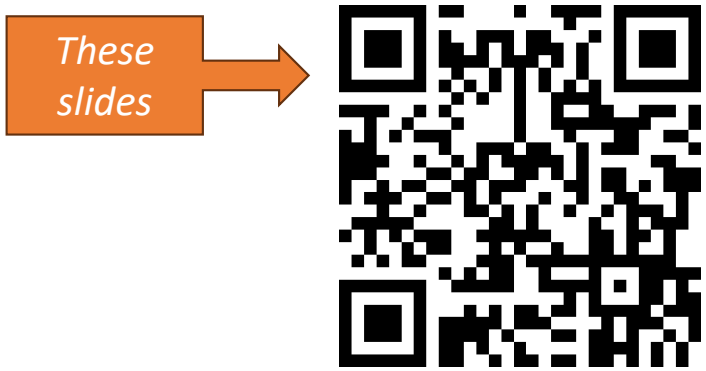

On the nature of FormSet

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- some of these slides: FIND2023 workshop, Göttingen, Germany. Dec 2023

*__Also__: Jason Ginsburg, Hiroshi Terada and Masumi Matsumoto (OKU)

Human Language

- *On Language*, W. von Humboldt (1836):
  - "*Language is an involuntary emanation of the mind, no work of nations, but a gift fallen to them by their inner destiny*."
  - "*Every language is produced by the original tendency or 'original talent' shared by all human beings.*"

- Chomsky (1964), *Logical Basis of Linguistic Theory*, cites Humboldt extensively.

Strong Minimalist Thesis (SMT)

- Language is '*optimal*'
- Maximal operational simplicity is not only desirable wrt. the theory
- It's a necessity (for *plausible evolution*)
- It's a necessity (for *biological computation*: slow brain)

Merge

- Maximal simplicity doesn't necessarily mean "free" or fewer constraints (e.g. free Merge)
- Simple could be limiting options
- *I-language is basically a thought-generating system* (Chomsky *MC*)
- Following *Duality of Semantics,* there's a division of labor:
  - External Merge (EM): form θ-configurations
  - Internal Merge (IM): *for other things*
- Displacement
  - IM: Q-formation, Focus etc.
  - (Chomsky) EXT: VP-fronting, Rightwards movement
  - *IM: verbal head movement: unformulable (must be at EXT: Amalgamation)
  - linear adjacency constraints cannot be expressed here either

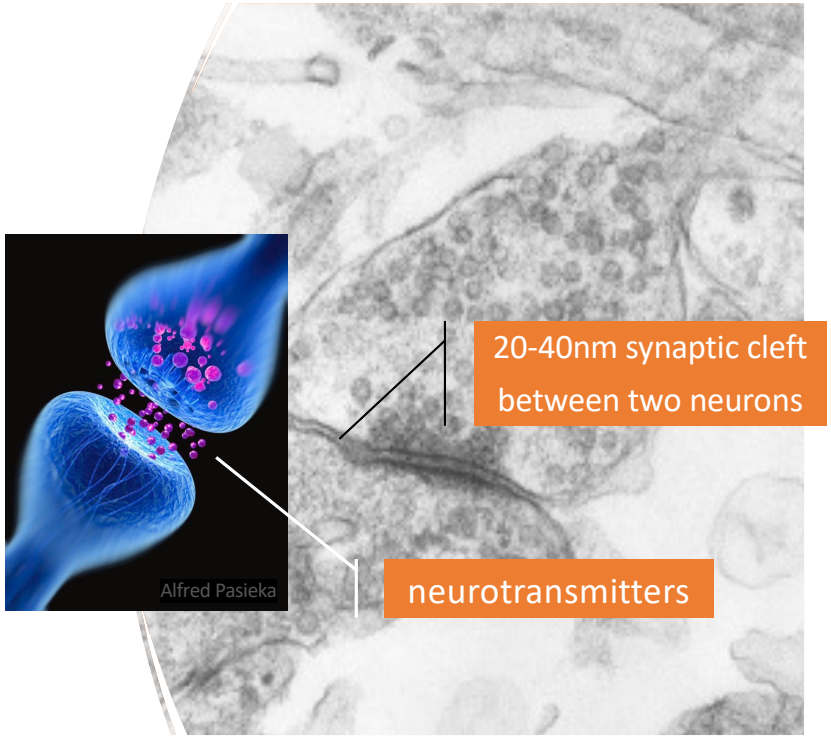
EM/IM must be defined not to explode search space (Minimal Yield), *computational efficiency*

Fact: Brain is slow

image from Reingrubber & Holcman (2011)

Computational efficiency (and **bandwidth**) are important considerations for all organic systems:

- our sensory apparatus can generate vast amounts of data (*sensor mismatch*)
- a slow (*chemical*) brain limits what can be analyzed
- *The War of Soups and Sparks* (Valenstein, 2005) 19th century belief that neurons were electrically connected. *Neurophysiologists believed only electrical transmission is fast enough to activate skeletal muscles.* Mid-20th century: biochemical.
- we (selectively) throw out/ignore almost all of the signal



Sensor/Brain Mismatch

- Sensor performance is incredibly good:

  sensitivity down to the single photon level (Tinsley *et al*., 2016)

  resolution (77 cycles/°) (Curcio et al. 1990) – *within a factor of 3 of an eagle's*

  we don't need/use it for scene analysis

Other sensors:

  olfactory thresholds at parts per billion (ppb) (Wackermannová et al., 2016)

  eardrums can detect tiny vibrations: down to the size of a hydrogen atom (Fletcher & Munson, 1933)

  brain doesn't need/use this either

90% of the area is peripheral vision: 50% of the nerve fibers

fovea pit (0.2mm diameter) 20/20 vision, color: 50%

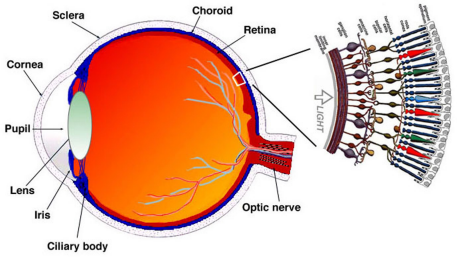


Fig. 1.1. A drawing of a section through the human eye with a schematic enlargement of the retina.

