Starr: a preference semantics for imperatives

Figure 1: William Starr

Plan

- Starr 2020 [2010]
- Tracking information flow
- Trivalent accounts of presupposition projection
  - gathering momentum, some reservations
  - [using union types to model failure]

Starr's program

- Representational theories vs. expressive theories
  - Prominent representational theory: Magda Kaufmann 2011
    - imperatives denote modal propositions
    1. Dance!
    2. You must dance.
    - Robust theory
- Starr goes for a non-representational theory
- "Imperatives are motivational, and plausible abstract models of motivational mental states have very different features from those for representational states."
- "I will argue that the only way for the non-representationalist to meet these **three challenges** is to adopt a dynamic semantics."
- Larger picture: focussing on the dynamic effect of an utterance rather than on its content allows a way of understanding how expressions with different forces interact.

Basic analysis (provided by Starr)

i. Imperatives introduce preferences between alternatives
ii. Declaratives provide information
iii. Conjunction sequences the effects of its conjuncts
iv. Disjunctions create competing 'substates' for each disjunct where that disjunct has had its standard effect

Starr's first challenge: imperatives under connectives

(1) Fly to Harare and I'll meet you there.

(2) Piss off a Texan and you'll be sorry.

(3) Make tortillas and you'll need flour.

(4) Move to Portland or you'll never relive the 90s.

(5) I'll make the chile and you make the tortillas!

(6)
   a. #{So/But} don't make tortillas
   b. #{So/But} I won't make the chile

Speakers remain committed to both the declarative content and the imperative content in (5)

(Starr sets aside hypothetical examples like *Make tortillas and Mom will complain*)

17. Put back *Waverly* or I'll put back *Naked Lunch*.

(Skipping discussions of Portner and N. Charlow)

Starr's second challenge: imperative felicity depends on local information

- An imperative is only felicitous in a context in which it has not been fulfilled

22. #The door is open. Open the door!

- "the felicity of imperatives depends on the mutual information that precedes their utterance."

23. [Asher and Lascarides 2003, not in Starr]
    a. Go to the end of the block.
    b. There will be a large sign there.

The local context wrt the truth of the declarative is evaluated contains the information implicit in the situation in which the imperative has been fulfilled.

Starr's third challenge (Ross' Paradox):

28. a. Post the letter!
    b. Post the letter or burn the letter!

29. a. You posted the letter.
    b. You posted the letter or you burnt the letter.

- Starr's challenge: find a unitary meaning for *or* that validates the inference in (29) but not the one in (28).

The problem for other non-representationalist theories

- *Representationalists* have no problem!
  - Kaufmann reduces imperatives to assertions. No problem coordinating.
- Portner argues that imperatives denote properties
  - They get added to a To-do list
  - Responsible agents bring it about that the properties on their To-do list apply to themselves
  - Starr shows that it is difficult to construct a theory that allows declaratives and imperatives to coordinate in embedded contexts
- Likewise for N. Charlow, etc.

Starr's analysis

- Meanings "are identified with the characteristic way in which they change language users' mental states."
- "Imperatives promote alternatives."
- In particular, *Dance, Frank!* ranks Frank's dancing over Frank's not dancing.
- A preference relation is a set of pairs of propositions in which the first element of each pair is prefered over its corresponding second element.
- The update effect of an imperative !A is to update the preference relation $\{\langle p_1, p_2\rangle, ..., \langle p_n, p_m\rangle\}$ into $\{\langle p_1, p_2\rangle, ..., \langle p_n, p_m\rangle, \langle a, \bar{a}\rangle\}$

