Loose ends
Sentence length and recursion
Types of sentence constituents
Syntactic patterns in different languages

Syntax

LING 200: Introduction to the Study of Language

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Loose ends
Sentence length and recursion
Types of sentence constituents
Syntactic patterns in different languages

Outline

1. Loose ends
   - Phrase-structure rules
   - Drawing trees

2. Sentence length and recursion

3. Types of sentence constituents
   - Subjects and predicates
   - Arguments and adjuncts
   - Heads and arguments

4. Syntactic patterns in different languages

Slides credit: Jessica Coon, David Pesetsky, Rebecca Starr

Loose ends
Sentence length and recursion
Types of sentence constituents
Syntactic patterns in different languages

Phrase-structure rules
Drawing trees

Phrase-structure rules

Phrase-structure rules

- Last week, we saw rules for constructing NPs and VPs.

  (1)   VP → (AdvP) **V** (NP) (PP)

  ➡ All VPs must contain a verb
  - VPs may additionally contain an adverb, an NP, and/or a PP

  (2)   NP → (D) (AdjP) **N** (PP)

  ➡ All NPs must contain a noun; we call the noun the *head* of the NP
  - NPs may additionally contain a determiner, an adjective phrase, or a PP.

Loose ends
Sentence length and recursion
Types of sentence constituents
Syntactic patterns in different languages

Phrase-structure rules
Drawing trees

Phrase-structure rules

Adjectives and adverbs

- **Adjectival phrases** must contain an **adjective**, possibly modified by an additional adverb:
    - tall
    - astoundingly tall

- Similarly, **adverbial phrases** must contain an **adverb**, possibly modified by an additional adverb:
    - quickly
    - very quickly

- Therefore, we can write the rules:

    (3)   AdjP → (AdvP) **Adj**

    (4)   AdvP → (AdvP) **Adv**

Loose ends
Sentence length and recursion
Types of sentence constituents
Syntactic patterns in different languages

Phrase-structure rules
Drawing trees

Phrase-structure rules

What about PPs?

- PPs have the form **P NP**:
    - in the park
    - into a dark pit
    - around McGill

- Therefore, we can write a rule:

    (5)   PP → **P** NP

- Why can't we make the rule: PP → P N?
    - This would work for phrases like "at McGill"
    - But not for phrases with larger NPs, e.g. "around the house"

Loose ends
Sentence length and recursion
Types of sentence constituents
Syntactic patterns in different languages

Phrase-structure rules
Drawing trees

Summary

Phrase-structure rules for this class

(6)   a. NP → (D) (AdjP) **N** (PP)

        b. VP → (AdvP) **V** (NP) (PP)

        c. PP → **P** NP

        d. AdjP → (AdvP) **Adj**

        e. AdvP → (AdvP) **Adv**

        f. S → NP VP

- This is not a complete set
  - E.g. we still don't know how to parse complex sentences:
  - Although the man and woman I saw yesterday appeared to be married, I suspect they were actually undercover agents.
- For this class, we won't worry about that.
- We also won't ask you to create new phrase-structure rules.

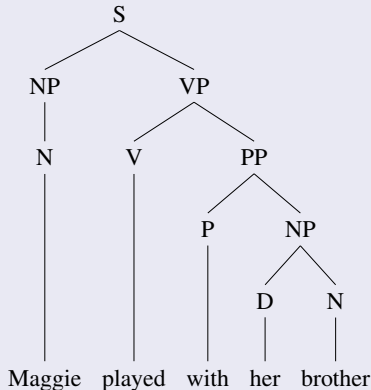**Loose ends**
Sentence length and recursion
Types of sentence constituents
Syntactic patterns in different languages

Phrase-structure rules
Drawing trees

Drawing trees

Two ways to draw trees

Start from the top:

Start from the bottom:

Loose ends
Sentence length and recursion
Types of sentence constituents
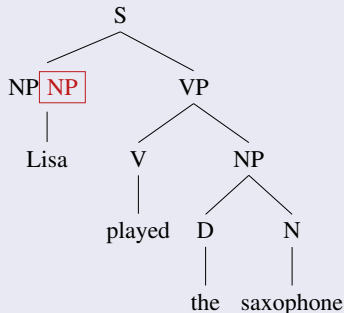Syntactic patterns in different languages

