

UCC



# Annotation of English

— Nathan Schneider ▫ COLING 2020 Tutorial: Part 2 —

<https://github.com/UniversalConceptualCognitiveAnnotation/tutorial>

# Overview

# Why UCCA?

- UCCA provides a **blueprint of conceptual compositionality** in a text, with a focus on **robustness to variation**. It recognizes that sometimes
  - Semantic headedness  $\neq$  syntactic headedness
  - Semantic predicate  $\neq$  syntactic predicate (e.g. nouns can denote events)
  - Semantic “word”/minimal unit  $\neq$  syntactic word (multiword expressions)
  - Semantic combinations may not be intuitively binary
  - A semantic dependent may be shared by multiple heads (syntax, inference)
  - Different languages use different grammatical trappings to convey information
- KEY DESIGN PRINCIPLES: **Foundational semantic graph structure, anchored in tokens, organized in terms of scenes, intuitive for annotators, multilingual, extensible with more layers**

# Preliminaries

- Level of annotation: **Passage**
- Base annotation layer: **Tokenization**
- This talk: the **Foundational Layer (FL)**
  - Main semantic graph structure in terms of **scenes**
  - FL depends on the tokenization + excluding punctuation
  - Other layers (e.g., **tense/aspect/modality**, **semantic roles**, **coreference**) can rest atop the FL

# Preliminaries

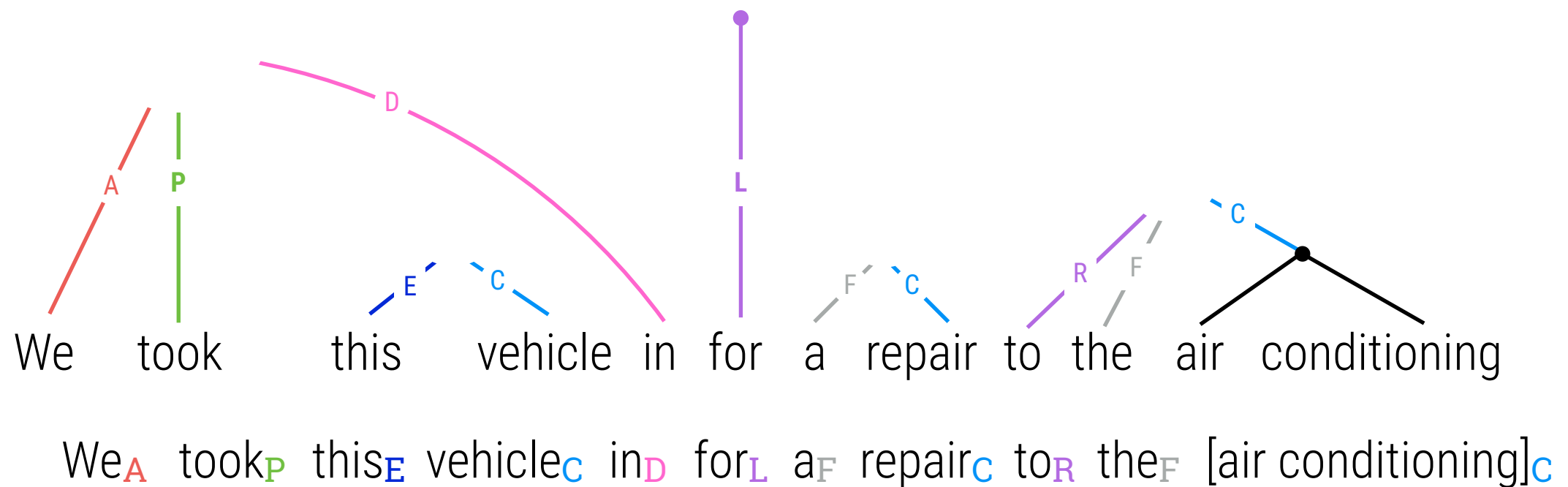
- Level of annotation: **Passage**
- Base annotation layer: **Tokenization**
- This talk: the **Foundational Layer (FL)**
  - Version 2.1 Guidelines (December 2020):  
<https://github.com/UniversalConceptualCognitiveAnnotation/docs/>

# Foundational Layer

Based on tokenized passage

We took this vehicle in for a repair to the air conditioning

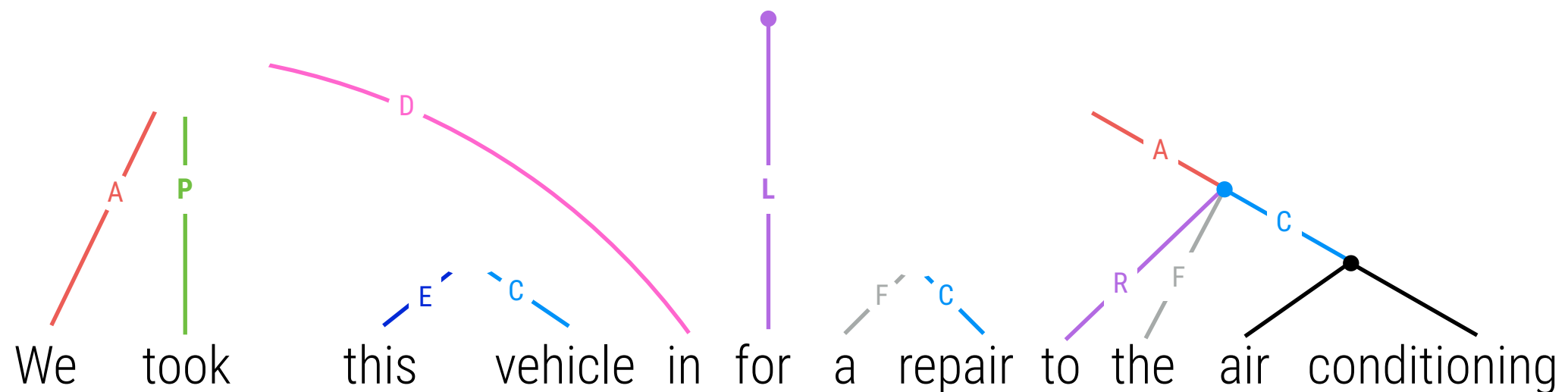
# Foundational Layer



Subsets of tokens form **units**

11 lexical units (1 unanalyzable)

# Foundational Layer

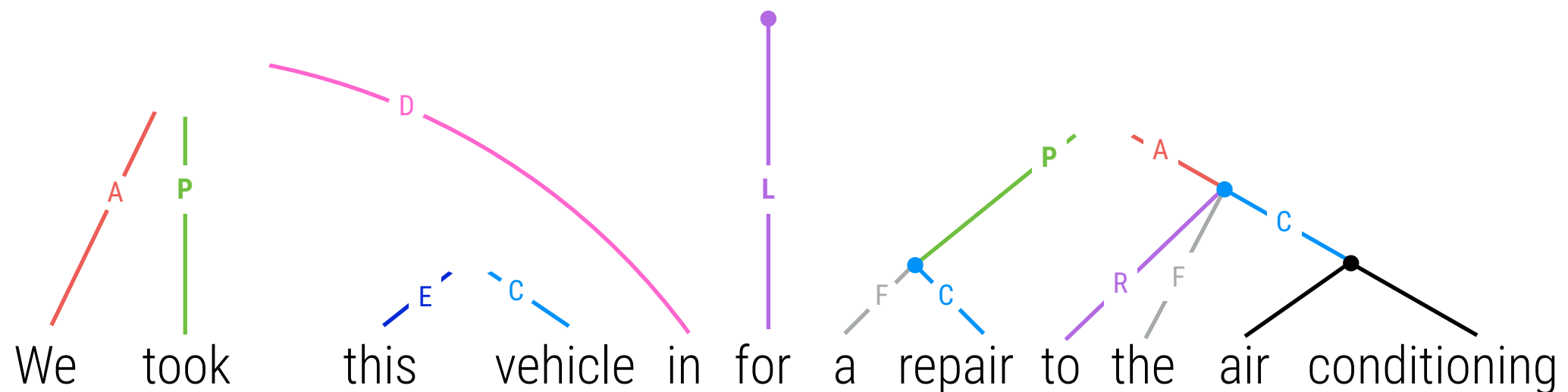


We<sub>A</sub> took<sub>P</sub> this<sub>E</sub> vehicle<sub>C</sub> in<sub>D</sub> for<sub>L</sub> a<sub>F</sub> repair<sub>C</sub> [to<sub>R</sub> the<sub>F</sub> [air conditioning]<sub>C</sub>]<sub>A</sub>

