** Syntax Problem Set
   - Start working on the problems now, in groups
   - Due next week - hand in one per group
   - (Put everyone's names and student numbers on the assignment)

2. **Instagram Homework:** Syntactic Minimal Pair AND/OR
   Find and post an example (or non-example) of a Design Feature
   - Discreteness
   - Semanticity
   - Arbitrariness
   - Productivity

References I

Chomsky, Noam. 1957. Syntactic structures. Walter de Gruyter.

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Skinner, BF. 1957. Verbal behavior. .