Phrase-structure rules
Drawing trees
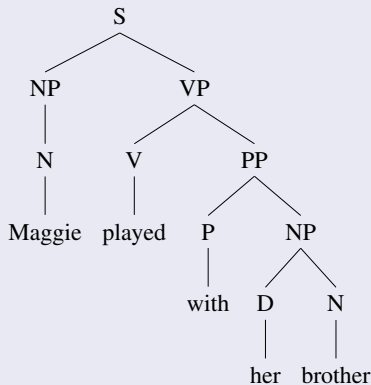
Drawing trees

Common errors

- Be careful when you have a phrase that contains only one word.
  - e.g., "Lisa"
- It is tempting to draw it like this:

- Remember that all tags immediately above the word should indicate that word's part of speech, NOT a phrase.
- Don't skip the step of NP → N

Loose ends
Sentence length and recursion
Types of sentence constituents
Syntactic patterns in different languages

Phrase-structure rules
Drawing trees

Drawing trees

Common errors

- A similar error often happens inside VPs and PPs.
- This VP looks pretty, but it is missing a level:

Loose ends
Sentence length and recursion
Types of sentence constituents
Syntactic patterns in different languages

Phrase-structure rules
Drawing trees
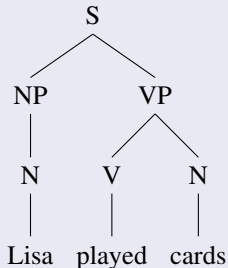
Drawing trees

Common errors

- Remember that the rule for VP is VP → (AdvP) **V** (NP) (PP): only an NP (not an N) may be the daughter of a VP.

Loose ends
Sentence length and recursion
Types of sentence constituents
Syntactic patterns in different languages

Phrase-structure rules
Drawing trees
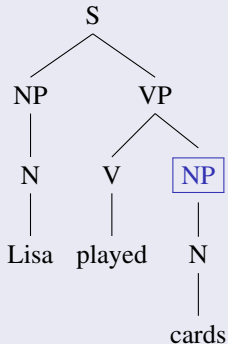
Drawing trees

Common errors

- Modifiers of adverbs and adjectives are always phrases:

Loose ends
Sentence length and recursion
Types of sentence constituents
Syntactic patterns in different languages

Phrase-structure rules
Drawing trees
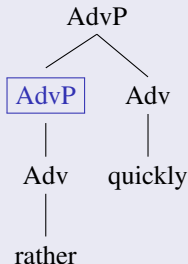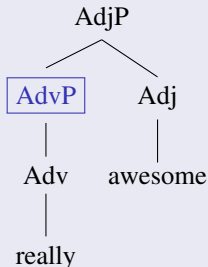
Drawing trees

Tips for drawing trees

- The phrase-structure rules we've seen aren't just things you have to memorize, they are quite useful for parsing a sentence into a tree.
- When you encounter a sentence you have to parse, start by considering the PS rule for sentences:
  - Joy adopted a cat.
  - Step 1: S → NP VP
    [NP Joy] [VP adopted a cat].
  - Step 2: VP → (AdvP) **V** (NP) (PP)
    [VP [V adopted] [NP a cat]]
  - Step 3: NP → (D) (AdjP) **N** (PP)
    [NP [D a] [N cat]]
    [NP [N Joy]]

Loose ends
Sentence length and recursion
Types of sentence constituents
Syntactic patterns in different languages

Phrase-structure rules
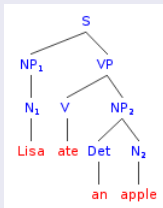**Drawing trees**

Drawing trees

Automatically generating a tree

- Don't feel like drawing endless lines in Word?
- Try typing the sentence in bracket form into this website:
  `http://ironcreek.net/phpsyntaxtree/`

  [S [NP [N Lisa]] [VP [V ate] [NP [Det an] [N apple]]]]

- Note: this will not generate a tree for you out of thin air, you need to specify the structure using brackets!