Units nest within larger units via **edges**  
labeled with **categories**



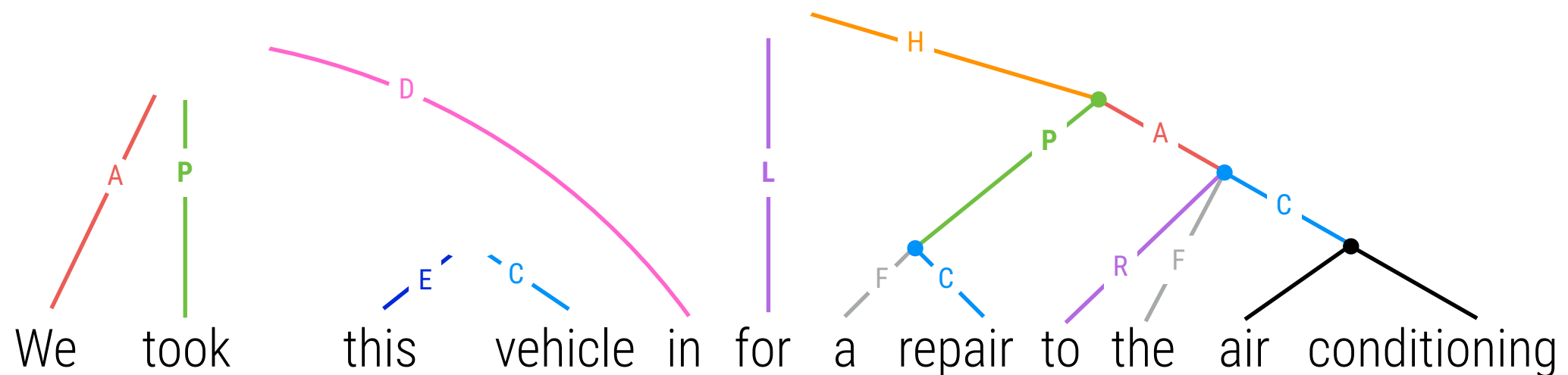
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We<sub>A</sub> took<sub>P</sub> this<sub>E</sub> vehicle<sub>C</sub> in<sub>D</sub> for<sub>L</sub> [a<sub>F</sub> repair<sub>C</sub>]<sub>P</sub> [to<sub>R</sub> the<sub>F</sub> [air conditioning]<sub>C</sub>]<sub>A</sub>

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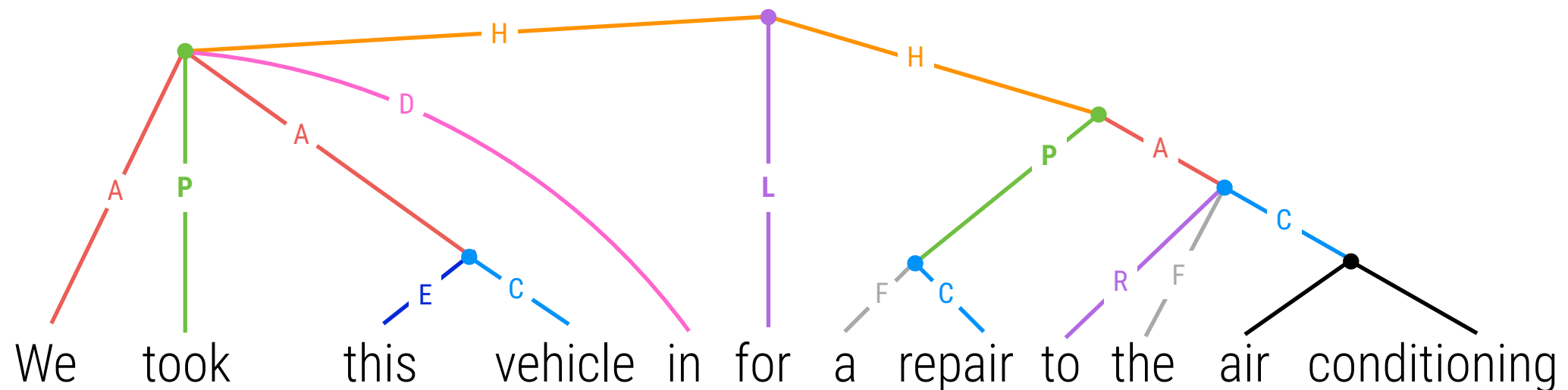
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We<sub>A</sub> took<sub>P</sub> this<sub>E</sub> vehicle<sub>C</sub> in<sub>D</sub> for<sub>L</sub> [ [a<sub>F</sub> repair<sub>C</sub>]<sub>P</sub> [to<sub>R</sub> the<sub>F</sub> [air conditioning]<sub>C</sub>]<sub>A</sub> ]<sub>H</sub>

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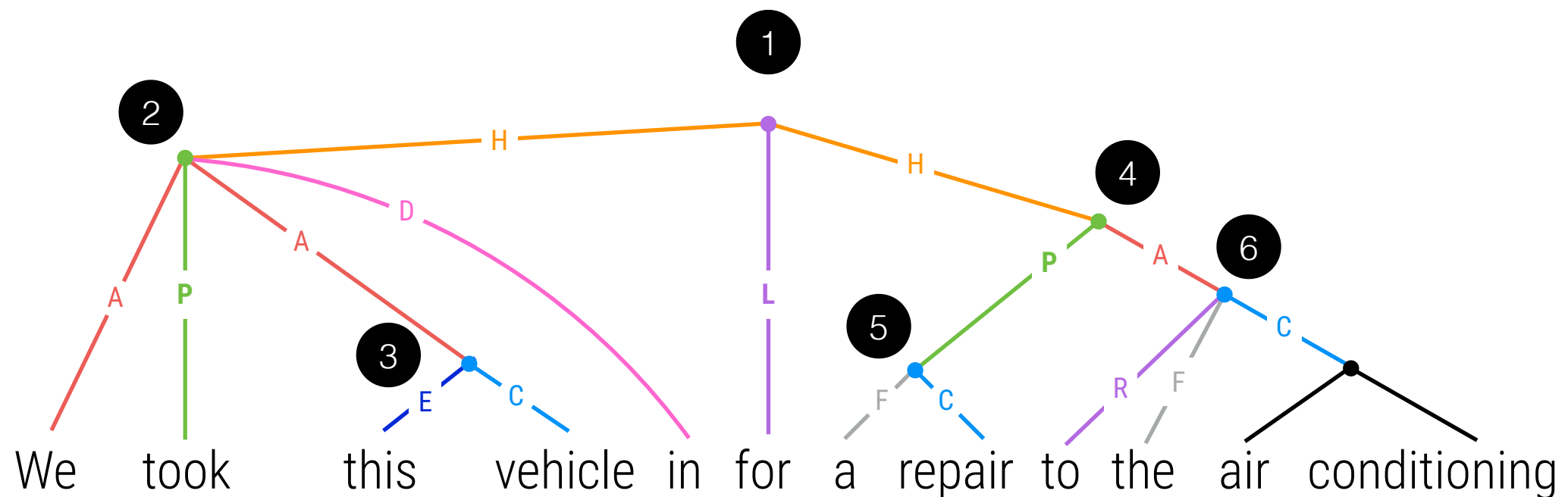
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[We<sub>A</sub> took<sub>P</sub> [this<sub>E</sub> vehicle<sub>C</sub>]<sub>A</sub> in<sub>D</sub>]<sub>H</sub> for<sub>L</sub> [ [a<sub>F</sub> repair<sub>C</sub>]<sub>P</sub> [to<sub>R</sub> the<sub>F</sub> [air conditioning]<sub>C</sub>]<sub>A</sub> ]<sub>H</sub>

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# Foundational Layer



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Subsets of tokens form  
nested **units**

11 lexical units (1 unanalyzable)

6 nonlexical units including root

# Top-Level Units

- At the top level, the passage is segmented into units acting as Parallel Scenes (**H**) and **L**inkers

Sorkin conceived the political drama *The West Wing* in 1997 when he went unprepared to a lunch with producer John Wells and in a panic pitched to Wells a series centered on the senior staff of the White House, using leftover ideas from his script for *The American President*. He told Wells about his visits to the White House while doing research for *The American President*, and they found themselves discussing public service and the passion of the people who serve. Wells took the concept and pitched it to the NBC network, but was told to wait because the facts behind the Lewinsky scandal were breaking and there was concern that an audience would not be able to take a series about the White House seriously.