source: Reuters

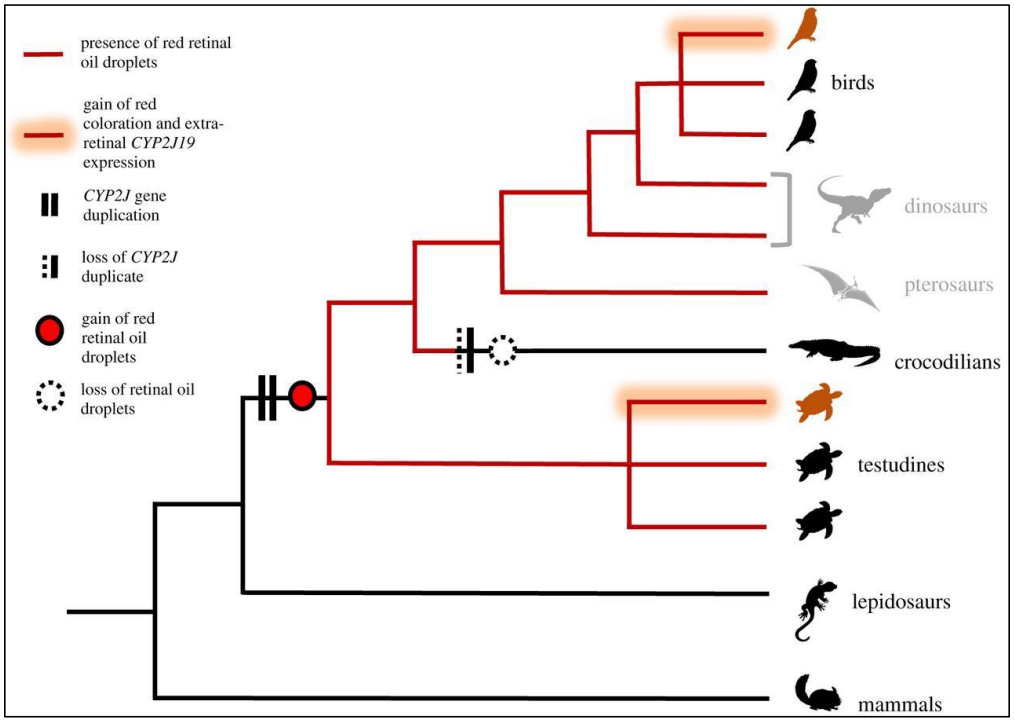
Avians: *eye architecture*:

- one/two foveae (*also denser*)
- higher flicker fusion rates
- more types of cones

Sensor/Brain Mismatch

Use it or lose it!

- http://genomewiki.ucsc.edu/index.php/Opsin_evolution:_trichromatic_ancestral_mammal
- Despite 100 million years of playing catchup, no [Therian] mammal has ever regained the superior sharp tetrachromatic color vision enjoyed by the amniote common ancestor and contemporary turtles, birds and lizards.
- It's possible to have much better color vision than human -- and many earlier diverging vertebrate species do.