Loose ends
Sentence length and recursion
Types of sentence constituents
Syntactic patterns in different languages

Phrase-structure rules
Drawing trees

Practice

Drawing trees

- Draw a tree for: I met the fastest man in the universe.

```
                         S
              ┌──────────┴──────────┐
             NP                     VP
              │           ┌─────────┴──────┐
              N           V                NP
              │           │      ┌────┬────┼──────────┐
              I          met     D   AdjP  N          PP
                                 │    │    │      ┌────┴────┐
                                the  Adj  man     P        NP
                                     │            │    ┌────┴────┐
                                  fastest         in   D        N
                                                       │        │
                                                      the    universe
```

Loose ends
Sentence length and recursion
Types of sentence constituents
Syntactic patterns in different languages
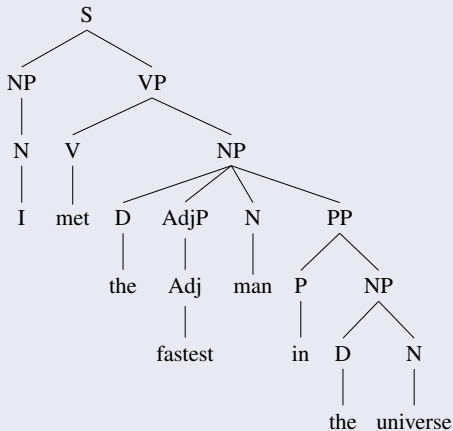
Sentence length and recursion

Extending sentences

- What is the maximum length for a grammatical sentence?

- We can consult our PS rules for an answer:
    - NP → (D) (AdjP) **N** (PP)
    - PP → **P** NP

- This means that a PP can nest within an NP, and an NP can nest within that PP.
    - A bird in the tree in the garden in the story in the book in the library....

- Logically speaking, this could go on forever!

Loose ends
Sentence length and recursion
Types of sentence constituents
Syntactic patterns in different languages

Sentence length and recursion

Extending sentences

- How else can we make an infinitely long sentence?

  I went to the store and bought one pencil, two pens, three notebooks, four erasers, five folders, six binders....

- We can extend a sentence through **coordination**.
    - Linking constituents of the same syntactic class as sisters.
    - Other examples:
        - "live or die"
        - "tall, dark, and handsome"

Loose ends
Sentence length and recursion
Types of sentence constituents
Syntactic patterns in different languages

Sentence length and recursion

Extending sentences

- Another strategy:

  Along came an ox that drank the water that put out the fire that burnt
  the stick that beat the dog that bit the cat that ate the goat my father
  bought for two zuzim.

  (Hebrew folk song "One little goat")

- We can also extend a sentence through **subordination** (or:
  embedding).

  - Adding a **subordinate** constituent as the daughter of another constituent.
  - Ex: "the man that I saw yesterday."

Loose ends
Sentence length and recursion
Types of sentence constituents
Syntactic patterns in different languages

Sentence length and recursion

Recursion

- The notion that syntactic elements can infinitely repeat within each other is known as **recursion**.
- Many linguists consider recursion to be a crucial property of human language that distinguishes it from other types of animal communication.

Loose ends
Sentence length and recursion
Types of sentence constituents
Syntactic patterns in different languages

Sentence length and recursion

Key points: recursive patterns in language

- Recursion is a distinctive feature of human language structure.
- Two types of recursion: coordination and subordination.

Loose ends
Sentence length and recursion
Types of sentence constituents
Syntactic patterns in different languages

Subjects and predicates
Arguments and adjuncts
Heads and arguments

Types of sentence constituents

Subjects and predicates

- We have learned that a syntactically well-formed sentence in English must consist of an NP + VP.
- These are also called the **subject** and the **predicate**.