Sketch of the formal details

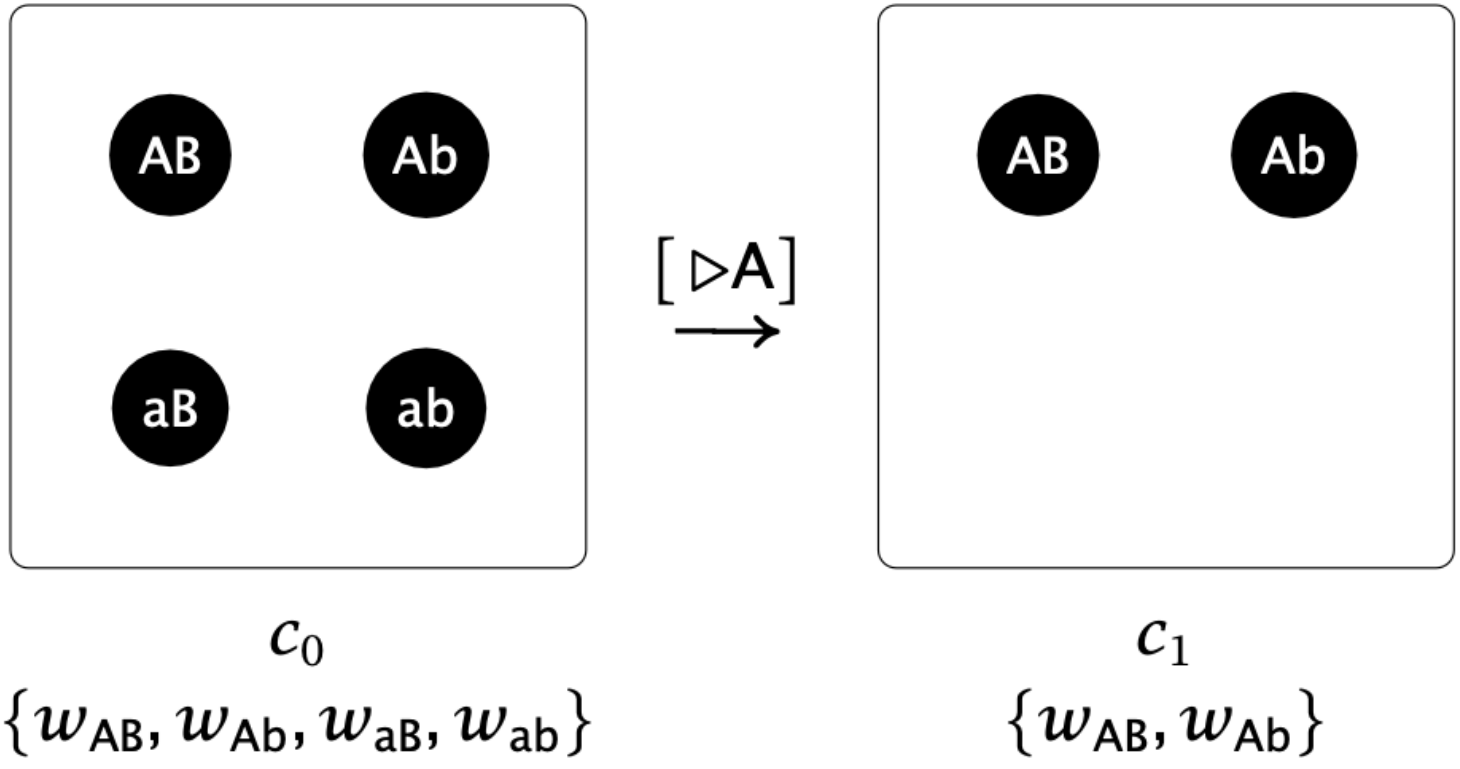
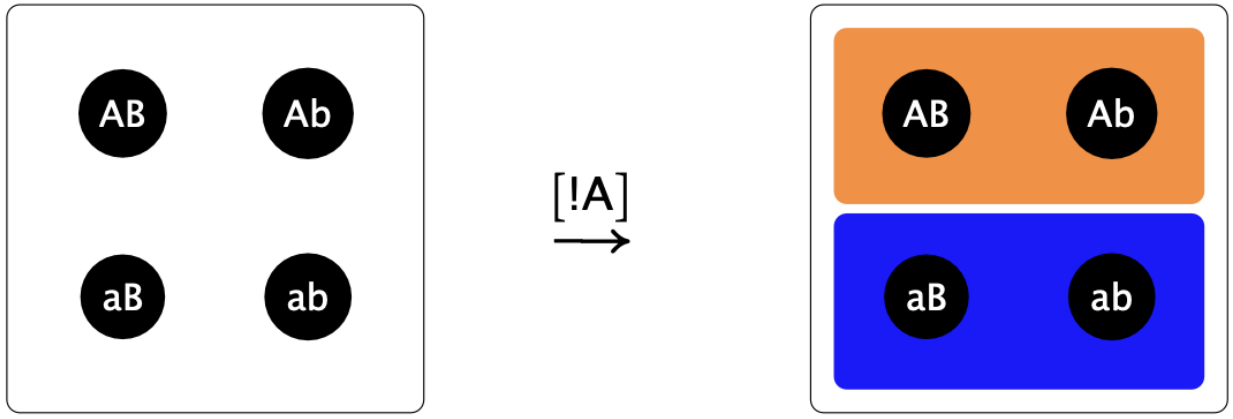