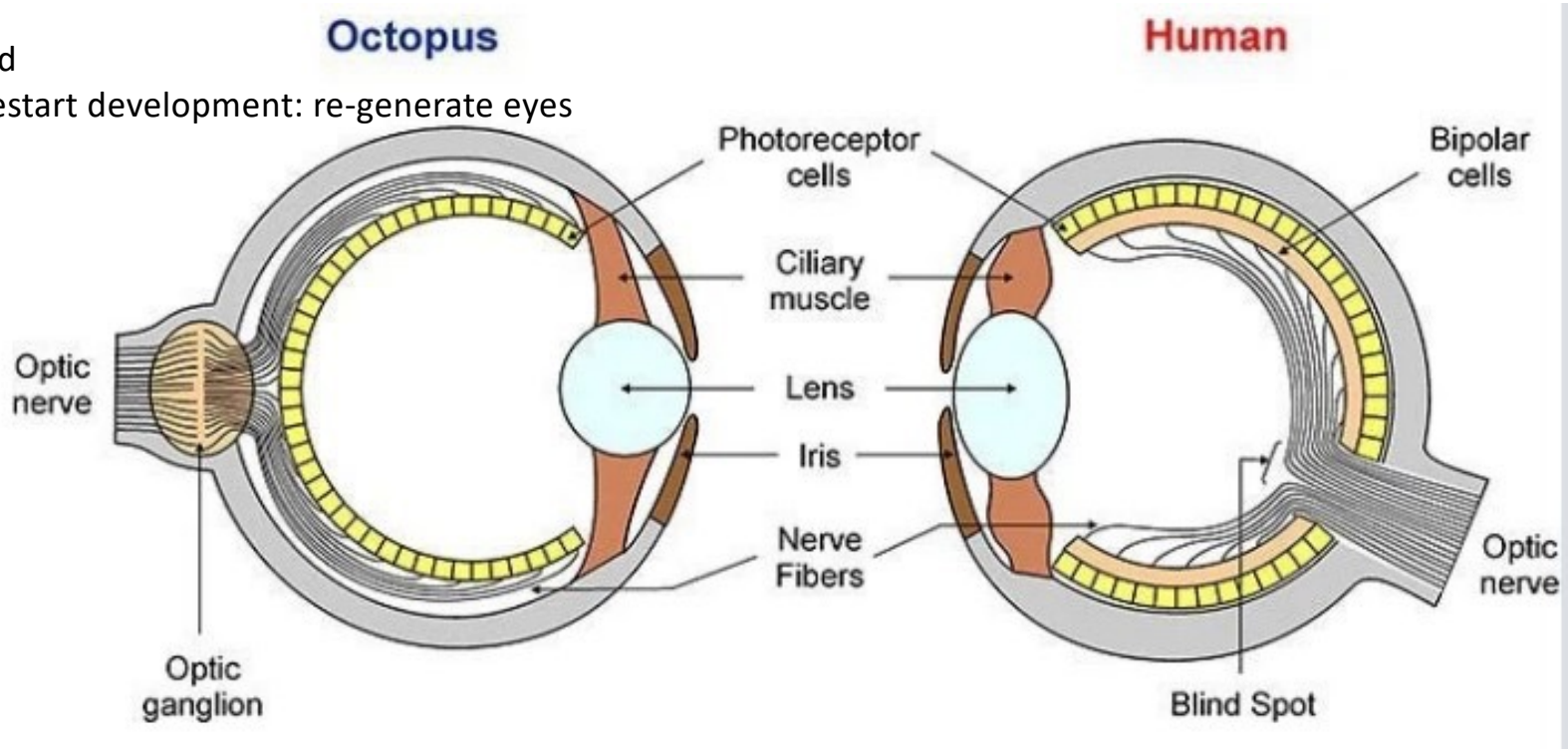


https://doi.org/10.1098/rspb.2016.1208

Sensor/Brain Mismatch

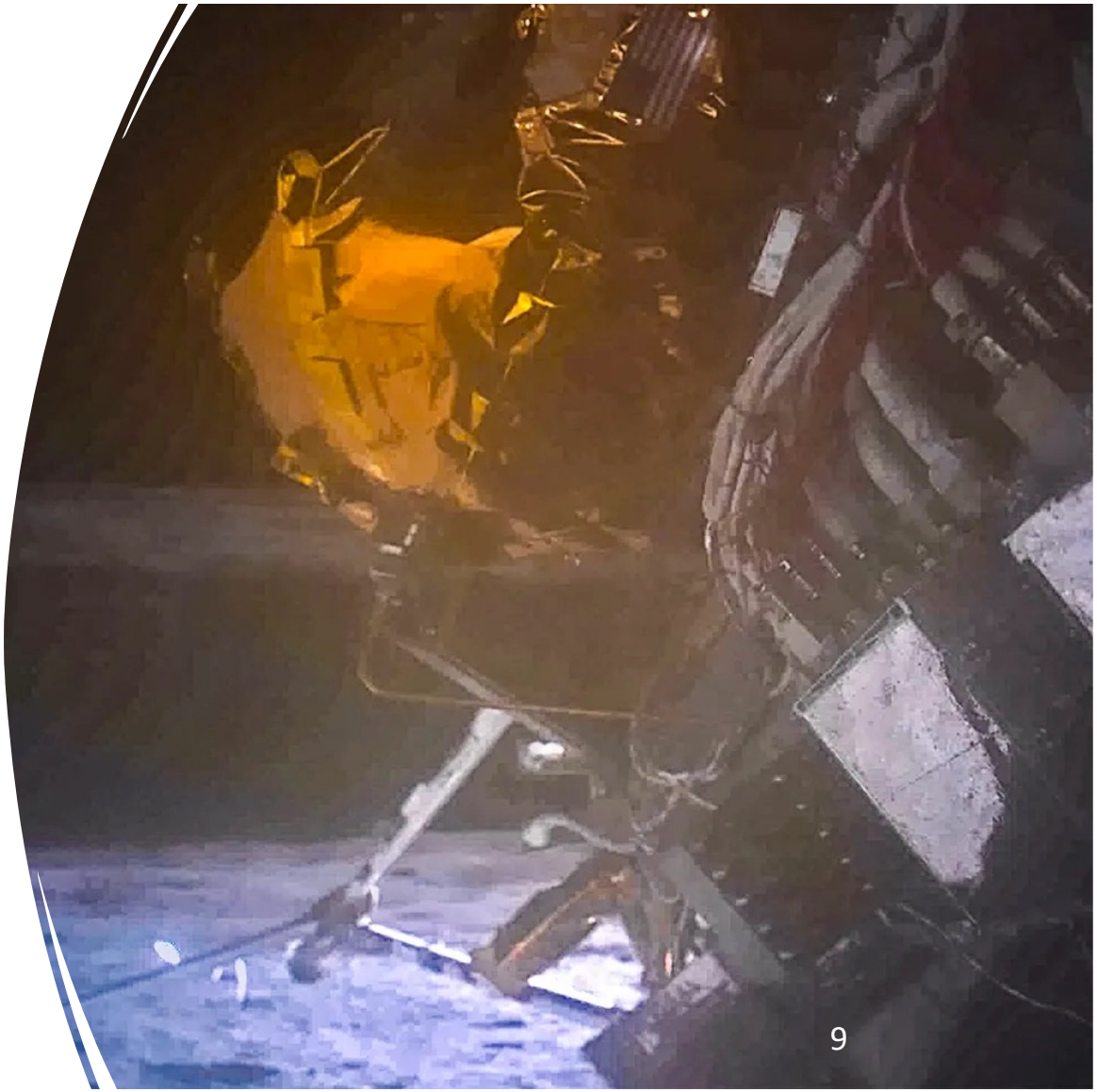
Cephalopods vs. *all* vertebrates

- color-blind
- but can restart development: re-generate eyes



Artificial Systems

- Problem also exists
  - https://www.bbc.com/news/science-environment-68425211
  - **[Odysseus]** had navigation issues whereby the onboard computer couldn't process precise laser range-finding data fast enough and had to rely solely on optical cameras for altitude and velocity information.
  - Result: broke a leg (30° ∠)



Merge

by the 3rd Factor
horrible combinatorics

- Operational Simplicity: Merge can't be free
  - No record of Merge is kept (Markovian)
    - "*a paper trail*" would be a memory device (Merge is memory-free)
    - *even Merge itself can't peek at prior Merges* (*never mind outsiders to Merge*)
  - also, Merge can't peek at relations computed at INT:
    - e.g. Labeling (for INT to decode structure, EXT),
    - FormCopy (affects EXT), *etc.*
  - **Oblivious Merge**:
    - Merge probing cannot refer to a Label (*maybe probing is done later*)

History = horrible combinatorics
Plus, too powerful, permitting island violations

Merge

- Can't tell if structure is built by IM or EM
  - because everything is an immutable set
  - No Tampering with Merge inputs or output
    (*Tampering compromises maximal simplicity*)
  - Note: feature valuation doesn't count as Tampering
  - No Deleting anything either …
  - P*hrases* have no room for extra baggage (memory)
  - e.g. Labels or IM/EM-feature (∴ Labels computed at INT/EXT)
- Duality would be nice, but cannot be detected (*or enforced*)
  - must be designed in?
  - ∴ irreducible
- Caveat: must distinguish output of FormSet (a set) from Merge (*also* a set) *as different conditions apply.*

Theta-aware Merge

- Chomsky (p.c.):
  - Well, there are no marking for IM vs. EM.
  - INT reads the computed structure and determines how to interpret identical inscriptions.
  - **That's true, but it doesn't mean that IM can't observe theta theory (and duality …), crashing and hence cancelling the preferred derivation.**
  - **Theta positions are detectable everywhere.**
- [T] **All relations and structure-building operations (SBO) are thought-related, with semantic properties interpreted at CI.** (Chomsky *MC*)
- Merge is θ-aware & θ-driven:
  - EM builds θ-configurations efficiently (*as quickly and simply as possible*)

Theta-aware Merge

- Efficiently as possible:
  - {XP, {v*, {R, XP}}} most efficiently built by IM, but must be blocked.
  - Banned by Duality
  - cannot dispense with Duality
  - External Merge (EM): select X, Y ∈ WS
  - *arguably* more efficient to select X twice
  - But we don't see {X, X} in language (*same* X)
  - Don't see Agree(X, X) either
  - Assumption: X and Y are distinct WS elements
  - Chomsky (p.c.): **one possibility might be Moro's analysis of copula, which derives "I am I/me" from {be, {I, I}}.**

Efficient Merge and Minimal Search

Efficiently as possible

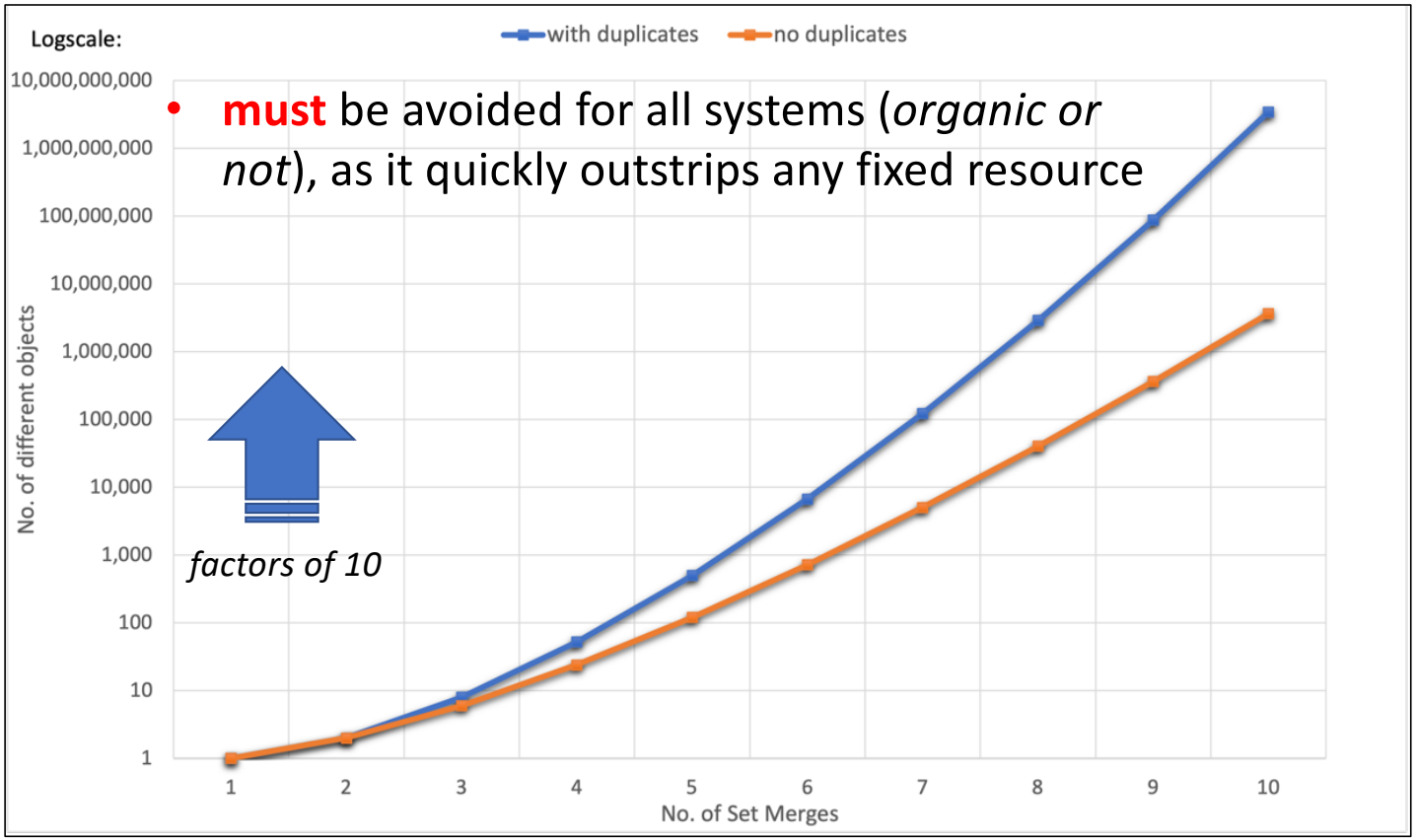
- External Merge (EM) (Chomsky p.c.):
  - **We assume that Merge like other operations observes it.**
  - **That's why only members of WS, not their terms, are eligible for EM.**