Loose ends
Sentence length and recursion
Types of sentence constituents
Syntactic patterns in different languages

Subjects and predicates
Arguments and adjuncts
Heads and arguments
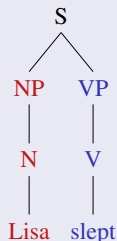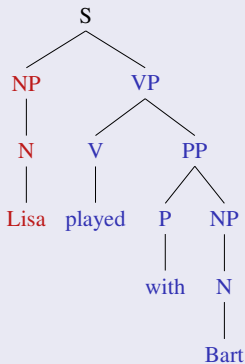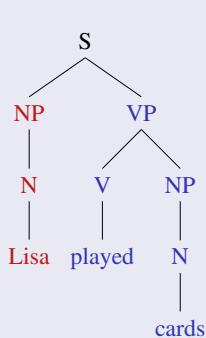
Types of sentence constituents

The predicate

- The most crucial component of the predicate is the **main verb**, which shapes the structure of the rest of the sentence:
    - She will **go** to school on Monday.
    - I did **see** them leave.
    - I **said** that I would do it.
    - You could **try** to draw a syntax tree.

  In red we have **auxiliary verbs**, which modify the grammatical function and meaning of the main verb.

Loose ends
Sentence length and recursion
Types of sentence constituents
Syntactic patterns in different languages

Subjects and predicates
Arguments and adjuncts
Heads and arguments

Types of sentence constituents

Types of verbs

- Verbs differ in how many and what types of **arguments** they take.
  - Arguments are expressions that are necessary to complete the meaning of the predicate.

- **Intransitive verbs** take one argument: they require a subject but no object.
  - She waited.
  - I am working.

Loose ends
Sentence length and recursion
Types of sentence constituents
Syntactic patterns in different languages

Subjects and predicates
Arguments and adjuncts
Heads and arguments

Types of sentence constituents

Types of verbs

- **Transitive verbs** take two arguments: they require a subject and an object.
    - *She likes.
    - She likes cats.

- **Ditransitive verbs** take three arguments: they require a subject and two objects.
    - *She gave him.
    - *She gave a cat.
    - She gave him a cat.

Loose ends
Sentence length and recursion
Types of sentence constituents
Syntactic patterns in different languages

Subjects and predicates
Arguments and adjuncts
Heads and arguments

Types of sentence constituents

Arguments vs. adjuncts

- Let's look at the following sentences:

  She gave him a cat on his birthday.
  The cat mysteriously vanished.

- Which of these constituents are necessary for the sentence to be grammatical, and which are optional?
- The constituents in green are **adjuncts**.
  - In contrast to arguments, they are not necessary to complete the meaning of the predicate.
  - They add information about how something occurred.

Loose ends
Sentence length and recursion
Types of sentence constituents
Syntactic patterns in different languages

Subjects and predicates
Arguments and adjuncts
Heads and arguments

Types of sentence constituents

Practice

- Are the underlined constituents arguments or adjuncts?

1. She put the lotion <u>in the basket</u>.
   * She put the lotion. — Argument
2. He volunteered <u>twice</u>.
   ✓He volunteered. — Adjunct
3. He forgot to sign out <u>before he left</u>.
   ✓He forgot to sign out. — Adjunct
4. She bought him <u>a toy</u>.
   ✓She bought him. — This works, but "a toy" is still an argument.
   Why?

Loose ends
Sentence length and recursion
Types of sentence constituents
Syntactic patterns in different languages

Subjects and predicates
Arguments and adjuncts
Heads and arguments

Heads and arguments

Verbs can vary in the types of arguments they take

. . . even when the meaning of these verbs is quite similar.

- eat vs. devour
- ask vs. inquire
- throw vs. put
- give vs. hand vs. write

Loose ends
Sentence length and recursion
Types of sentence constituents
Syntactic patterns in different languages

Subjects and predicates
Arguments and adjuncts
Heads and arguments

Heads and arguments

Verbs can vary in the types of arguments they take

(7) a.   Mary has eaten.

 b.   Mary has eaten the pizza.

 c.   * Mary has devoured.

 d.   Mary has devoured the pizza.