Figure 2: Declarative update

Imperative update



r_0

$\{\langle\{w_{AB}, w_{Ab}, w_{aB}, w_{ab}\}, \varnothing\rangle\}$

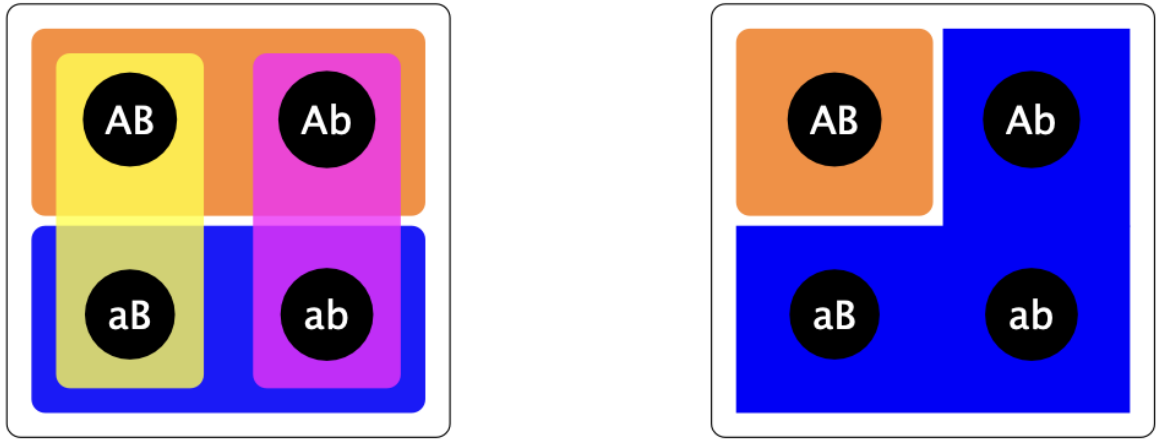
r_1

$\{\langle\{w_{AB}, w_{Ab}\}, \{w_{aB}, w_{ab}\}\rangle,$
$\langle\{w_{AB}, w_{Ab}, w_{aB}, w_{ab}\}, \varnothing\rangle\}$

Figure 2 Imperative Update, Warm Colors as Preferred Alternative

Figure 3: Imperative update

Conjunction of imperatives



$r_0[!A \wedge !B]$ $r_0[!(A \wedge B)]$

Figure 5 Conjoined Imperatives and Imperative Conjunctions

Figure 4: Conjoined imperatives

Conjunction of declarative and imperative

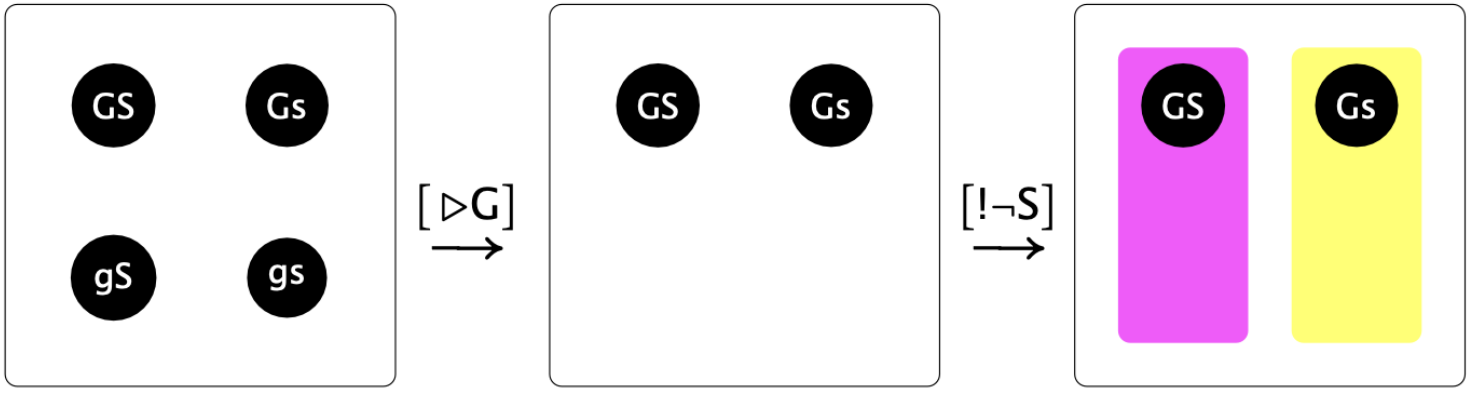


Figure 6 $r[\triangleright G \wedge !\neg S] = (r[\triangleright G])[!\neg S]$

Figure 5: Declarative conjoined with imperative

- Should be symmetric. . .