A Note on Combinatorics

- Operational Simplicity: Merge can't be freely applied
  - 3rd factor tied to biology: must be efficient
  - How many ways are there to freely Merge two heads *a* and *b*? (*without* Duality *etc.*)
- **Example**:
  - Initial WS: a b
  - 1 Merge (EM):
    - {a, b}
  - 2 Merges (IM):
    - {a, {a, b}} {b, {a, b}}
  - 3 Merges (IM):
    - {{a,b},{a,{a,b}}} {b,{a,{a,b}}} {a,{a,{a,b}}}
    - {{a,b},{b,{a,b}}} {b,{b,{a,b}}} {a,{b,{a,b}}}

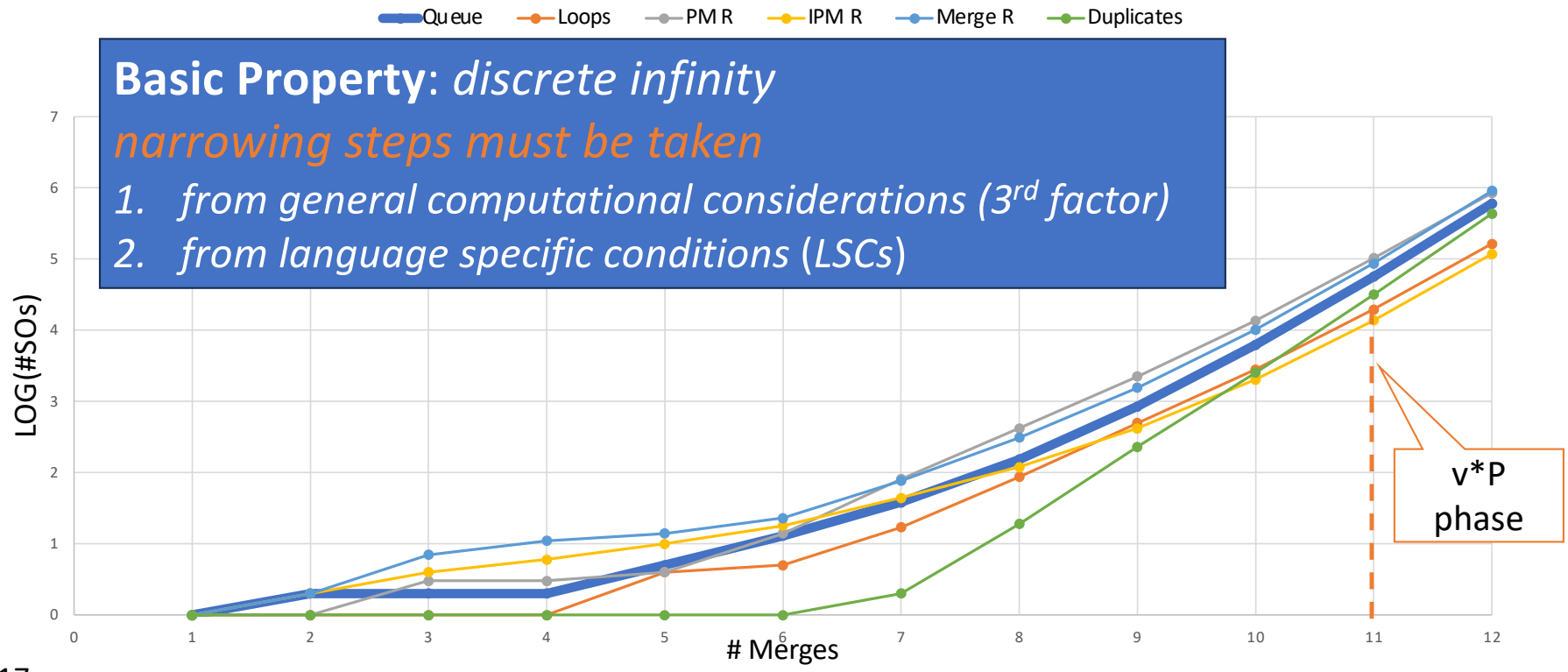
***Duplicate** should be listed twice*!
same structure derived in 2 ways:
{a_1, {a_2, b}}
1. {a_1, {a_1, {a_2, b}}}
2. {a_2, {a_1, {a_2, b}}}

A Note on Combinatorics



- **must** be avoided for all systems (*organic or not*), as it quickly outstrips any fixed resource

A Note on Combinatorics



A Note on Combinatorics

- Narrowing steps cannot involve *clever devices*:
  - example: filtering out duplicate structures
- Violates SMT: requires a memory device
  - *need to know whether we've seen something before* (***Dynamic Programming***)
- Language requires identical inscriptions (*that have to be repetitions*)
- Example (Chomsky):
  - *the man who saw many people didn't see many people*

A Note on Combinatorics

- **Example**:
  - *the man who saw many people didn't see many people*
- WS:
  - {*v**, {see, many people}}
  - {who man} INFL C_{rel} the INFL Neg C
- Construct a relative clause e.g. *following* Cecchetto & Donati (2015):
  - {the, {man, {who ~~man~~, {C_{rel}, {~~who man~~, {INFL, {~~who man~~, {*v**, {see, many people}}}}}}}}}
- **Now stuck!**
  - would need to invent a new operation to deep fish out {*v**, …} ***SMT**
  - or subvert the Markovian assumption by *reaching back into history of Merge*
  - violates **Duality**: *only EM can introduce a theta role-bearing item*

