1. First Clues: Miss Scarlet, Colonel Mustard, and Davidsonian Adjuncts

(1) Scarlet poked Mustard with a pencil in the library.         (1) $\Rightarrow$ (2) & (3)
(2) Scarlet poked Mustard with a pencil.                     $\Rightarrow$ $\Rightarrow$
(3) Scarlet poked Mustard in the library.                    (2) (3)
(4) Scarlet poked Mustard.                                   $\Rightarrow$ $\Rightarrow$ $\Rightarrow$ $\Rightarrow$
(5) Scarlet poked Mustard in the kitchen.                    (8) (4) (9)
(6) Scarlet poked Mustard with a spoon.                      $\Rightarrow$ $\Rightarrow$ $\Rightarrow$
(7) Scarlet poked Mustard in the kitchen with a spoon.       (5) (6)
(8) *Scarlet poked Mustard with a pencil in the kitchen.*    $\Rightarrow$ $\Rightarrow$
(9) *Scarlet poked Mustard in the library with a spoon.*    (7) $\Rightarrow$ (5) & (6)
(10) Scarlet poked Mustard with a pencil, and               Scarlet poked Mustard in the library.

The conjunction of (1) and (7) doesn’t imply (8) or (9). But the conjunction of (8) and (9) implies (2-6). And while (1) implies (10), (10) doesn’t imply (1).

(11) There was a banker from Dallas who wore a hat.           (11) $\Rightarrow$ (12) & (13)
(12) There was a banker from Dallas.                         $\Rightarrow$ $\Rightarrow$
(13) There was a banker who wore a hat.                      (12) & (13)
(14) There was a banker.                                     $\Rightarrow$ $\Rightarrow$ $\Rightarrow$ $\Rightarrow$
(15) There was a banker who wore suspenders.                 (18) (14) (19)
(16) There was a banker from Manhattan.                     $\Rightarrow$ $\Rightarrow$ $\Rightarrow$
(17) There was a banker from Manhattan who wore suspenders.  (15) (16)
(18) *There was a banker from Dallas who wore suspenders.*   $\Rightarrow$ $\Rightarrow$
(19) *There was a banker from Manhattan who wore a hat.*    (17) $\Rightarrow$ (15) & (16)
(20) There was a banker from Dallas, and there was a banker who wore a hat.

The conjunction of (11) and (17) doesn’t imply (18) or (19). But the conjunction of (18) and (19) implies (12-16). And while (11) implies (20), (20) doesn’t imply (11).

(11a) $\exists e[\text{Banker}(e) & \text{From-Dallas}(e) & \text{Wore-a-hat}(e)]$
(12a) $\exists e[\text{Banker}(e) & \text{From-Dallas}(e)]$
(13a) $\exists e[\text{Banker}(e) & \text{Wore-a-hat}(e)]$
(14a) $\exists e[\text{Banker}(e)]$

(1a) $\exists e[\text{Past-poke-by-off}(e, \text{Scarlet, Mustard}) & \text{With-a-pencil}(e) & \text{In-the-library}(e)]$
(2a) $\exists e[\text{Past-poke-by-off}(e, \text{Scarlet, Mustard}) & \text{With-a-pencil}(e)]$
(3a) $\exists e[\text{Past-poke-by-off}(e, \text{Scarlet, Mustard}) & \text{In-the-library}(e)]$
(4a) $\exists e[\text{Past-poke-by-off}(e, \text{Scarlet, Mustard})]$

Maybe speakers *understand* (1-4) as existential generalizations like (1a-4a), and *recognize* the indicated inferences as instances of a corresponding valid form: $\exists e[\Phi(e) & \Psi(e)]$ $\exists e[\Phi(e)]$
2. More Existentials: Hr∃, Thr∃ & 3vrywhr∃

(21) a spy poked a soldier
(21a) ∃x∃y[Spy(x) & Past-poke-by-off(e, x, y) & Soldier(y)]
(21b) ∃e[PastSimple(e) & ∃x∃y[Spy(x) & Poke-by-off(e, x, y) & Soldier(y)]]

Factoring out tense highlights further complexity (see, e.g., Reichenbach 1947 Hornstein 1990)

PastSimple(e) = ∃π[SpeechTime(π) & Before(e, π)]
= ∃π[ReferenceTime(π) & ∃π′[Before(π, π′) & SpeechTime(π′)] & At(e, π)]
PastPerfect(e) = ∃π[ReferenceTime(π) & ∃π′[Before(π, π′) & SpeechTime(π′)] & Before(e, π)]
FutureSimple(e) = ∃π[SpeechTime(π) & After(e, π)]
= ∃π[ReferenceTime(π) & ∃π′[After(π, π′) & SpeechTime(π′)] & At(e, π)]
FuturePerfect(e) = ∃π[ReferenceTime(π) & ∃π′[After(π, π′) & SpeechTime(π′)] & Before(e, π)]