Disjunction of imperatives

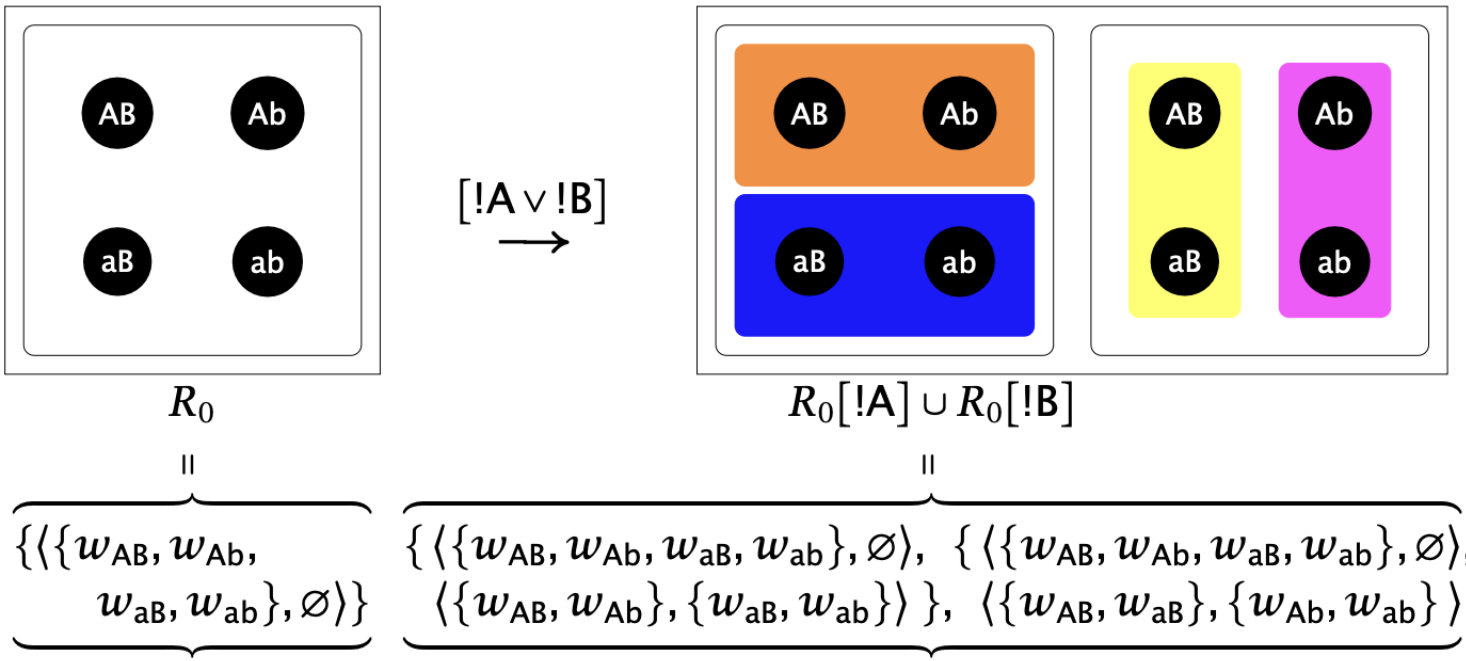


Figure 7 Updating with $!A \vee !B$

Figure 6: Disjunction of imperatives

You put back *Waverly*, or I'll put back *Naked Lunch*

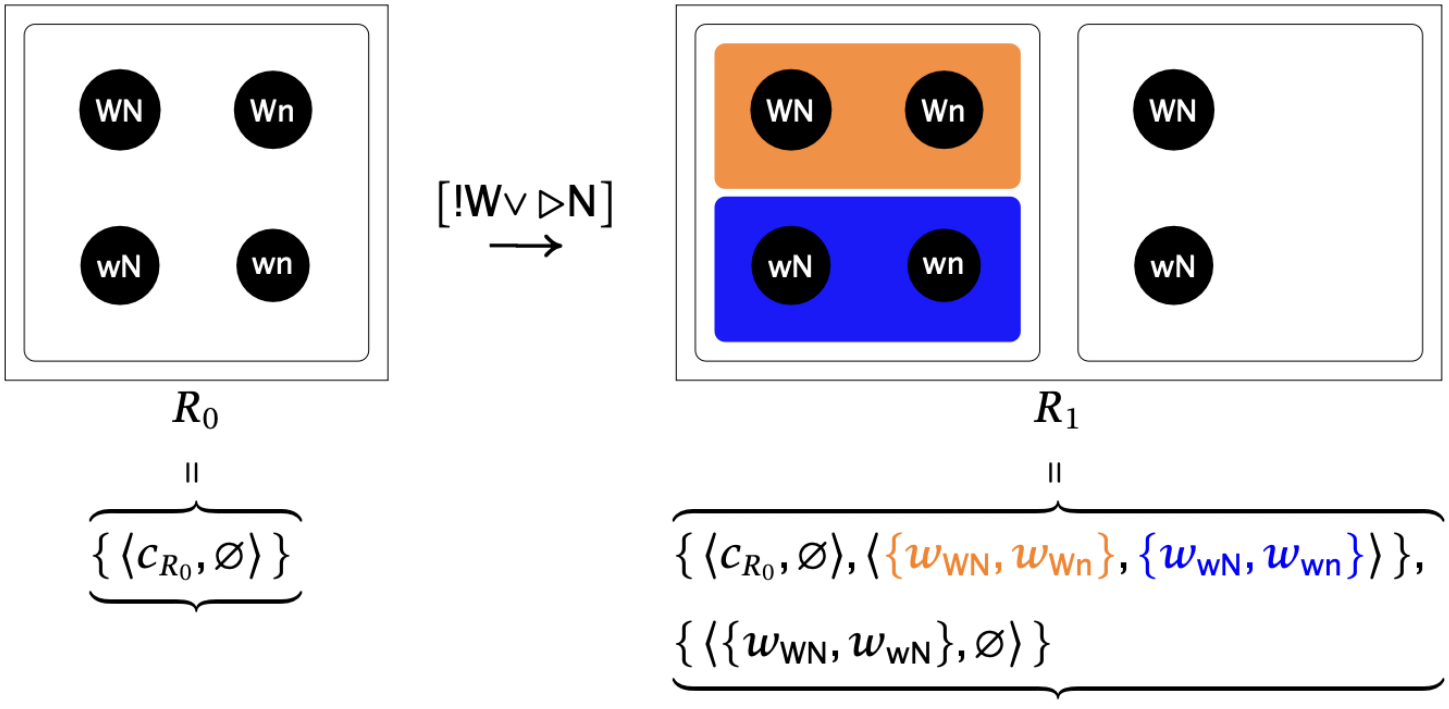


Figure 9 Updating with $!W \vee \triangleright N$

Figure 7: You put back *Waverly*, or I'll put back *Naked Lunch*

Ross' Paradox

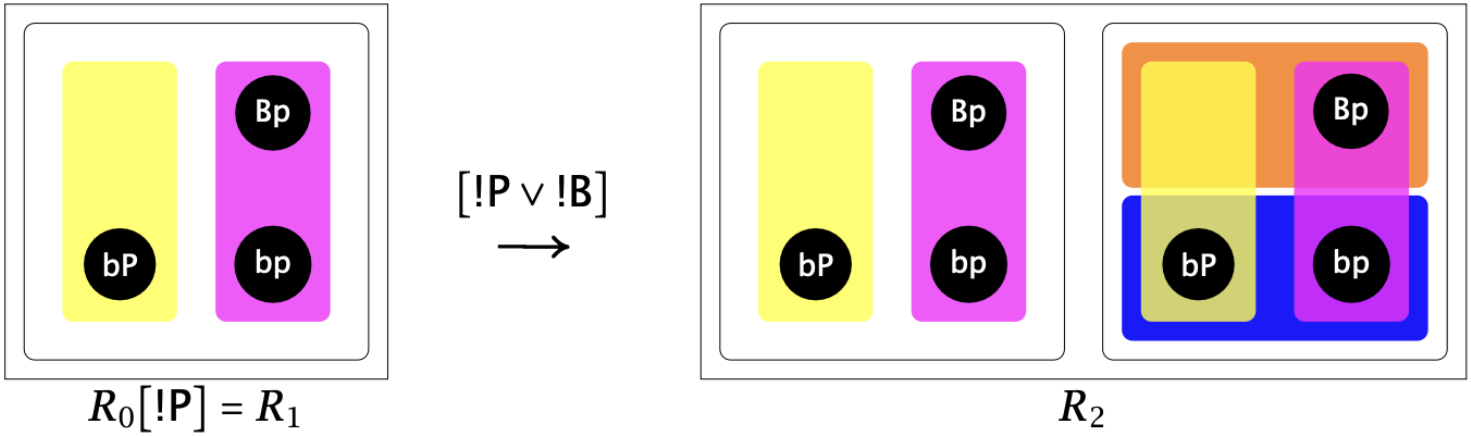


Figure 12 Disjunction Introduction is not a Preferential Consequence

Figure 8: Post the letter or burn the letter

Contingent disjunctions

What about contingent commands (Kamp 1978, Kaufmann)?

1. Bring a pencil or bring a pen, whichever Sue says she needs.
2. Bring a pencil or bring a pen, whichever you prefer.

Anna Alsop: "It's clear that the speaker is not truly indifferent between the two preference relations; there's some kind of meta contingency that dictates which preference relation reflects the speaker's true intent." How would Starr deal with these?

Compare:

3. Bring a pencil or a pen.

Does Starr make embedding imperatives *too* easy? (Zhuoye Zhao)

- Mixed-force conjunction may have a wider distribution than mixed-force disjunction

1. a. He went home, and don't try to call him! [Starr]
   b. ??He went home, or don't try to call him.

- "Imp *or* Dec" may sometimes be possible, but not "Dec *or* Imp"

2. a. Move to Portland or you'll never relive the 90s. [Starr]