A Note on Combinatorics

- Narrowing steps cannot involve *clever devices*:
  - **Example:** Infinite Loop Filter:
    - *ππ, where π = (IM O_1, … , IM O_n), $n \geq 1$
    - (O_i = selected subterm; cross- π compare selected O_i)
- **Example**:
  - {a, b}
  - {a_1, {a_2, b}}
  - {a_1, {a_1, {a_2, b}}}
  - {a_1, {a_1, {a_1, {a_2, b}}}}
  - {a_1, {a_1, {a_1, {a_1, {a_2, b}}}}}

  and so on … without violating MS

A Note on Combinatorics

Infinite Loop strategy:

select *a* and *b* alternately

- **Example**:
  - `{a, b}`
  - `{b, {a, b}}`
  - `{a, {b, {a, b}}}`
  - `{b, {a, {b, {a, b}}}}`
  - `{a, {b, {a, {b, {a, b}}}}}`

  and so on …

A Note on Combinatorics

- Proposed filter
  - new device (*unless loop-free computation is in the evolutionary toolkit*) *SMT
  - can't rule all cases anyway (*see below*)
  - requires access to history of Merge (*violates* **Markovian assumption**)
- **Example**:
  - WS: a b
  - {a, b}
  - {b, {a, b}}
  - {{a, b}, {b, {a, b}}}
  - {{b, {a, b}}, {{a, b}, {b, {a, b}}}}
  - {{a, b}, {b, {a, b}}}, {{b, {a, b}}, {{a, b}, {b, {a, b}}}}}

  and so on …

IM selects the WS object from previous round

- compare to ordinals
- *successor*(x) = x U {x}

Use of Set Theory

- Limited use of set theory for representation:
  - no {} (*a true null*)
  - no infinite sets (*sets are finite, but an infinite number of them*)
  - no union, intersection, difference, powerset operations
    - e.g. `{a, b} ∪ {b, c} ⇨ {a, c}`
  - no equality (mathematics: *equals means same*)
  - not a set, perhaps a multi-set (repetitions) (*also the WS isn't a set*)
  - naïve set theory paradoxes seem not to apply
    - {*x*: P(*x*)}, P some property
    - Russell's Paradox: suppose P(*x*) is $x \notin x$
    - *Barber Paradox*: *how does the barber shave* (*himself*)?

Use of Set Theory

Axiomatic Set Theory

- e.g. Zermelo-Fraenkel (ZF) Set Theory
  - axioms expressed in 1st order logic + ∈ (*set membership*)
  - **Axiom of Extension**: same set if same members
    - $x \in y$ iff $x \in z$ implies $y = z$ for all x
    - doesn't hold for language
    - we have "occurrences", possibly repetitions/copies

Use of Set Theory

UG: sub-phrases are **unordered**

- Set theory allows for the construction of **ordered** elements too
- Define *x* < *y* iff *x* ∈ *y*
- **Example**:
  - a < b, a sequence <a, b> = {a, {a, b}} (IM)
  - a < b < c, <a, b, c> = {a, {a, {b, {b, c}}}} (IM)
- **Example**:
  - ordinals {}, {{}}, {{}, {{}}}, *and so on …*
  - generally, *successor*(x) = x ∪ {x} (*John von Neumann*)
  - succ({}) = {} ∪ {{}}
  - succ({{}}) = {{}} ∪ {{{}}}
  - but language doesn't count! (cf. *artificial language: e.g. nth last word signals an interrogative*)

Use of Set Theory

- **Question:**
  - does anything block the formation of ordered elements in this model?
- **Note 1**:
  - ordinal operation `x ∪ {x}` *not formulable* under **Simplest Merge** (*binary*)
  - e.g. {∅, {∅}, {∅, {∅}}, {∅, {∅}, {∅, {∅}}}} cannot be constructed (∅ = {})
  - the above expression maps to 4 in $\mathbb{N}$.

  Why?
  - ∅ = 0
  - {∅} = 1
  - {∅, {∅}} = 2
  - {∅, {∅}, {∅, {∅}}} = 3

Use of Set Theory

- **Note 2**:
  - the sequence <a, b, c> is represented by the set {a, {a, {b, {b, c}}}}

  1) this set can be formed by iterated External Merge (EM) from WS:

     a a b b c

     b c $\Rightarrow_{EM}$ {b, c} $\Rightarrow_{EM}$ {b, {b, c}} $\Rightarrow_{EM}$ {a, {b, {b, c}}} $\Rightarrow_{EM}$ {a, {a, {b, {b, c}}}}

  2) this set **can also** be formed from a minimal WS:

     a b c

     b c $\Rightarrow_{EM}$ {b, c} $\Rightarrow_{IM}$ {b, {b, c}} $\Rightarrow_{EM}$ {a, {b, {b, c}}} $\Rightarrow_{IM}$ {a, {a, {b, {b, c}}}}

  - do these violate SMT?
  - I-language builds thought objects only.
    - *Θ-configurations + other projections*

Merge and FormSet

- Example:

1) (a) {like, Mary} predicative/substantive
   (b) {narrow, hallway} EM: predicate-argument (AP)
   (c) {long, hallway} *suppose each also in WS*
   (d) {dark, hallway}

- FormSet ({…}, n≥2) (Chomsky *GK*):

2) {{long, hallway}, {narrow, hallway}, {dark, hallway}}

- Need a nominal to head the NP:

3) {hallway, {{long, ~~hallway~~}, {narrow, ~~hallway~~}, {dark, ~~hallway~~}}}
4) *a long, narrow, (and) dark hallway* (*det PM* (Oishi, 2015))

The Determiner

- Chomsky (p.c.):
  - **Is this External Merge?**
  - **We're just ignoring functional elements, stick them in wherever you want.**
  - **And, of course, you know there's lots of things to say about them, so why does the definite article appear before the noun?**
  - **In fact, does the definite article even apply to the noun?**
  - **Maybe the definite article's a feature of the noun phrase.**
  - **Like in Semitic, for example, it's just distributed among the elements of the noun phrase.**
- Hebrew:

  5) *ha-yeled ha-ze*
     'this child'

  - Language-particular: attributive adjectives must agree in definiteness; and predicative adjectives are indicated syntactically, by the lack of an article in conjunction with a definite noun.

Concord and Agreement

- Adjectival Phrase:
  - {A, $N_{\phi.DEF}$}
- At EXT, there are options. Assume sisterhood between A and N.

1. {A, $N_{\phi.DEF}$} N features expressed on A also (Concord)
   - Example: Arabic
   - *al*-rajul-u *al*-saʕid-u
   - DEF-man-NOM.SG.M DEF-happy-NOM.SG.M
   - 'the happy man'

2. *DEF*$_{\phi}$ $N_{\phi.DEF}$ N feature DEF (definite) spells out as a word.
   - Example: Hebrew
     - *ha-yeled* *ha-ze*
     - DEF-child.$\phi_{SG.M}$ this.$\phi_{SG.M}$
     - 'this child'

FormSet

- Assume FormSet is generally available to computation
  - cognition beyond I-Language
  - Note: n = 2 not same as binary Merge due to different conditions
  - Note: n = 1? logical possibility unavailable to binary Merge, arithmetic!
- Simplicity:
  - members must be a coherent of set of syntactic objects (Chomsky)
  - **simplest formulation**: *all members must be treated the same*
  - members must obey some parallelism requirement for INT (and Merge)
    - find example of parallelism, might be FormSet!
- Example

  6) (a) {{long, hallway}, {narrow, hallway}, {dark, hallway}}
  (b) {hallway, {{long, ~~hallway~~}, {narrow, ~~hallway~~}, {dark, ~~hallway~~}}}
  - operate in unison: IM one, same Merge ATB similarly