(8) a.   Bill will ask the time.

 b.   * Bill will inquire the time.

 c.   Bill will ask about the time

 d.   Bill will inquire about the time.

Loose ends
Sentence length and recursion
Types of sentence constituents
Syntactic patterns in different languages

Subjects and predicates
Arguments and adjuncts
Heads and arguments

Heads and arguments

Verbs can vary in the types of arguments they take

(9) a. * Sue will throw.

 b.   Sue will throw the ball.

 c.   Sue will throw the ball to Tom.

 d. * Sue will throw to Tom.

<div align="center">(a & d ok in sports context)</div>

(10) a. * Sue will put.

 b. * Sue will put the book.

 c.   Sue will put the book on the table.

 d. * Sue will put on the table.

Loose ends
Sentence length and recursion
Types of sentence constituents
Syntactic patterns in different languages

Subjects and predicates
Arguments and adjuncts
Heads and arguments

Heads and arguments

The facts:

eat:	optional NP sister
devour:	obligatory NP sister
ask:	optional NP sister
inquire:	*NP sister
throw:	obligatory NP and optional PP sisters
put:	obligatory NP PP sisters

Loose ends
Sentence length and recursion
Types of sentence constituents
Syntactic patterns in different languages

Subjects and predicates
Arguments and adjuncts
Heads and arguments

Heads and arguments

Subcategorization information in lexical entries:

eat:	[+ _____ (NP)]
devour:	[+ _____ NP]
ask:	[+ _____ (NP)]
inquire:	(not like *ask*)
throw:	[+ _____ NP (PP)]
put:	[+ _____ NP PP]

Loose ends
Sentence length and recursion
Types of sentence constituents
Syntactic patterns in different languages

Subjects and predicates
Arguments and adjuncts
Heads and arguments

Heads and arguments

Subcategorization:

It's not just verbs that have subcategorization properties:

(11) **Adjectives**

    a.   * Mary is fond.

    b.   Mary is fond of her friends.

    c.   Mary is proud.

    d.   Mary is proud of her friends.

(12) **Prepositions**

    a.   * Mary went into.

    b.   Mary went into the room.

    c.   Mary went in.

    d.   Mary went in the room.

Loose ends
Sentence length and recursion
Types of sentence constituents
Syntactic patterns in different languages

Subjects and predicates
Arguments and adjuncts
Heads and arguments

Heads and arguments

Subcategorization:

➠ **Chomsky's generalization:**
The lexical entry for a word contains subcategorization information only about its sister.

What is *interesting* about Chomsky's generalization?

➠ Significant for language acquisition:
1. Assume the generalization is just the way language works – part of *Universal Grammar*.
2. This means that a child who is acquiring language does not have to pay attention to the entire phrase structure tree when learning the subcategorization requirements of a word. Makes the task easier.

Loose ends
Sentence length and recursion
Types of sentence constituents
Syntactic patterns in different languages

Subjects and predicates
Arguments and adjuncts
Heads and arguments

Heads and arguments

What is *wrong* about Chomsky's generalization?
A verb may subcategorize for the P of an argument PP:

English	Hebrew	
depend on	taluy be-	lit. 'depend in'
speak to	ledaber im	lit. 'speak with'
look at	lehistakel al	lit. 'look on'
look for	lexapes	lit. 'seek'

Loose ends
Sentence length and recursion
Types of sentence constituents
Syntactic patterns in different languages

Subjects and predicates
Arguments and adjuncts
Heads and arguments

Heads and arguments

He is waiting _____ Smith

Loose ends
Sentence length and recursion
Types of sentence constituents
Syntactic patterns in different languages

Subjects and predicates
Arguments and adjuncts
Heads and arguments

Heads and arguments

Modification of Chomsky's generalization:

➠ **The revised subcategorization generalization:**
The lexical entry for a word contains subcategorization information
only about the ***head*** of its sister.

V subcategorizes for P when it has a PP complement

(13)   a.   Mary will depend on John.

        b.   Mary will speak with John.

        c.   * Mary will depend with John.

        d.   * Mary will speak on John.