   b. ??You'll never relieve the 90s or move to Portland!

Trying mixed-force disjunction in Mandarin

- *huozhe* 'or' can disjoin either declaratives or imperatives:

3. Luxun tou-le yi-ge gua huozhe Runtu tou-le yi-ge gua. (W
   Luxun steal-le one-CL melon or Runtu steal-le one-CL me
   'Luxun stole a melon or Runtu stole a melon. (I don't kn

4. na yi-ge pingguo huozhe na yi-ge xiangjiao.
   take one-CL apple or take one-CL banana.
   'Take an apple or take a banana.'

But it's no good for mixed disjunction—unless the subject is overt:

5. #Ba Waverly fang huiqu huozhe wo ba Naked Lunch fang hui
    Ba Waverly put back, or I ba Naked Lunch put back.
    Intended: 'put back Waverly, or I'll put back Naked Lun

6. ni ba Waverly fang huiqu huozhe wo ba Naked Lunch fang h
   you Ba Waverly put back or I ba Naked Lunch put back. I
   'you put back Waverly or I put back Naked Lunch. I'm ok

The role of dynamic update in Starr's theory

- denotations are explicitly intended to model attitudes
- the dynamics track how sequences of imperatives require attitudes to change
- a dynamic account handles embedding and coordidation
- how do we know for sure that a static (non-representationalist) theory couldn't work?

Categorizing dynamic theories

Categorizing dynamic theories by the type of their evaluation coordinates

- World, assignment function, set of worlds, pairs of assignment functions...