FormSet

- Case n = 1
  - a logical possibility unavailable to binary Merge
  - WS: x
  - {x}
  - {{x}}
  - {{{x}}}

    and so on
  - generally, *successor*(x) = {x}

FormSet

- Chomsky GK (pg. 31):
  - unbounded unstructured sequences (UUS's)

  7) *John, Bill, my friends, the actor who won the Oscar, ... ran, danced, took a vacation* (*respectively*)

- FormSet ({…}):

  8) (a) S_1 = {John, Bill, my friends, the actor who won the Oscar}

     (b) S_2 = {ran, danced, took a vacation}

  - Members of S_1: referential similarity (but not NUM)
  - Members of S_2: predicatehood
  - S_1 and S_2 can have distinct cardinality (Chomsky *GK* fn. 47)

UUS: Relative clause stacking

Example:

9) *the student who lives here who studies English whom I know*

FormSet applies to:

10) (a) {student, {who {~~student~~, {lives here}}}}

(b) {student, {who, {~~student~~, {studies English}}}}

(c) {student, {who, {I, {know, ~~student~~}}}}

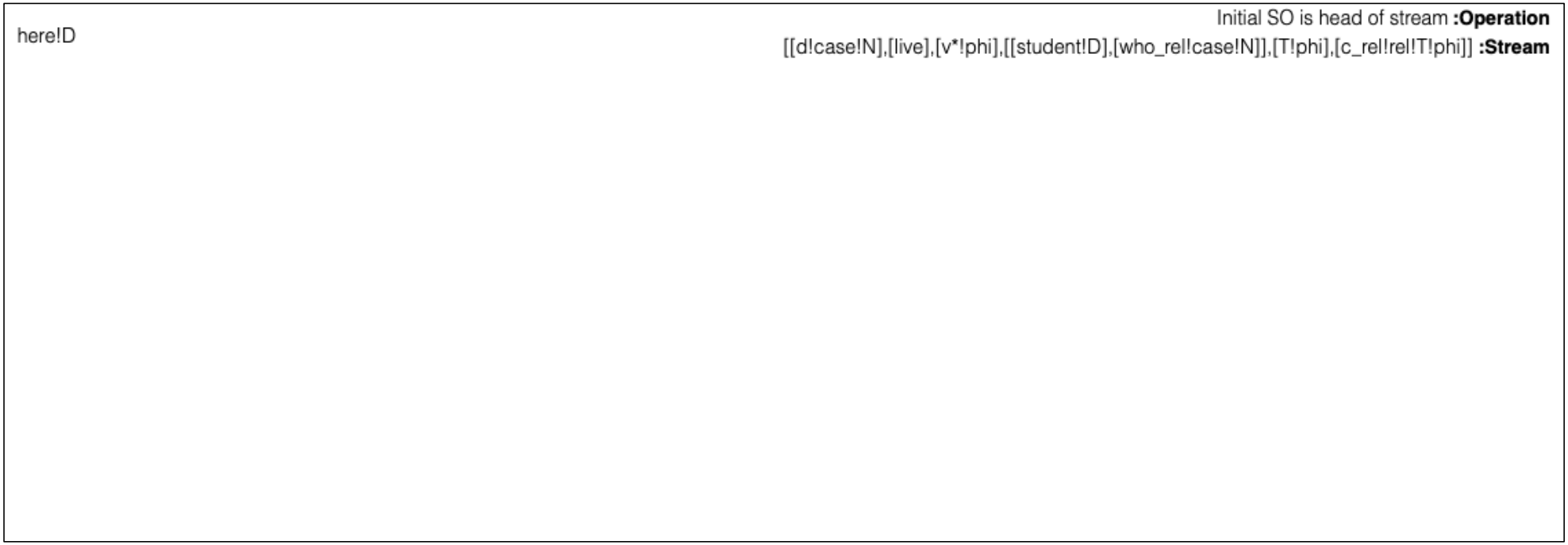
- relative CPs need not be identical (Williams, 1978)

Optionally spelling out as:

11) *the student who lives here, who studies English and whom I know*

UUS: Relative clause stacking

[animation not visible in PDF version]

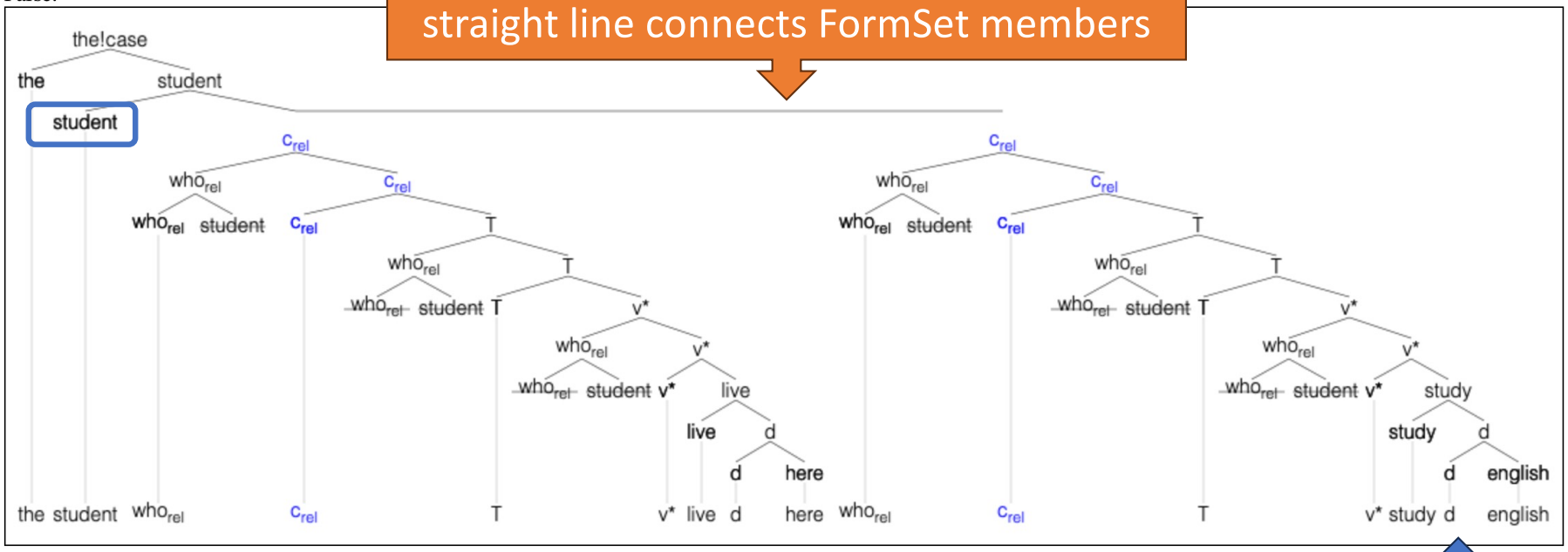


UUS: Relative clause stacking

- note 62: Fong & Ginsburg. Open Linguistics, vol. 9, no. 1, 2023.