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the NBC network, but was told to wait because the facts behind the 8  
Lewinsky scandal were breaking and there was concern that an audience 9  
would not be able to take a series about the White House seriously. 10

*(Technically, “unprepared” in the first sentence is evokes a separate scene—see Secondary Predicates below—so there are 11 top-level scenes here.)*

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Sorkin conceived the political drama The West Wing in 1997 when he went unprepared to a lunch with producer John Wells and in a panic pitched to Wells a series centered on the senior staff of the White House, using leftover ideas from his script for The American President. He told Wells [about [his visits to the White House] while [doing research for The American President] ], and they found a common passion of the people with the NBC network, but was told to wait because the facts behind the Lewinsky scandal were breaking and there was concern that an audience would not be able to take a series about the White House seriously.

Parallel Scenes and Linkers may be embedded within a larger unit as well.



# Top-Level Units

- At the top level, the passage is segmented into units acting as Parallel Scenes (**H**) and **L**inkers
  - [Josh started a fire]**H** **but****L** [unfortunately the chimney was blocked]**H**
  - **Either****L** [you come with me]**H** **or****L** [you stay at home]**H**
  - **After****L** [Abbey's party]**H** [we went to a bar]**H**



# Scene Structure

- Main relation (scene-evoking unit): **S**tate or **P**rocess
- Participant (**A**) units
  - non-scene units (for most non-temporal NPs, PPs), as well as
  - scene units typically in a core syntactic position (subject, object/complement)
- Modifier units
  - **Adverbial** (**D**): manner/degree modifiers, modals, negation, spatial particles, ...
  - **T**ime: modifier (e.g. PP, adverb, adjective) expressing when or how often something happens *without constituting its own scene*
  - **G**round: extra-propositional element that relates a semantic unit to the speech event (speaker-oriented adverbial, interjection, vocative)

# Main Relations: S vs. P

- **P**rocess: a dynamic event

- ▶ [Zoey presumably **graduates**<sub>P</sub> from Georgetown tomorrow ]<sub>H</sub>
- ▶ [Zoey's **graduation**<sub>P</sub> at Georgetown ]<sub>H</sub>
- ▶ cognitive activities like **seeing** & **thinking**: **P**

- **S**tate

- ▶ [Charlie passionately **loves**<sub>S</sub> Zoey ]<sub>H</sub>
- ▶ [the block of cheese **weighed**<sub>S</sub> 2 tons ]<sub>H</sub>



# Participants (A)

- **P**rocess: a dynamic event

- ▶ [Zoey<sub>A</sub> presumably **graduates**<sub>P</sub> [from Georgetown]<sub>A</sub> tomorrow ]<sub>H</sub>
- ▶ [[Zoey 's]<sub>A</sub> **graduation**<sub>P</sub> [at Georgetown]<sub>A</sub>]<sub>H</sub>
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- ▶ [Charlie<sub>A</sub> passionately **loves**<sub>S</sub> Zoey<sub>A</sub>]<sub>H</sub>
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# Modifiers in Scenes

- **P**rocess: a dynamic event

- ▶ [Zoey<sub>A</sub> presumably<sub>G</sub> **graduates**<sub>P</sub> [from Georgetown]<sub>A</sub> tomorrow<sub>T</sub>]<sub>H</sub>
- ▶ [[Zoey 's]<sub>A</sub> **graduation**<sub>P</sub> [at Georgetown]<sub>A</sub>]<sub>H</sub>
- ▶ cognitive activities like **seeing** & **thinking**: **P**

- **S**tate

- ▶ [Charlie<sub>A</sub> passionately<sub>D</sub> **loves**<sub>S</sub> Zoey<sub>A</sub>]<sub>H</sub>
- ▶ [[the block of cheese]<sub>A</sub> **weighed**<sub>S</sub> [2 tons]<sub>A</sub>]<sub>H</sub>



# Participant vs. Adverbial

- Individuals, instruments, locations/destinations in an event are invariably **A**
  - [**Oliver**<sub>A</sub> shattered<sub>P</sub> **[the dictaphone]**<sub>A</sub> **[with a hammer]**<sub>A</sub>]<sub>H</sub>
  - [**Leo**<sub>A</sub> told<sub>P</sub> **Bartlet**<sub>A</sub> **[the news]**<sub>A</sub> **[in his office]**<sub>A</sub>]<sub>H</sub>
- **D** applies only to units that do not introduce another participant or scene
  - [You<sub>A</sub> **should**<sub>D</sub> **not**<sub>D</sub> behave<sub>P</sub> **recklessly**<sub>D</sub>]<sub>H</sub>
  - [They<sub>A</sub> treated<sub>P</sub> him<sub>A</sub> **[with disrespect]**<sub>D</sub>]<sub>H</sub>

# Participant Scenes

- Scenes expressed with subjects, objects, and complement clauses can be **A**
  - **[the confirmation<sub>P</sub>]<sub>A</sub> exhausted<sub>P</sub> Toby<sub>A</sub>]<sub>H</sub>**
  - **[She<sub>A</sub> announced<sub>P</sub> [that he had resigned<sub>P</sub>]<sub>A</sub>]<sub>H</sub>**
  - **[They<sub>A</sub> broadcast<sub>P</sub> [her<sub>A</sub> announcement<sub>P</sub> [that he had resigned<sub>P</sub>]<sub>A</sub>]<sub>A</sub>]<sub>H</sub>**
- **scene unit** = any unit containing a **P** or **S** daughter.

# Scenes: Practice

- Specify scene boundaries, Linkers, and each scene's main relation, Participants, and modifiers:
  - ▶ Jordan was annoyed when Leo angrily departed from the late meeting at the Capitol with Republicans





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  - ▶ [Jordan<sub>A</sub> was annoyed<sub>P</sub>]<sub>H</sub> when<sub>L</sub> [Leo<sub>A</sub> angrily departed<sub>P</sub> [from the late meeting<sub>P</sub> [at the Capitol]<sub>A</sub> [with Republicans]<sub>A</sub> ]<sub>A</sub> ]<sub>H</sub>

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  - ▶ Jordan was annoyed when Leo angrily departed from the late meeting at the Capitol with Republicans
  - ▶ [Jordan was **annoyed**<sub>P</sub>]<sub>H</sub> when<sub>L</sub> [Leo angrily **departed**<sub>P</sub> [from the late **meeting**<sub>P</sub> at the Capitol with Republicans] ]<sub>H</sub>
  - ▶ [Jordan<sub>A</sub> was annoyed<sub>P</sub>]<sub>H</sub> when<sub>L</sub> [Leo<sub>A</sub> angrily departed<sub>P</sub> [from the late meeting<sub>P</sub> [at the Capitol]<sub>A</sub> [with Republicans]<sub>A</sub> ]<sub>A</sub> ]<sub>H</sub>
  - ▶ [Jordan<sub>A</sub> was annoyed<sub>P</sub>]<sub>H</sub> when<sub>L</sub> [Leo<sub>A</sub> angrily<sub>D</sub> departed<sub>P</sub> [from the late<sub>T</sub> meeting<sub>P</sub> [at the Capitol]<sub>A</sub> [with Republicans]<sub>A</sub> ]<sub>A</sub> ]<sub>H</sub>

# Non-Scene Units

- If a non-scene unit has multiple children, the main one (semantic head): **C**enter

- certain constructions warrant multiple Centers

[both presidential candidates<sub>C</sub> with their wives]

- **Q**uantity units

[all<sub>Q</sub> 17<sub>Q</sub> people<sub>C</sub>]

- **C**onconnector (**N**) units

[Ed<sub>C</sub> and<sub>N</sub> Larry<sub>C</sub>]

- **E**laborator units

- scene or non-scene

[this<sub>E</sub> chocolate<sub>E</sub> cake<sub>C</sub>]

- in general, **modifiers of non-scenes**: attributive adjective modifier, noun modifier in noun-noun compound, PP, apposition, relative clause, title, demonstrative determiner, degree modifier, ...