Purely strictly compositional system: no coordinates

1. Arithmetic: $[\![(3+4)-2=7]\!]$
   - clear notion of content: integers and truth values
   - clear notion of computation: replacing an operator with its value
   - no coordinates: content is not relative to worlds or assignments
2. If division is allowed, need to allow for presupposition failure
   - $[\![3/0]\!] = \#_{\mathsf{Int}}$ (failure of reference)
   - $[\![2=3/0]\!] = \#_{\mathsf{Bool}}$ (failure of reference inherited by sentence)

Propositional Logic: coord: static interpretation function $\mathcal{I}$

- content: truth value
- $\mathcal{I}$ gives values to propositional symbols p, q, etc.
- $\mathcal{I}$ never manipulated by object language operator
- pure cascade model of information flow

$$[\![(p \wedge q) \vee r]\!]^{\mathcal{I}}$$

- Now value depends on context

Predicate calculus: modifiable assignment function

- content: individuals, truth values
- content computed relative to an assignment function: $[\![x \wedge y]\!]^g$
- assignment fn can be controlled by object lg operator:

$$[\![\exists x.\phi]\!]^g = \text{ True iff there is some } u \in D : [\![\phi]\!]^{g[x \mapsto u]}$$

- cascade model of information flow, except operators can modulate the context with respect to which their arguments get evaluated

Standard static intensional semantics for natural language

- content: individuals and truth values
- world coordinate: cascade, but modifiable:

$$[\![\text{thinks (Ann left)}]\!]^{g,w} = \lambda x.\forall w' \in \textsc{dox}_x : [\![\text{Ann left}]\!]^{g,w'}$$

Assignment fns can eliminated by going "variable-free"

1. Lambda calculus: $[\![((\lambda x(xx))(\lambda yy))]\!]$
   - clear notion of content: lambda term
   - clear notion of computation: beta reduction
   - natural to compute values relative to an assignment fn, i.e.:

$$[\![((\lambda x(xx))(\lambda yy))]\!]^g = [\![xx]\!]^{g[x \mapsto \lambda yy]}$$

2. Combinatory Logic: $[\![I(SKI)]\!]$
   - clear notion of content: CL term
   - clear notion of computation: SKI reduction (no alpha vars!)
   - reduction not relative to any coordinates (so no assignment fns)
   - provably equivalent to the lambda calculus in expressive power

Moral: don't count on the presence of a coordinate to reveal something deep about the nature of the problem domain