Loose ends
Sentence length and recursion
Types of sentence constituents
Syntactic patterns in different languages

Subjects and predicates
Arguments and adjuncts
Heads and arguments

Heads and arguments

V subcategorizes for the *complementizer* when it has a clausal complement

(14) a.   Mary will believe that John likes cats.

　　　b.   Mary will arrange for John to like cats.

　　　c.   * Mary will believe for John to like cats.

　　　d.   * Mary will arrange that John likes cats.

The complementizer subcat. for the tense of its sister (*to* vs. *tensed verb*):

(15) a.   Mary will believe that John likes cats.

　　　b.   Mary will arrange for John to like cats.

　　　c.   * Mary will believe that John to like cats.

　　　d.   * Mary will arrange for John likes cats.

Loose ends
Sentence length and recursion
Types of sentence constituents
Syntactic patterns in different languages

Subjects and predicates
Arguments and adjuncts
Heads and arguments

Heads and arguments

Tense subcategorizes for the verbal morphology of its VP sister

(16) a.   Mary will arrange for John to like cats.

b.   * Mary will arrange for John to liked cats.

(17) a.   Mary will believe that John will like cats.

b.   * Mary will believe that John will liked cats.

(18) a.   * Mary will believe that John has like cats.

b.   Mary will believe that John has liked cats.

Loose ends
Sentence length and recursion
Types of sentence constituents
Syntactic patterns in different languages

Subjects and predicates
Arguments and adjuncts
Heads and arguments

Types of sentence constituents

Key points

- By syntactic function:
  - Subject
  - Predicate
    - Main verb: intransitive, transitive, ditransitive
    - Auxiliary verb

- By obligatoriness:
  - Argument
  - Adjunct

- Chomsky's generalization: The lexical entry for a word contains subcategorization information only about the head of its sister.

Loose ends
Sentence length and recursion
Types of sentence constituents
Syntactic patterns in different languages

Syntactic patterns in different languages

Word Order

- We can categorize languages by the order in which subjects, verbs, and objects usually occur in sentences.
- This is called **word order typology**.
- English is an **SVO** language:

I	love	cheese.
subject	verb	object

Loose ends
Sentence length and recursion
Types of sentence constituents
Syntactic patterns in different languages

Syntactic patterns in different languages

Word Order

- About 42% of the worlds languages are SVO
  - English
  - French
  - Hebrew
  - Chinese
  - Malay
  - Russian
  - ...

Loose ends
Sentence length and recursion
Types of sentence constituents
Syntactic patterns in different languages

Syntactic patterns in different languages

Word Order

- Slightly more of the worlds languages (about 45%) are **SOV**.
  - Japanese
  - Tamil
  - Korean
  - Tibetan
  - ...

	subject	object	verb
Japanese:	watashi-wa	chiizu-ga	daisuki.
	I	cheese	love

Loose ends
Sentence length and recursion
Types of sentence constituents
Syntactic patterns in different languages

Syntactic patterns in different languages

Word Order

- Approximately 10% of the worlds languages are **VSO**.
  - Tagalog
  - Irish Gaelic
  - Arabic (certain dialects)
  - ...

	verb	subject	object
Tagalog:	gusto	ko	ng keso
	love	I	cheese

Loose ends
Sentence length and recursion
Types of sentence constituents
Syntactic patterns in different languages

Syntactic patterns in different languages

Word Order

- Only about 3% are **VOS**, 1% are **OVS**, and almost none are **OSV**.

	verb	object	subject
Malagasy:	mila	dokotera	aho
	need	doctor	I

"I need a doctor"

Loose ends
Sentence length and recursion
Types of sentence constituents
Syntactic patterns in different languages

Syntactic patterns in different languages

Word Order

- This tell us something interesting about how language works in the mind:
  - We strongly prefer to order the subject before the object in a sentence.
  - We also prefer to place the verb somewhere after the subject.
  - This may reflect how humans conceive of events.

Loose ends
Sentence length and recursion
Types of sentence constituents
Syntactic patterns in different languages

Syntactic patterns in different languages

Do all languages have strict word order?