[Dr.<sub>E</sub> Bartlet<sub>C</sub>]

[Governor<sub>C</sub> [of Maine]<sub>E</sub>]

[Lord<sub>E</sub> [John Marbury]<sub>C</sub>]

- \* (later: details on adjectives, appositions, relative clauses, PPs)

[very<sub>E</sub> angrily<sub>C</sub>]

# Functional Units

- Usually these are terminal units (no children)
- **R**elator units provide functional cues regarding a nested unit

- prepositions
- complementizers, relativizers: *that, which*
- subordinators that are not Linkers

[babies<sub>C</sub> [with<sub>R</sub> hats<sub>C</sub>]<sub>E</sub>]  
[plenty<sub>Q</sub> [of<sub>R</sub> hats<sub>C</sub>]<sub>C</sub>]  
[He<sub>A</sub> left<sub>P</sub> [on<sub>R</sub> Monday<sub>C</sub>]<sub>T</sub>]<sub>H</sub>  
[I<sub>A</sub> saw<sub>P</sub> [that<sub>R</sub> he<sub>A</sub> left<sub>P</sub>]<sub>A</sub>]<sub>H</sub>

- **F**unction units

- articles
- non-modal auxiliaries
- copula with predicate adjective or relational noun
- expletive *it*
- polite forms
- infinitive *to* when not a purposive Linker

[the<sub>F</sub> car<sub>C</sub>]  
[It<sub>F</sub> will<sub>F</sub> be<sub>F</sub> raining<sub>P</sub>]<sub>H</sub>  
[Could<sub>F</sub> you<sub>A</sub> please<sub>F</sub> leave<sub>P</sub>?]<sub>H</sub>  
[I waited [[for<sub>R</sub> him<sub>C</sub>]<sub>A</sub> to<sub>F</sub> leave<sub>P</sub>]<sub>A</sub>]<sub>H</sub>

# Lexical Units

- **Unanalyzable units (UNA)**: multiple tokens forming a named entity or multiword expression where internal semantic structure is unclear. These multiword lexical units serve as leaves in the UCCA graph:
  - Personal names: *John Spencer*
  - Titles of works of art/literature/law: *The West Wing*
  - Foreign phrases: *Los Angeles, post hoc*
  - Idiomatic multiword expressions with opaque meanings: *hot dog, give up, in order to, as well as, according to, due to*
- Generally **analyzable**: proper names of places, organizations, and events, along with many specialized terms. Thus each token = 1 lexical unit.
  - University<sub>C</sub> [of<sub>R</sub> California<sub>C</sub>]<sub>E</sub>                      time<sub>E</sub> signature<sub>C</sub> (*in music*)
- Dates and addresses have a “flat” structure with multiple Centers:
  - vote [in<sub>R</sub> [Washington<sub>C</sub> , DC<sub>C</sub> , USA<sub>C</sub>]<sub>C</sub>]<sub>A</sub> [on<sub>R</sub> [Tuesday<sub>C</sub> November<sub>C</sub> 3<sub>C</sub> , 2020<sub>C</sub>]<sub>C</sub>]<sub>T</sub>

# Categories: Summary

<i>Unit type:</i>	Superparallel unit	Scene unit	Sub-scene unit	Lexical unit
Required elements	Parallel Scene ( <b>H</b> )	<b>P</b> rocess xor <b>S</b> tate	<b>C</b> enter	Token(s)
Optional elements	<b>L</b> inker	Participant ( <b>A</b> ), Adverbial ( <b>D</b> ), <b>T</b> ime, <b>G</b> round	{ <b>E</b> laborator, <b>Q</b> uantity} xor Connector ( <b>N</b> )	
	.....	<b>F</b> unction, <b>R</b> elator		
Legal parentage	root, <b>A</b> , <b>E</b> , <b>C</b>	<b>A</b> , <b>E</b> , <b>C</b> , <b>H</b>	any but <b>F</b> , <b>R</b> , root	any category

## Secondary categories:

**UN**analyzable may be combined with any category in the table on a lexical unit;  
 Coordinated Main Relation (**CMR**) may occur with **P** or **S**

# Basics: Practice

- Complete the parse:
  - [Jordan<sub>A</sub> **was** annoyed<sub>P</sub>]<sub>H</sub> when<sub>L</sub> [Leo<sub>A</sub> angrily<sub>D</sub> departed<sub>P</sub>  
[**from the** late<sub>T</sub> meeting<sub>P</sub> [**at the Capitol**]<sub>A</sub>  
[**with Republicans**]<sub>A</sub> ]<sub>A</sub> ]<sub>H</sub>



# Basics: Practice

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 [with<sub>R</sub> Republicans<sub>C</sub>]<sub>A</sub> ]<sub>A</sub> ]<sub>H</sub>

# Basics: Practice

- Complete the parse:
  - ▶ [Jordan<sub>A</sub> was<sub>F</sub> annoyed<sub>P</sub>]<sub>H</sub> when<sub>L</sub> [Leo<sub>A</sub> angrily<sub>D</sub> departed<sub>P</sub>  
[from<sub>R</sub> [**the**<sub>F</sub>]<sub>P</sub>— late<sub>T</sub> [**meeting**<sub>C</sub>]<sub>—P</sub> [at<sub>R</sub> the<sub>F</sub> Capitol<sub>C</sub>]<sub>A</sub>  
[with<sub>R</sub> Republicans<sub>C</sub>]<sub>A</sub> ]<sub>A</sub> ]<sub>H</sub>

*Technically, determiners are attached to nouns within the main relation, creating a discontinuous unit [the<sub>F</sub> meeting<sub>C</sub>]<sub>P</sub>*

# Simple Examples

1. Over the summer John read two books
2. Mary has been going to the gym every day for the last two years
3. John is speaking quietly and calmly to the children
4. Because we ate so early, we should bring a snack

# Simple Examples

1. [[Over<sub>R</sub> the<sub>F</sub> summer<sub>C</sub>]<sub>T</sub> John<sub>A</sub> read<sub>P</sub> [two<sub>Q</sub> books<sub>C</sub>]<sub>A</sub>]<sub>H</sub>
2. [Mary<sub>A</sub> has<sub>F</sub> been<sub>F</sub> going<sub>P</sub> [to<sub>R</sub> the<sub>F</sub> gym<sub>C</sub>]<sub>A</sub> [every<sub>Q</sub> day<sub>C</sub>]<sub>T</sub>  
[for<sub>R</sub> the<sub>F</sub> last<sub>E</sub> two<sub>Q</sub> years<sub>C</sub>]<sub>T</sub>]<sub>H</sub>
3. [John<sub>A</sub> is<sub>F</sub> speaking<sub>P</sub> [quietly<sub>C</sub> and<sub>N</sub> calmly<sub>C</sub>]<sub>D</sub> [to<sub>R</sub> the<sub>F</sub>  
children<sub>C</sub>]<sub>A</sub>]<sub>H</sub>
4. Because<sub>L</sub> [we<sub>A</sub> ate<sub>P</sub> [so<sub>E</sub> early<sub>C</sub>]<sub>T</sub>]<sub>H</sub>, [we<sub>A</sub> should<sub>D</sub> bring<sub>P</sub>  
[a<sub>F</sub> snack<sub>C</sub>]<sub>A</sub>]<sub>H</sub>

# English Constructions: A Tour

# Adjectives / Remotes

- Predicative adjectives typically denote states:
  - [[the<sub>F</sub> car<sub>C</sub>]<sub>A</sub> is<sub>F</sub> red<sub>S</sub>]<sub>H</sub>
- Most attributive adjectives (“**red** car”) can be paraphrased as predicative.