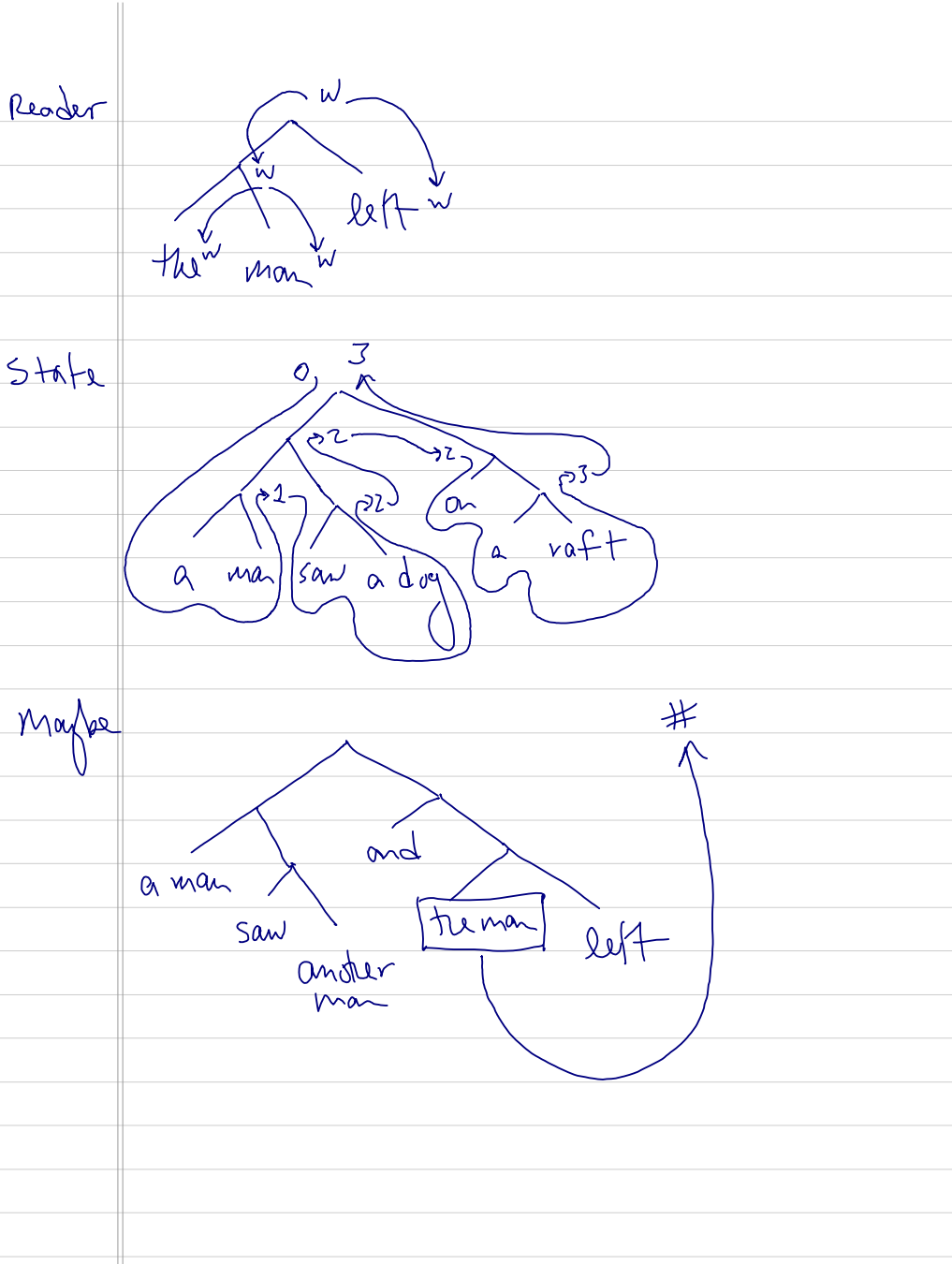
DPL: pair of assignment fns

- Refactor relation over assignments into a fn from a pair of assignments to ordinary content
- content now is individuals and truth values

$$[\![\phi \wedge \psi]\!]^{g,h} = \exists k : [\![\phi]\!]^{g,k} \text{ and } [\![\psi]\!]^{k,h}$$

- Information flow is no longer a cascade: information travels from left assignment into right assignment
- Rough diagnostic: if evaluation relates two coordinates of the same type, it's likely you have non-local information flow

Reminder of information flow



Rethinking information flow in Heim 1983

- Officially, content is a CCP: $(([e], s) \to t) \to ([e], s) \to t$
- But the full set of worlds is only ever used to determine if an indefinite index is suitable
- We can achieve the desired effect by tracking the least unused variable index
- Use integers as indices (inspired by Dekker's work)

$$[\![(\mathrm{a}^i \text{ man}) \text{ left}]\!]^{g,w,i,j} = g(i) \in \textbf{left}(w) \wedge j = i + 1$$

- Each use of an indefinite increments the least unused index
- Now content is individuals and truth values
- Information flow is a modifiable cascade for g and w, and a left to right flow connecting input i with output j
- Requires making sure that initial context maps each index to the full range of individuals
- Is the number of indefinites in an expression a syntactic or a semantic property?
- This leaves out presupposition failure; see discussion of trivalence below

GSV

- epistemic *might* requires access to the entire context set
- so denotations are relations over context sets
- a context c is a set of world-assignment pairs

$$[\![\phi \wedge \psi]\!]^{c_1,c_3} = \exists c_2 : [\![\phi]\!]^{c_1,c_2} \text{ and } [\![\psi]\!]^{c_2,c_3}$$

- So information flow is left to right

Murray, ABH

- expressions are evaluated wrt a sequence of individuals, worlds, and sets of worlds
- evaluation updates the context sequence
- picture like GSV above, but with heterogeneous sequences instead of context sets
- so information flow is left to right

A dynamic/static challenge

- Can non-local information flow be eliminated?
- That is, is a cascade (perhaps with local manipulation) flow enough?

Pryor's challenge

- Definitions of dynamics always seem to need to mention specific technical details of the implementation: types, values, etc. Is there a sense of "dynamic" that is formalism-independent?
- Rothschild and Yalcin 2016: "These definitions do not capture the idea of a conversation system which is such that it can only be compositionally induced by a semantics which is dynamic in shape—that is, whose only matching com- positional semantics is surface dynamic. (Thus our definition of "avoidably dynamic" fails to fully live up to its name.) We might call such systems (if they exist) essentially dynamic. If there were clear examples of fragments of natural language having this property, it would be a powerful form of argument for dynamic approaches to compo- sitional semantics. But it seems to us that the relevant technical notion of "essentially dynamic" is elusive. Our aim has been to draw this out."
- That is: a language is *essentially dynamic* if every possible adequate account is formally dynamic

Trivalence and presupposition failure

Assume expressions denote fns from evaluation points to truth values

Scenario:

- w1: Ann has a sick giraffe.
- w2: Ann has a healthy giraffe.
- w3: Ann doesn't have a giraffe.