Parse:

straight line connects FormSet members



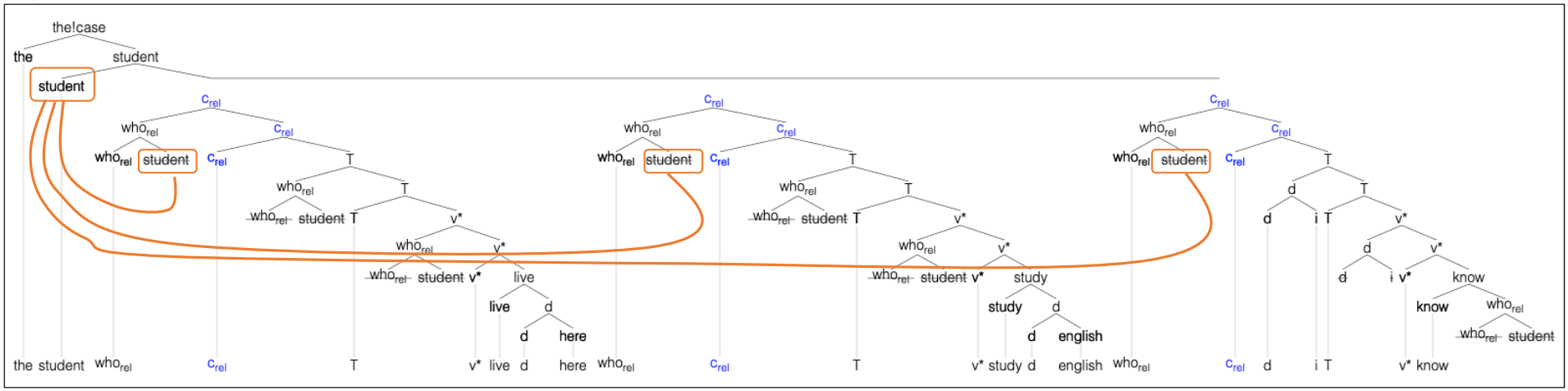
Spell-out:
the student who -s live -acc here who -s study -acc English (after morpheme realization)
the student who live -s here -acc who study -s English -acc (after affix-hop)
the student who live -s here -acc who study -s English -acc (after morpheme realization, stage 2)
the student who lives here who studies English

old implementation
DP

UUS: Relative clause stacking

the student who lives here who studies English whom I know

Parse:

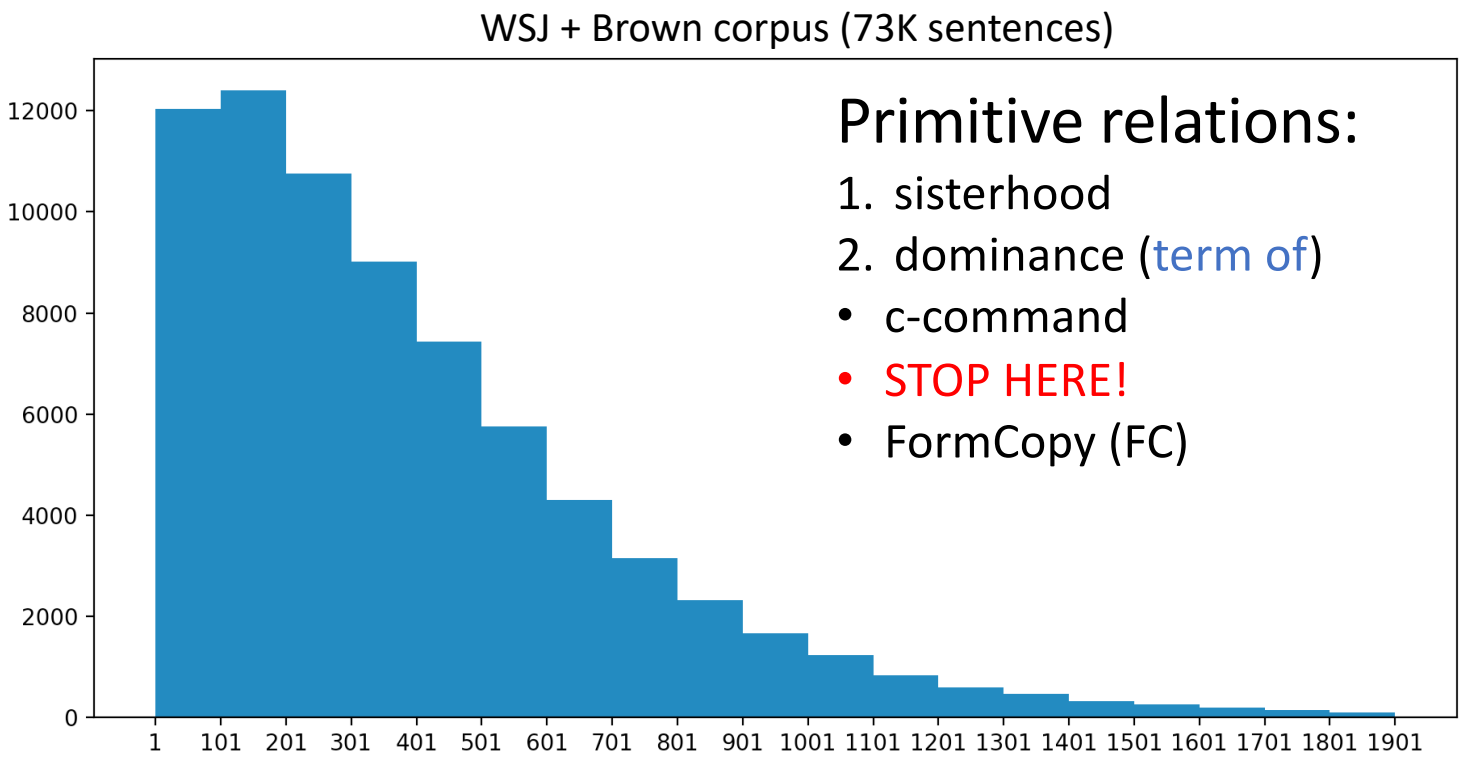


Spell-out:
the student who -s live -acc here who -s study -acc E
the student who live -s here -acc who study -s Englis
the student who live -s here -acc who study -s Englis
the student who lives here who studies English whom

One derivation found.

Irrelevant: implementation details: could be Box Theory
Important: Parallelism (*members of a set treated uniformly*)

Aside: are relations really computed?



UUS: Relative clause stacking

- Relative clause stacking parallel to PP stacking (Chomsky GK):

  12) (a) *John lived on a farm with his family*

  (b) *John lived on a farm and with his family*

- IM in unison, targets subject/object:

  13) (a) *Which book did John buy and read*?

  (b) which book did John buy ~~which book~~ and read ~~which book~~

  (c) {{John, {v*, {buy, which book}}}, {John, {v*, {read, which book}}}}

  14) (a) *John arrived and met Bill*

  (b) {{v, {arrive, John}, {John, {v*, {meet, Bill}}}}

Output of FormSet and the target of IM

- Identical inscription target requirement (Williams 1978):

  15) (a) *Who *and* when did John see and ignore him?

  (b) {{John, {v*, {see, who}}}, {{John, {v*, {ignore, him}}}, when}}

- FormSet :

  16) (a) *When and where did you see her*?