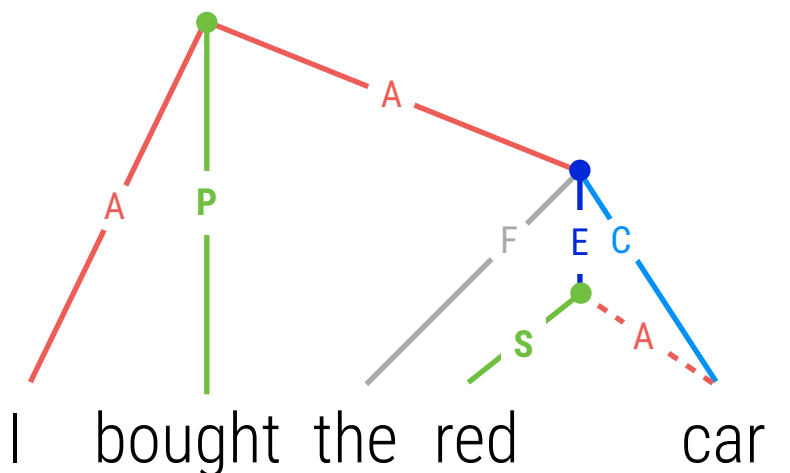
- To preserve scene structure, make the adjective *both* a State and an Elaborator, with a **remote unit**—a reentrancy for the modified noun—denoted in parentheses:

[I<sub>A</sub> bought<sub>P</sub> [the<sub>F</sub> [red<sub>S</sub> (**car**)<sub>A</sub>]<sub>E</sub> car<sub>C</sub>]<sub>A</sub>]<sub>H</sub>

- Thus the *car* token is shared between two units:

\* **primary edge** – Center in sub-scene unit for the full NP

\* **remote edge** – Participant in scene unit evoked by the adj.



- Every lexical unit has exactly 1 primary edge and may have 0 or more remote edges. We will see other uses of remote edges later.

# Adjectives / Remotes

- However, not all uses of adjectives are states: exceptions include
  - ▶ Quantities: numerous<sub>Q</sub> cookies<sub>C</sub>
  - ▶ Pertainyms: a scientific<sub>E</sub> paper<sub>C</sub>
  - ▶ Inherent composition descriptors: sugary<sub>E</sub> drinks<sub>C</sub>
  - ▶ Modifiers of scene-evoking nouns: a beautiful<sub>D</sub> wedding<sub>P</sub>
    - \* Only a non-scene unit can serve as Adverbial within a scene

# CMR

- When predicate lexical units are **coordinated** it is tedious to annotate them as separate scenes with remote participants. A shorthand is to treat as non-scene coordination and mark the unit as **Coordinated Main Relation (CMR)**:

- Adjectives: [He<sub>A</sub> is<sub>F</sub> **quiet<sub>C</sub> and<sub>N</sub> shy<sub>C</sub>**]<sub>S+CMR</sub><sub>H</sub>
- Verbs: [Walden<sub>A</sub> **wrote<sub>C</sub> and<sub>N</sub> recorded<sub>C</sub>**]<sub>P+CMR</sub> [the score]<sub>A</sub><sub>H</sub>

- In postprocessing, these are normalized to the full form:

- [He<sub>A</sub> is<sub>F</sub> **quiet<sub>S</sub>**]<sub>H</sub> **and<sub>L</sub>** [(He)<sub>A</sub> **shy<sub>S</sub>**]<sub>H</sub>
  - \* The Function category is considered semantically void, so remote **F**'s are not permitted (the copula appears just once)
- [Walden<sub>A</sub> **wrote<sub>P</sub>** [the score]<sub>A</sub>]<sub>H</sub> **and<sub>L</sub>** [(Walden)<sub>A</sub> **recorded<sub>P</sub>** (score)<sub>A</sub>]<sub>H</sub>



# Degree Modifiers

- Degree of a scene
  - [The plate is **very**<sub>D</sub> hot<sub>S</sub>]<sub>H</sub>
- Degree of a non-scene
  - [You won<sub>P</sub> [**quite**<sub>E</sub> handily<sub>C</sub>]<sub>D</sub>]<sub>H</sub>
  - [a [**very**<sub>E</sub> beautiful<sub>C</sub>]<sub>D</sub> wedding<sub>P</sub>]<sub>H</sub>

# Adjective+Main Relation

- Infinitive complement (incl. *tough*-constructions)
  - [He<sub>A</sub> is<sub>F</sub> easy<sub>D</sub> to<sub>F</sub> please<sub>P</sub>]<sub>H</sub>
  - [He<sub>A</sub> is<sub>F</sub> ready/likely<sub>D</sub> to<sub>F</sub> leave<sub>P</sub>]<sub>H</sub>
- Prepositional complement
  - [London<sub>A</sub> is<sub>F</sub> great<sub>D</sub> for<sub>F</sub> music<sub>P</sub>]<sub>H</sub>

# Secondary Predicates

- VP may contain adjective that serves as predicate to the subject or object of the verb.
  - In UCCA this is treated as a parallel scene with a remote Participant.
- Depictives
  - [John<sub>A</sub> left<sub>P</sub> home<sub>A</sub>]<sub>H</sub> [**young**<sub>S</sub> (John)<sub>A</sub>]<sub>H</sub>
- Resultatives
  - [Mary<sub>A</sub> painted<sub>P</sub> [the<sub>F</sub> fence<sub>C</sub>]<sub>A</sub>]<sub>H</sub> [**blue**<sub>S</sub> (fence)<sub>A</sub>]<sub>H</sub>

# Role Nominals

- A noun which denote an occupation (*scientist*) or role within an activity (*voter, contestant*) automatically has an associated scene with a Process and Participant:
  - [**John**<sub>A</sub> is<sub>F</sub> a<sub>F</sub> superb<sub>D</sub> English<sub>A</sub> **teacher**<sub>P</sub>]<sub>H</sub> – compare:  
 [**John**<sub>A</sub> is<sub>F</sub> a<sub>F</sub> superb<sub>D</sub> **teacher**<sub>P</sub> [of<sub>R</sub> English<sub>C</sub>]<sub>A</sub>]<sub>H</sub>  
 [**John**<sub>A</sub> **teaches**<sub>P</sub> English<sub>A</sub> superbly<sub>D</sub>]<sub>H</sub>
- If the filler of the role is not mentioned separately, the role noun doubles as a Participant:
  - [[the<sub>F</sub> superb<sub>D</sub> English<sub>A</sub> **teacher**<sub>P+A</sub>]<sub>A</sub> arrived<sub>P</sub>]<sub>H</sub>
  - [[the<sub>F</sub> [tall<sub>S</sub> (**teacher**)<sub>A</sub>]<sub>E</sub> [English<sub>A</sub> **teacher**<sub>P+A</sub>]<sub>C</sub>]<sub>A</sub> arrived<sub>P</sub>]<sub>H</sub>
  - [[The<sub>F</sub> series<sub>S</sub>]<sub>A</sub> features<sub>S</sub> [many<sub>Q</sub> [young<sub>S</sub> (**actor**)<sub>A</sub>]<sub>E</sub> [**actors**<sub>P+A</sub>]<sub>C</sub>]<sub>A</sub>]<sub>H</sub>
- Note that scene-modifiers (*superb*) are distinguished from entity-modifiers (*tall, young*).

# Light/Secondary Verbs

- Many English verbs primarily contribute modal, evidential, aspectual, or causal meaning to a scene. These “**secondary verbs**” are annotated as Adverbial elements:
  - *Modal auxiliaries*: [You<sub>A</sub> **should**<sub>D</sub> go<sub>P</sub> home<sub>A</sub>]<sub>H</sub>
  - *Aspectual/change-of-state verbs*: [CJ<sub>A</sub> **began**<sub>D</sub> singing<sub>P</sub>]<sub>H</sub> [Josh **grew**<sub>D</sub> weak<sub>S</sub>]<sub>H</sub>
  - *Verbs of necessity, desire, trying/succeeding/failing, helping, causing, allowing/preventing w.r.t. a situation*:
    - \* [Donna<sub>A</sub> **wants**<sub>D</sub> to<sub>F</sub> go<sub>P</sub> home<sub>A</sub>]<sub>H</sub>
    - \* [Ainsley<sub>A</sub> **helped**<sub>D</sub> Sam<sub>A</sub> write<sub>P</sub> [the<sub>F</sub> memo<sub>C</sub>]<sub>A</sub>]<sub>H</sub> (*secondary verb adds a Participant*)
- Other verbs are **light verbs** that combine with a scene noun which carries most of the semantic content. The verb is annotated with the Function category, and the noun as Center, within a State or Process unit:
  - [Amy<sub>A</sub> [**took**<sub>F</sub> a<sub>F</sub> shower<sub>C</sub>]<sub>P</sub>]<sub>H</sub>
  - Discontinuous units: I **took a** short **break** [Amy<sub>A</sub> [**gave**<sub>F</sub>]<sub>P-</sub> Josh<sub>A</sub> [a<sub>F</sub> smile<sub>C</sub>]<sub>-P</sub>]<sub>H</sub>