Desired judgments:

1. Ann's giraffe is sick.
   - w1 -> T
   - w2 -> F
   - w3 -> #
2. Ann has a giraffe, and Ann's giraffe is sick.
   - w1 -> T
   - w2 -> F
   - w3 -> F

Solution 1: dynamically eliminate points that fail

Heim 1983

- Evaluate the right conjunct wrt the output of the left conjunct
- So if the left conjunct is false at a point (Ann doesn't have a giraffe), the right conjunct never sees it
- Denotations evaluated wrt pair of context sets; information flow is left to right
- Information flow is non-local

Solution 2: Order-sensitive trivalent logical operators

- Peters 1979

```
A\B | T   F   #
------------
 T  | T   F   #      B if A=T
 F  | F   F   F    }
 #  | #   #   #    } otherwise, A
```

- Lazy version

$$[\![\text{A and B}]\!]^{g,w} = \begin{cases} [\![B]\!]^{g,w} & \text{if } [\![A]\!]^{g,w} = \text{True} \\ [\![A]\!]^{g,w} & \text{otherwise} \end{cases}$$

$$[\![\text{A or B}]\!]^{g,w} = \begin{cases} [\![B]\!]^{g,w} & \text{if } [\![A]\!]^{g,w} = \text{False} \\ [\![A]\!]^{g,w} & \text{otherwise} \end{cases}$$

George 2007

- George shows how to systematically derive suitable trivalent operators from the standard bivalent logical operators ("Peters-Kleene deployment")
- Add this to the refactored Heim 1983 above, and presuppositions work
- logical operators operate on points instead of context sets
- information flow is pure cascade
- tricky to add indefinite tracking to the lazy version
  - if the right conjunct doesn't get evaluated, its indefinites get ignored

Momentum for trivalence:

- Rothschild, Daniel. 2017. A Trivalent Account of Anaphora and Presupposition. *21st Amsterdam Colloquium* 21. Aims to extend trivalent goodness from presupposition projection to cover anaphora as well. "It is my view that, when the dust has settles, [a trivalent account] remains the ***simplest viable*** treatment of presupposition projection on the market."
- Winter, Yoad. 2019. On Presupposition Projection with Trivalent Connectives. In *Semantics and Linguistic Theory* 29: 582 ff. https://doi.org/10.3765/salt.v29i0.4644 Starts with strong Kleene, then proposes a filtering algorithm based on "determinant values". "Presuppositions are often thought of as a pragmatic matter, and there are many good reasons for that. However, the projection of presuppositions is connected to questions that are at the heart of formal semantic theory. We cannot separate inference with presuppositions from the meaning of the most prototypically "logical" elements of language – the propositional connectives."

More momentum for trivalence:

- Spector, Benjamin. 2019. An argument for the trivalent approach to presupposition projection. *Snippets* 37: 97–99. https://doi.org/10.7358/snip-2019-037-spec
- Elliot, Patrick. 2020/2021. [considerable work in various manuscripts]
- Comments on trivalence follow

Comment 1: trivalence is a special case of error

- Trivalence adds an error signal to the set of truth values
- Other expression types can give rise to errors
  - Reference failure: *the square circle*, *Ann's giraffe*
- So "trivalence" is a special case of a more general situation
- Need to add an independent layer for tracking failure
  - Maybe monad (Haskell; in OCaml, it's the Either monad)
  - generalizes smoothly to reference failure ("Ann's giraffe")
- [to do: discuss how the Curry-Howard isomorphism relates logical conjunction to ordered pairs and logical disjunction to union types, including Mayber and Either]

Comment 2: Peters-style trivalence conflates error with evaluation order

- Presupposition projection is asymmetric wrt linear order
- This asymmetry is reflected in "mixed Kleene" trivalence
- But dynamic sensitivity to linear order is more general
  - anaphora (though see Rothschild's 2017 attempt to treat them together)
  - modality
- So sensitivity to linear order is more general
- Should be treated independently

Comment 3: Trivalence is not explanatory

- trivalence in general is about error propagation
- George motivates their trivalent logical connectives by appealing to order of evaluation:

  "The rule that I will employ, which I call Peters-Kleene function deployment, exploits Krahmer's 'middle Kleene' intuition, combining the intuition behind the strong Kleene logic [namely, error-propagation –CB] (cf. Kleene, 1952; Beaver and Krahmer, 2001) with a left-to-right incremental evaluation strategy."
- "information about earlier arguments of a function can inform the evaluation of later arguments, but not vice versa"
- Possible rephrase [I do not claim this is what George had in mind]: the information content of earlier expressions can influence the evaluation of later expressions
- More general than just the logical connectives

Two views on the trivalent order asymmetry

- order of evaluation
  - Evaluate left first
  - Evaluate the second in a local context updated with the content of the first
  - both expressions get evaluated
- lazy evaluation
  - if the left conjunct is false, don't even bother to evaluate the rest
  - in PS's theory, one way to understand how expressions can have a value when their presuppositions are not met
  - Prediction: the right conjunct will not trigger any dynamic effects
    - indefinites will not constraint variables
    - appositives will not be evaluated?
  - Confound: unless the context goes to empty, there will be evaluation points that survive update with the left expression, so the right expression will get evaluated; maybe these points will power the dynamics of the right expression

Should trivalent presup projection count as “static”?

- Trivalent logical connectives fossilize dynamic evaluation (George, Winter)
- Information flow is modifiable cascade (a Reader monad), no non-local flow
- If the Predicate Calculus is static, then (all else equal) a trivalent theory of presupposition projection is too