  (b) {C_Q, {you, {INFL, {{~~you~~, {v*, {see, her}}}, {when, where}}}}}

Adjectival and Predicative Noun Phrases

Example:

17) (a) *the politician is greedy and a charlatan*
(b) {politician, {be, {{greedy, ~~politician~~}, {charlatan, ~~politician~~}}}}

Similarly:

18) (a) {hallway, {{long, ~~hallway~~}, {narrow, ~~hallway~~}, {dark, ~~hallway~~}}}
(b) *the hallway is long, narrow and dark*
(c) *the long, dark and narrow hallway*

- (Di Scuillo 2022) complex cardinals

19) (a) *two hundred and two* (additive complex)
(b) {two hundred, two}

FormSet: Agree

- Given the NTC, how does S-V Agreement or Case assignment work?
- phrases don't have features: (Minimal) Search (must) find heads only
- a big question: do these things happen in Merge Syntax or at the interface?
- Examples:

20) a. *John, Bill, and the actor who won the Oscar are taking a vacation*
b. S = {John, Bill, the actor who won the Oscar}

- NUM PL can't be found in set S

21) (a) *John believes* { you and me / me and you / ? I and you / you and I } *are going to the movies*

(b) {you, I}

- NUM PL intrinsic property of {...}
- Possessives: *yours and mine / mine and yours*
- Case is not relevant for Raising to Object?

FormSet: Agree

- Apparent D-N Agreement:

22) (a) *this/*these man and woman* {man, woman}

(b) **this/these men and women* {men, women}

(c) **this/*these man and women* {man, women}

(d) **this/*these women and man*

(e) *this man and these women* {this man, these women}

- Agree **must** operate in unison across FormSet members
- EXT problem

Noun Phrase Formation

Recap:

23) (a) {dark, hallway} EM: predicative-substantive
(b) {{dark, ~~hallway~~}, hallway} Nominal head needed
(c) *a* {{dark, ~~hallway~~}, hallway} Det

Unaccusative:

24) (a) {arrive, train} EM: predicative-substantive
(b) {{arrive, ~~train~~}, train} Nominal head needed

- {arrive, ~~train~~} must be EXT as an adjectival

(c) *the arrived train / the train arrived*

- (Radford 2009)

25) (a) *the recently arrived train is the delayed 8:28 for London Euston*
(b) *the train arrived* (*at platform 4*) *is the delayed 8:28 for London Euston*

- (*Quirk et al.* 1972):

26) (a) *the visible stars / the stars visible* (INT: "individual"/stage level predicate)
(b) *the navigable river / the only river navigable during a drought*

Noun Phrase Formation

- Causative/inchoative verb *change:*

26) (a) {change, man}
(b) {prt, {change, man}}
(c) {{prt, {change, ~~man~~}}, man}

EM: predicate-argument
prt: passive particle (*DbyP-style*)
Nominal head needed

- EXT prt-*change*-~~man~~ as *changed*

(d) *A changed man*
(e) *A broken man*

Noun Phrase Formation

Radford (2009): doesn't apply to transitives and unergatives:

27) (a) *The man *committed* suicide was a neighbour of mine

(b) *The thief *stolen* the jewels was never captured

(c) *The man *overdosed* was Joe Doe

(d) *The *yawned* student eventually fell asleep in class

Transitive predicate *steal:*

28) (a) {thief, {v*, {steal, the jewels}}} predicate-arguments

(b) {{~~thief~~, {v*, {steal, the jewels}}}, thief} Nominal head needed

- perfectly fine thought, can't EXT *v*-steal-the-jewels* adjectivally

(c) **The thief stolen the jewels* (*cf. the thief-stolen jewels*)

Secondary Predication and FormSet

Both okay in English:

29) (a) *paint green the red wall* (resultative)
(b) *paint the red wall green*

- A puzzle for FormSet:

30) (a) {red, wall} predicate-argument
(b) {green, wall}
(c) {{red, ~~wall~~}, wall}} Nominal head needed
(d) {paint, *the* {{red, ~~wall~~}, wall}}}
(e) {Peter, {v*, {paint, *the* {{red, ~~wall~~}, wall}}}}
(f) {{Peter, {v*, {paint, *the* {{red, ~~wall~~}, wall}}}}, {green, wall}}

- But:

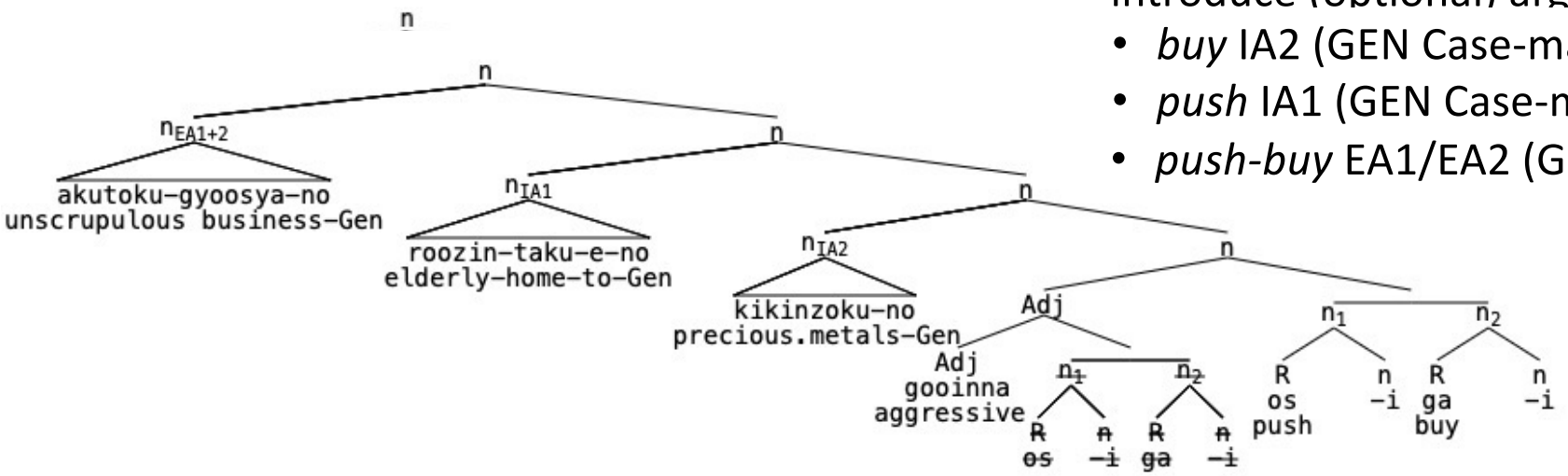
(g) {paint, {green, {the, {{~~red~~, wall}, wall}}}} (**compound predicate** *paint green*)
(h) paint {{{red, ~~wall~~}, {green, ~~wall~~}}, wall} (*paint the red and green wall*)

Serial Verbs and Deverbal Noun Compounds

- Evidence for FormSet from Japanese predicates?
- Serial Verbs:
  - **binary**: *home-tataeru* (admire-praise)
  - **ternary**: *oti-tuki-harau* (fall-attach-brush.off)
    '*completely stay calm*'
- Deverbal noun compounds:
  - **binary**: *tumami-gui* (pinch-eating)
    '*eat with your fingers/to snack/go through partners one after another*'
  - **ternary**: *naki-ne-iri* (crying-sleeping-entering)
    '*refrain from complaining/put up with something without complaining*'
- Note:
  - argument sharing (*need not be complete*) between individual predicates required
  - Valency Reduction compound predicate

Serial Verbs and Deverbal Noun Compounds

- **Example** [animated slide]:



- form an AP (θ-config.)
- NP must be headed by a nominal
- introduce (optional) arguments
  - *buy* IA2 (GEN Case-marked)
  - *push* IA1 (GEN Case-marked)
  - *push-buy* EA1/EA2 (GEN Case-marked)

Aggressive buying of pricey items from the elderly by unscrupulous businesses

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