# Raising & Control

- With a **secondary verb** or a **speaker's-perception verb** like *seem*, only one scene:
  - *Secondary verb*: [Donna<sub>A</sub> **wants**<sub>D</sub> to<sub>F</sub> go<sub>P</sub> home<sub>A</sub>]<sub>H</sub>
  - *Speaker as implied perceiver*—Ground: [Josh<sub>A</sub> **seems**<sub>G</sub> to<sub>F</sub> be<sub>F</sub> fine<sub>S</sub>]<sub>H</sub>
- Raising with two scenes—syntactic argument of one is Participant of the other:
  - [Donna<sub>A</sub> proved<sub>P</sub> [**Josh**<sub>A</sub> to<sub>F</sub> be<sub>F</sub> a<sub>F</sub> liar<sub>P</sub>]<sub>A</sub>]<sub>H</sub>
- Control with two scenes—shared Participant (remote in embedded scene):
  - *Subject control verb*: [**Donna**<sub>A</sub> promised<sub>P</sub> [to<sub>F</sub> be<sub>F</sub> better<sub>S</sub> (**Donna**)<sub>A</sub>]<sub>A</sub>]<sub>H</sub>
  - *Object control verb*: [Donna<sub>A</sub> asked<sub>P</sub> **Josh**<sub>A</sub> [to<sub>F</sub> be<sub>F</sub> careful<sub>S</sub> (**Josh**)<sub>A</sub>]<sub>A</sub>]<sub>H</sub>
  - *Purpose clause adjunct*: [**Josh**<sub>A</sub> went<sub>P</sub> there<sub>A</sub>]<sub>H</sub> to<sub>L</sub> [buy<sub>P</sub> coffee<sub>A</sub> (**Josh**)<sub>A</sub>]<sub>H</sub>

# Reflexives

- Reflexive marking (which in English is on pronouns: *myself*, etc.) canonically signals that a single Participant is filling multiple roles of an event. The reflexive is annotated as forming **an unanalyzable unit with the verb**:
  - [Mary<sub>A</sub> **introduced herself**<sub>P+UNA</sub> [to<sub>R</sub> everyone<sub>C</sub>]<sub>A</sub>]<sub>H</sub>
- The same analysis applies when the reflexive gives the verb an idiomatic meaning (which is very common e.g. in Romance languages):
  - [[The<sub>F</sub> dog<sub>C</sub>]<sub>A</sub> **relieved himself**<sub>P+UNA</sub> outside<sub>A</sub>]<sub>H</sub>
- English reflexive pronouns have other uses, however:
  - *Entity emphasis—Function*: [[The<sub>F</sub> president<sub>C</sub> **himself**<sub>F</sub>]<sub>A</sub> [paid<sub>F</sub> a<sub>F</sub> visit<sub>C</sub>]<sub>P</sub>]<sub>H</sub>
  - *In a PP meaning 'alone'*: [I<sub>A</sub> solved<sub>P</sub> [the<sub>F</sub> mystery<sub>C</sub>]<sub>A</sub> **by**<sub>R</sub> **myself**<sub>C</sub>]<sub>A</sub>]<sub>H</sub>

# Relative Clauses

- **E**-scenes with a noun

- ▶ [the<sub>F</sub> person<sub>C</sub> [who<sub>R</sub> resigned<sub>P</sub> (person)<sub>A</sub>]<sub>E</sub>]

- ▶ [the<sub>F</sub> car<sub>C</sub> [you<sub>A</sub> wanted<sub>P</sub> (car)<sub>A</sub>]<sub>E</sub>]

- \* *want-to-have sense; would be D for want-to-do sense*

- ▶ [the<sub>F</sub> car<sub>C</sub> [you<sub>A</sub> were<sub>F</sub> looking<sub>P</sub> [for<sub>R</sub> (car)<sub>C</sub>]<sub>A</sub>]<sub>E</sub>]

- ▶ [the<sub>F</sub> car<sub>C</sub> [that<sub>R</sub> is<sub>F</sub> red<sub>S</sub> (car)<sub>A</sub>]<sub>E</sub>]

- ▶ *See guidelines for considerations where the modified noun is scene-evoking*

- Free relative clauses: Fused **E**-scenes

- ▶ [I<sub>A</sub> wonder<sub>P</sub> [what<sub>C</sub> [they<sub>A</sub> 've<sub>F</sub> been<sub>F</sub> eating<sub>P</sub> (what)<sub>A</sub>]<sub>E</sub>]<sub>A</sub>]<sub>H</sub>

- ▶ [John<sub>A</sub> will<sub>F</sub> explain<sub>P</sub> [how<sub>C</sub> [it<sub>A</sub> works<sub>P</sub> (how)<sub>D</sub>]<sub>E</sub>]<sub>A</sub>]<sub>H</sub>



# Scenes within Scenes

## A-Scenes

### Complementation

- ▶ [She<sub>A</sub> promised<sub>P</sub> **[to<sub>F</sub> be<sub>F</sub> better<sub>S</sub> (She)<sub>A</sub>]<sub>A</sub>]<sub>H</sub>**
- ▶ [She<sub>A</sub> announced<sub>P</sub> **[that<sub>R</sub> he<sub>A</sub> had<sub>F</sub> resigned<sub>P</sub>]<sub>A</sub>]<sub>H</sub>**
- ▶ [She<sub>A</sub> talked<sub>P</sub> **[about<sub>R</sub> resigning<sub>P</sub> (She)<sub>A</sub>]<sub>A</sub>]<sub>H</sub>**

### Role nominals

- ▶ **[[the<sub>F</sub> superb<sub>D</sub> English<sub>A</sub> teacher<sub>P+A</sub>]<sub>A</sub> arrived<sub>P</sub>]<sub>H</sub>**

## E-Scenes

### Attributive adjectives

- ▶ [I<sub>A</sub> bought<sub>P</sub> [the<sub>F</sub> **[red<sub>S</sub> (car)<sub>A</sub>]<sub>E</sub>** car<sub>C</sub>]<sub>A</sub>]<sub>H</sub>

### Relative Clauses

[I<sub>A</sub> asked/bought<sub>P</sub> [ ... ]<sub>A</sub>]<sub>H</sub>

- ▶ the<sub>F</sub> person<sub>C</sub> **[who<sub>R</sub> resigned<sub>P</sub> (person)<sub>A</sub>]<sub>E</sub>**
- ▶ the<sub>F</sub> car<sub>C</sub> **[you<sub>A</sub> wanted<sub>P</sub> (car)<sub>A</sub>]<sub>E</sub>**
- ▶ the<sub>F</sub> car<sub>C</sub> **[you<sub>A</sub> were<sub>F</sub> looking<sub>P</sub> [for<sub>R</sub> (car)<sub>A</sub>]<sub>A</sub>]<sub>E</sub>**
- ▶ the<sub>F</sub> car<sub>C</sub> **[that<sub>R</sub> is<sub>F</sub> red<sub>S</sub> (car)<sub>A</sub>]<sub>E</sub>**
- ▶ **how<sub>C</sub> [it<sub>A</sub> works<sub>P</sub> (how)<sub>D</sub>]<sub>E</sub>**

# Questions

- Question words should be annotated with the same category as their respective component in a given answer.
  - [**Who**<sub>A</sub> did<sub>F</sub> you<sub>A</sub> meet<sub>P</sub> ?]<sub>H</sub>
  - [**How**<sub>D</sub> did<sub>F</sub> you<sub>A</sub> fix<sub>P</sub> [the<sub>F</sub> car<sub>C</sub>]<sub>A</sub> ?]<sub>H</sub>
- Yes/No questions
  - [Will<sub>F</sub> John<sub>A</sub> be<sub>F</sub> coming<sub>P</sub> ?]<sub>H</sub>    [**Yes**<sub>G</sub> (John)<sub>A</sub> (coming)<sub>P</sub> .]<sub>H</sub>