- In English, we have some flexibility with word order, particularly when it comes to adjuncts:

  I will leave tomorrow.
  Tomorrow, I will leave.

Loose ends
Sentence length and recursion
Types of sentence constituents
Syntactic patterns in different languages

Syntactic patterns in different languages

Do all languages have strict word order?

- But we rely on word order to identify the syntactic role of most constituents:

  Mary gave John a dog.
  John gave Mary a dog.
  Mary gave a dog John.

- There is no **inflectional morphology** on the constituents to let us know their role in the sentence, we only have word order cues.

Loose ends
Sentence length and recursion
Types of sentence constituents
Syntactic patterns in different languages

Syntactic patterns in different languages

Do all languages have strict word order?

- Languages like English with almost no inflectional morphology are called **analytic languages**.
- These languages rely on relatively strict word order to indicate relationships between constituents.

Loose ends
Sentence length and recursion
Types of sentence constituents
Syntactic patterns in different languages

Syntactic patterns in different languages

Do all languages have strict word order?

- Other languages have more extensive inflectional morphology:

	dominus	(nominative)	"lord, master"
	domine	(vocative)	
Latin:	dominum	(accusative)	
	domini	(genitive)	
	domino	(dative)	

- Languages with extensive inflectional morphology are called **synthetic** (in contrast to analytic).

Loose ends
Sentence length and recursion
Types of sentence constituents
Syntactic patterns in different languages

Syntactic patterns in different languages

Do all languages have strict word order?

- Synthetic languages generally have less strict word order:

  Domin**us** illuminatio mea.   "The lord is my light"
  Anno domin**i**.   "The year of our lord"

- This morphology allows us to identify the syntactic role of "lord" just by looking at the word form alone:

  Troia est in Asia.
  Troia in Asia est.
  "Troy is in Asia."

- In other words, languages with richer morphology tend to have simpler syntax, and vice versa.

Loose ends
Sentence length and recursion
Types of sentence constituents
Syntactic patterns in different languages

Syntactic patterns in different languages

> **In some languages, words end up getting very long...**
>
> (19) South Baffin Inuktitut   (from Richard Compton)
>
>   a. puijjuraaqgunnaqngaaqlauqsimanngittuq
>   puijjuraaq-gunnaq-ngaaq-lauq-sima-nngit-tuq
>   swim-can-instead-DIST.PAST-PERF-NEG-DEC.3SG
>   'He/she was not able to swim instead.'
>
>   b. Kumaqaqtuq   qarisaujatuqaralaakulunnguangani.
>   kumak-qaq-tuq qarisaujaq-tuqaq-ralaaq-kuluk-nnguaq-nga-ni
>   insect-have-DEC.3SG
>   computer-old-small-adorable-pretend-3SG.POSS.SG-LOC
>   'There's an insect in his/her pretend, adorable, small, old computer.'
>
> *(This complexity of words does not mean that there is no syntactic structure here!)*

Loose ends
Sentence length and recursion
Types of sentence constituents
Syntactic patterns in different languages

Syntactic patterns in different languages

Do all languages have strict word order?

- This illustrates a general property of language: languages tend to "even out" in overall complexity.
    - Less inflectional morphology → more complex syntactic patterns.
    - Smaller phonological inventory → longer words.
- Why is this?
    - What competing pressures might cause languages to converge in overall complexity?

Loose ends
Sentence length and recursion
Types of sentence constituents
Syntactic patterns in different languages

Syntactic patterns in different languages

Key points: syntactic patterns across languages

- English is an SVO language.
- Most languages are SOV or SVO.
- Analytic languages like English have relatively strict word order due to a lack of inflectional morphology.
- Synthetic languages like Latin have relatively free word order.

Loose ends
Sentence length and recursion
Types of sentence constituents
Syntactic patterns in different languages

For next time. . .

- **Assignment 4** due Wednesday.
- **Next time:** Semantics and pragmatics
- **Read**: O'Grady & Archibald "Contemporary Linguistic Analysis," chapter 6.1 (pages 190-199), in course pack.