# Copula Constructions

- Predicate complement is scene-evoking, e.g. attributing a property or relational noun to an entity: copula = **F**
  - [CJ<sub>A</sub> is<sub>F</sub> **tall**<sub>S</sub>]<sub>H</sub>
  - [[The ambassador]<sub>A</sub> is<sub>F</sub> **in**<sub>S</sub> [the Mural Room]<sub>A</sub>]<sub>H</sub>
  - [John<sub>A</sub> is<sub>F</sub> an<sub>F</sub> English<sub>A</sub> **teacher**<sub>P</sub>]<sub>H</sub>
- Complement contributes an attribute of the scene denoted by the subject: copula = **F**
  - [[The service]<sub>P</sub> was<sub>F</sub> **slow**<sub>D</sub>]<sub>H</sub>
  - [[The election]<sub>P</sub> is<sub>F</sub> **[on Tuesday]**<sub>T</sub>]<sub>H</sub>
- Otherwise (equation of two entity references): copula = **S**
  - [This<sub>A</sub> **is**<sub>S</sub> [a<sub>F</sub> car<sub>C</sub>]<sub>A</sub>]<sub>H</sub>
  - [This<sub>A</sub> **is**<sub>S</sub> [a<sub>F</sub> [red<sub>S</sub> (car)<sub>A</sub>]<sub>E</sub> car<sub>C</sub>]<sub>A</sub>]<sub>H</sub>

# Existentials

- Expressing that something exists in a particular location:

locative relation = **S**, *there* = **F**

- [There<sub>F</sub> is<sub>F</sub> [a<sub>F</sub> turkey]<sub>A</sub> **on**<sub>S</sub> [the<sub>F</sub> desk]<sub>C</sub>]<sub>A</sub>]<sub>H</sub>
    - ≈ [[a<sub>F</sub> turkey]<sub>A</sub> is<sub>F</sub> **on**<sub>S</sub> [the<sub>F</sub> desk]<sub>C</sub>]<sub>A</sub>]<sub>H</sub>
  - [There<sub>F</sub> is<sub>F</sub> [a<sub>F</sub> [great<sub>S</sub> (restaurant)]<sub>A</sub>]<sub>E</sub> restaurant]<sub>C</sub>]<sub>A</sub> **nearby**<sub>S+A</sub>]<sub>H</sub>

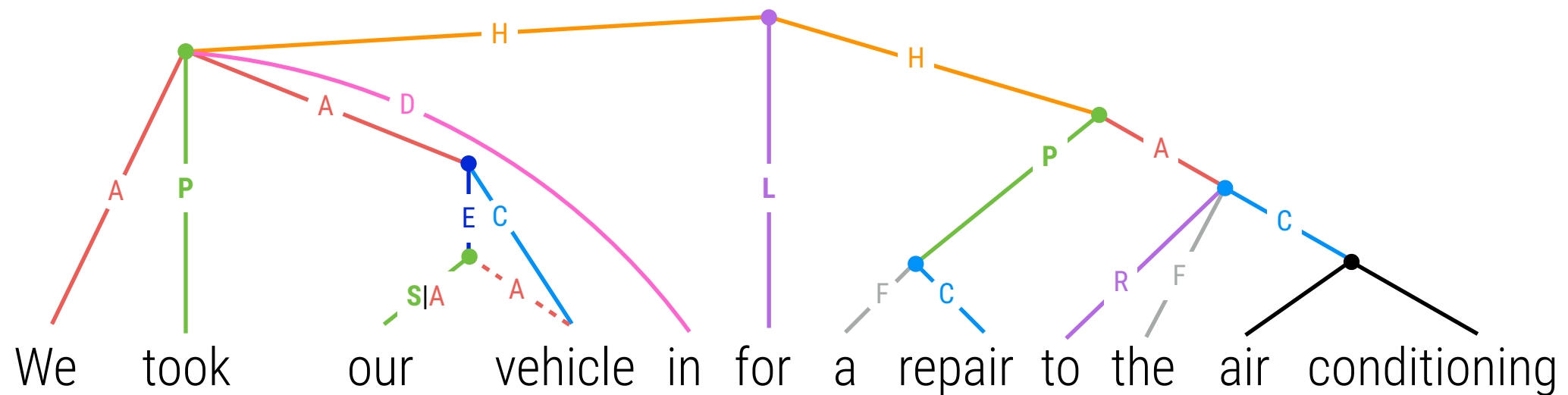


- Otherwise (only relation is assertion of existence): *there* = **S**
  - [**There**<sub>S</sub> are<sub>F</sub> [thousands<sub>Q</sub> [of<sub>R</sub> us]<sub>C</sub>]<sub>A</sub>]<sub>H</sub>
- Note that *be* = **F** with existential *there* subject

# Possessives

- Possessive can mark a Participant of a **scene-evoking noun** such as an eventive or relational noun:
  - [[Zoey<sub>C</sub> 's<sub>R</sub>]<sub>A</sub> **graduation**<sub>P</sub> [at Georgetown]<sub>A</sub>]<sub>H</sub>
  - [[[Zoey<sub>C</sub> 's<sub>R</sub>]<sub>A</sub> **boyfriend**<sub>S+A</sub>] attended<sub>P</sub>]<sub>H</sub>
  - [[Zoey<sub>C</sub> 's<sub>R</sub>]<sub>A</sub> **boyfriend**<sub>S</sub> is<sub>F</sub> JP<sub>A</sub>]<sub>H</sub>
- When it marks an **ownership** relation, possessive = **S**:
  - [[[Simon<sub>A</sub> 's<sub>S</sub> (car)<sub>A</sub>]<sub>E</sub> car<sub>C</sub>]<sub>A</sub> is<sub>F</sub> parked<sub>S</sub> outside<sub>A</sub>]<sub>H</sub>
  - [[[**His**<sub>S+A</sub> (car)<sub>A</sub>]<sub>E</sub> car<sub>C</sub>]<sub>A</sub> is<sub>F</sub> parked<sub>S</sub> outside<sub>A</sub>]<sub>H</sub>
    - \* Possessive pronoun doubles as State and Participant
  - [[This<sub>E</sub> car<sub>C</sub>]<sub>A</sub> is<sub>F</sub> **mine**<sub>S+A</sub>]<sub>H</sub>
- Likewise for an social/organizational relationship absent a relational noun:
  - [She<sub>A</sub> was<sub>F</sub> proud<sub>D</sub> to<sub>F</sub> represent<sub>P</sub> [[**her**<sub>S+A</sub> (school)<sub>A</sub>]<sub>E</sub> school<sub>C</sub>]<sub>A</sub>]<sub>H</sub>
- Other forms of inalienable possession (body parts, attributes) are non-scene-evoking:
  - [Zoey<sub>C</sub> 's<sub>R</sub>]<sub>E</sub> name/arm<sub>C</sub>

# Possessive Example



[We<sub>A</sub> took<sub>P</sub> [ [our<sub>S+A</sub> (vehicle)<sub>A</sub>]<sub>E</sub> vehicle<sub>C</sub>]<sub>A</sub> in<sub>D</sub>]<sub>H</sub>

for<sub>L</sub>

[ [a<sub>F</sub> repair<sub>C</sub>]<sub>P</sub> [to<sub>R</sub> the<sub>F</sub> [air conditioning]<sub>C</sub>]<sub>A</sub> ]<sub>H</sub>

# Modifier + “of” + Noun

- *Of* can connect an amount (**Q**) with the item quantified or measured:
  - ▶ *Quantities:*    thousands<sub>Q</sub> [of<sub>R</sub> books<sub>C</sub>]<sub>C</sub>            [a lot]<sub>Q</sub> [of<sub>R</sub> trouble<sub>C</sub>]<sub>C</sub>
  - ▶ *Portions:*            some<sub>Q</sub> [of<sub>R</sub> the<sub>F</sub> cats<sub>C</sub>]<sub>C</sub>            3<sub>Q</sub> [of<sub>R</sub> the<sub>F</sub> 12<sub>Q</sub> trees<sub>C</sub>]<sub>C</sub>  
                         80%<sub>Q</sub> [of<sub>R</sub> women<sub>C</sub>]<sub>C</sub>            the<sub>F</sub> rest<sub>Q</sub> [of<sub>R</sub> the<sub>F</sub> cake<sub>C</sub>]<sub>C</sub>
  - ▶ *Unitizers:*            a<sub>F</sub> box<sub>Q</sub> [of<sub>R</sub> chocolates<sub>C</sub>]<sub>C</sub>    a<sub>F</sub> bottle<sub>Q</sub> [of<sub>R</sub> champagne<sub>C</sub>]<sub>C</sub>
- It can also connect a word like *kind* or *type* (**E**) to a category:
  - ▶ this<sub>E</sub> kind<sub>E</sub> [of<sub>R</sub> music<sub>C</sub>]<sub>C</sub>

# Appositions

- When two phrases are related by apposition,
  - ▶ if one of them is a name and the other is a description, the name is the Center and the description is the Elaborator
    - \* Sheen portrays [[a fictional president]<sub>E</sub>, [Josiah Bartlet]<sub>C</sub>].
    - \* Sheen portrays [[Josiah Bartlet]<sub>C</sub>, [a fictional president]<sub>E</sub>].
  - ▶ otherwise the syntactic head (usually the first item) is the Center and the other item is the Elaborator
    - \* Sheen portrays [[the president]<sub>C</sub>, [a Democrat]<sub>E</sub>].



# Implicit Units

- When a syntactic construction involves a locally missing argument (e.g., relative clause, passive, imperative, control, ellipsis, pro-drop), it is filled in with a **remote unit** if possible.
- If no available unit in the passage, an **implicit unit** (i.e. a lexical unit with 0 tokens) is specified.
  - [(IMP)<sub>A</sub> Go<sub>P</sub> !]<sub>H</sub>
  - [[The<sub>E</sub> car<sub>C</sub>]<sub>A</sub> was<sub>F</sub> stolen<sub>P</sub> (IMP)<sub>A</sub>]<sub>H</sub>
  - [It<sub>F</sub> is<sub>F</sub> unhealthy<sub>S</sub> [to<sub>F</sub> smoke<sub>P</sub> (IMP)<sub>A</sub>]<sub>A</sub>]<sub>H</sub>
  - [[Smoking<sub>P</sub> (IMP)<sub>A</sub>] is<sub>F</sub> unhealthy<sub>S</sub>]<sub>H</sub>
- Strict interpretation of the guidelines:  
Most other types of arguments (*Has he arrived*  $\emptyset_{Place}$ ? *We ate*  $\emptyset_{Food}$ .) are not represented with implicit or remote units. (But some annotators use implicit units more liberally.)

👉 More on implicit units:  
[Cui & Hershcovich, DMR 2020](#)

# Ellipsis

- Remote units allow “copying” of elements in ellipsis constructions and shared subject VP coordination.  
Try annotating:
  - ▶ Josh stepped outside and slipped on ice.
  - ▶ John bought eggs and Mary, gum.
  - ▶ You bought three horses, I bought one.
  - ▶ John will go to school tomorrow and so will Mary.
- Note that remote **F**'s are prohibited.

# Ellipsis

- Remote units allow “copying” of elements in ellipsis constructions and shared subject VP coordination:
  - ▶ [Josh<sub>A</sub> stepped<sub>P</sub> outside<sub>A</sub>]<sub>H</sub> and<sub>L</sub> [(Josh)<sub>A</sub> slipped<sub>P</sub> [on<sub>R</sub> ice<sub>C</sub>]<sub>A</sub>]<sub>H</sub>
  - ▶ [John<sub>A</sub> bought<sub>P</sub> eggs<sub>A</sub>]<sub>H</sub> and<sub>L</sub> [Mary<sub>A</sub>, (bought)<sub>P</sub> gum<sub>A</sub>]<sub>H</sub>
  - ▶ [You<sub>A</sub> bought<sub>P</sub> [three<sub>Q</sub> horses<sub>C</sub>]<sub>A</sub>]<sub>H</sub>, [I<sub>A</sub> bought<sub>P</sub> [one<sub>Q</sub> (horses)<sub>C</sub>]<sub>A</sub>]<sub>H</sub>
  - ▶ [John<sub>A</sub> will<sub>F</sub> go<sub>P</sub> [to<sub>R</sub> school<sub>C</sub>]<sub>A</sub> tomorrow<sub>T</sub>]<sub>H</sub> and<sub>L</sub> [so<sub>D</sub> will<sub>F</sub> Mary<sub>A</sub> (go)<sub>P</sub> ([to<sub>R</sub> school<sub>C</sub>])<sub>A</sub> (tomorrow)<sub>T</sub>]<sub>H</sub>
- Note that remote **F**'s are prohibited.

# Speech Act Phenomena

- **Interjections** are labeled **G**.
- **Vocatives:** A vocative addressee is labeled **G** (**G+A** in an imperative):
  - [Joey<sub>G</sub>, I<sub>A</sub> want<sub>P</sub> numbers<sub>A!</sub>]<sub>H</sub>
  - [Go<sub>P</sub>, Donna<sub>G+A!</sub>]<sub>H</sub>
- **Yes and No:** As responses, these are labeled **G** in a scene alongside the response content (which may be remote):
  - [No<sub>G</sub>, I<sub>A</sub> do<sub>F</sub> n't<sub>D</sub> kill<sub>P</sub> [[my<sub>S+A</sub> (pets)<sub>A</sub>] pets<sub>C</sub>]<sub>A</sub>]<sub>H</sub>
- **Quotations** generally consist of one or more Parallel Scenes—either at the top level or embedded as a Participant of a speech event.
- **Please:** The politeness marker *please* is labeled **F**.
- **Thanks:** The subjectless expressions *thank you* and *thanks* are treated as Processes with an implicit Participant (the grateful person); otherwise *thank* is a regular Process:
  - [[Thank you]<sub>P+UNA</sub> (IMP)<sub>A</sub> [for<sub>R</sub> leaving<sub>P</sub> (Josh)<sub>A</sub>]<sub>A</sub>, Josh<sub>G</sub>]<sub>H</sub>
  - [I<sub>A</sub> should<sub>D</sub> thank<sub>P</sub> you<sub>A</sub> [for<sub>R</sub> leaving<sub>P</sub>]<sub>A</sub>]<sub>H</sub>

# More in Guidelines

- Comparatives
- Ordinals
- Directional particles
- Coordination
- Focus modifiers (“also”, “even”, “only”)
- Expletive *it*
- **German** compound splitting
- ...

# Summary

# Formal Properties of Foundational Layer

**Rooted DAG.** Each edge has one or more **category** labels.

## Primary Edges

- ▶ Form a **tree** (not necessarily projective in sentence order)
- ▶ **Lexical unit:** 0 or more non-punctuation tokens (2+ = unanalyzable unit); overt (non-implicit) units must be disjoint
- ▶ Units may be **nested** within other units, including unary nesting
- ▶ Units may be **discontinuous**
- ▶ Some simplifications are made prior to parser **evaluation**, which is span-based and forgiving w.r.t. attachment of F units (see later)

## Remote Edges

- ▶ These are **reentrancies** within a passage (not necessarily same sentence)
- ▶ Grammatically required (e.g. control, ellipsis, relative clause)
- ▶ Coreference between overt mentions (including pronouns) is NOT indicated in the foundational layer (but see section on extensions)

# Categories: Summary

<i>Unit type:</i>	Superparallel unit	Scene unit	Sub-scene unit	Lexical unit
<b>Required elements</b>	Parallel Scene ( <b>H</b> )	<b>P</b> rocess xor <b>S</b> tate	<b>C</b> enter	Token(s)
<b>Optional elements</b>	<b>L</b> inker	Participant ( <b>A</b> ), Adverbial ( <b>D</b> ), <b>T</b> ime, <b>G</b> round	{ <b>E</b> laborator, <b>Q</b> uantity} xor Connector ( <b>N</b> )	
	.....	<b>F</b> unction, <b>R</b> elator		
<b>Legal parentage</b>	root, <b>A</b> , <b>E</b> , <b>C</b>	<b>A</b> , <b>E</b> , <b>C</b> , <b>H</b>	any but <b>F</b> , <b>R</b> , root	any category

## Secondary categories:

**UN**analyzable may be combined with any category in the table on a lexical unit;  
 Coordinated Main Relation (**CMR**) may occur with **P** or **S**



# UCCA Tutorial

<https://github.com/UniversalConceptualCognitiveAnnotation/tutorial>

1. Bird's Eye View of UCCA // [Omri Abend](#)
  - 2. Annotation of English (Foundational Layer) // [Nathan Schneider](#)**
  3. Annotated Corpora & UCCApp Annotation Tool // [Dotan Dvir](#)
  4. Extension Layers & Comparison to Other Formalisms // [Jakob Prange](#)
  5. Parsing, Evaluation, & Applications // [Daniel Hershcovich](#)
  6. Crosslinguistic Investigations // [Omri Abend](#)
- Thanks to Dotan Dvir for help with the example sentences, and Georgetown students in the Advanced Semantic Representation course for feedback!