(22) a soldier was poked
(22a) ∃e∃y[Past-poke-off(e, y) & Soldier(y)]
(22b) ∃e{PastSimple(e) & ∃y[Poke-off(e, y) & Soldier(y)]}

(23) a spy poked a soldier with a pencil
   (i) ∃x∃y{PastSimple(e) & Spy(x) & Poke-by-off(e, x, y) & Soldier(y) & ∃π[Withposs(y, π) & Pencil(π)]}
   #(ii) ∃x∃y{PastSimple(e) & Spy(x) & Poke-by-off(e, x, y) & Soldier(y) & ∃π[Withposs(x, π) & Pencil(π)]}
   (iii) ∃x∃y{PastSimple(e) & Spy(x) & Poke-by-off(e, x, y) & Soldier(y) & ∃π[Withposs(e, x, π) & Pencil(π)]}
   (i') ∃e{PS(e) & ∃π[By(e, π) & Spy(π)] & ∃y[Poke-off(e, y) & Soldier(y) & ∃π[Withposs(y, π) & Pencil(π)]]}
   (ii') ∃e{PS(e) & ∃π[By(e, π) & Spy(π)] & ∃y[Poke-off(e, y) & Soldier(y)] & ∃π[Withposs(e, π) & Pencil(π)]}

(24) a tailor saw a tinker with a tool
   (i) ∃e{PastSimple(e) & ∃x∃y[Tailor(x) & See-by-off(e, x, y) & Tinker(y) & ∃π[Withposs(y, π) & Tool(π)]]}
   #(ii) ∃e{PastSimple(e) & ∃x∃y[Tailor(x) & See-by-off(e, x, y) & Tinker(y) & ∃π[Withposs(x, π) & Tool(π)]]}
   (iii) ∃e{PastSimple(e) & ∃x∃y[Tailor(x) & See-by-off(e, x, y) & Tinker(y) & ∃π[Withposs(e, π) & Tool(π)]]}
   (iv) ∃x∃y[Tailor(x) & Saw-by-off(e, x, y) & Tinker(y) & ∃π[Withposs(y, π) & Tool(π)]]
   #(v) ∃x∃y[Tailor(x) & Saw-by-off(e, x, y) & Tinker(y) & ∃π[Withposs(x, π) & Tool(π)]]
   (vi) ∃x∃y[Tailor(x) & Saw-by-off(e, x, y) & Tinker(y) & ∃π[Withposs(e, π) & Tool(π)]]

(21) a spy poked a soldier
(21a) ∃x∃y[Spy(x) & Past-poke-by-off(e, x, y) & Soldier(y)]
(21b) ∃e{PastSimple(e) & ∃x∃y[Spy(x) & Poke-by-off(e, x, y) & Soldier(y)]}
(21c) ∃e{PastSimple(e) & ∃π[By(e, π) & Spy(π)] & ∃π[Poke-off(e, π) & Soldier(π)]}  
      ... & ∃π' [... e... ]

(25) a soldier was poked by a spy
(26) a guest heard a scream in the hall

\[ \exists e \{ \text{PastSimple}(e) \land \exists \pi [\text{By}(e, \pi) \land \text{Guest}(\pi)] \land \]

(i) \[ \exists \pi [\text{Hearing-of}(e, \pi) \land \text{Scream}(\pi) \land \text{In-the-hall}(\pi)] \]

(ii) \[ \exists \pi [\text{Hearing-of}(e, \pi) \land \text{Scream}(\pi) \land \text{In-the-hall}(\pi)] \]

Higginbotham 1983

(27) a guest heard a soldier scream in the hall

\[ \exists e \{ \text{PastSimple}(e) \land \exists \pi [\text{By}(e, \pi) \land \text{Guest}(\pi)] \land \]

(i) \[ \exists \pi [\text{Hearing-of}(e, \pi) \land \exists \pi' [\text{Scream-by}(\pi, \pi') \land \text{Soldier}(\pi')] \land \text{In-the-hall}(\pi)] \]

(ii) \[ \exists \pi [\text{Hearing-of}(e, \pi) \land \exists \pi' [\text{Scream-by}(\pi, \pi') \land \text{Soldier}(\pi')] \land \text{In-the-hall}(\pi)] \]

Vlach 1983

(28) guest hears soldier scream in hall

(29) spy pokes soldier in library with pencil

And don’t forget article-free languages, or Kamp-Heim accounts of English indefinites.

It may be that ‘a’ simply marks nouns as singular (+count, –plural).

\[ \begin{align*}
\text{‘a spy’} & \quad \text{‘a soldier’} \\
(\exists e \{ \text{PastSimple}(e) \land \exists \pi [\text{By}(e, \pi) \land \text{Spy}(\pi)] \land \exists \pi [\text{PokeOf}(e, \pi) \land \text{Soldier}(\pi)] \land \exists \pi [\text{In}(e, \pi) \land \text{Library}(\pi)] \land \exists \pi [\text{With}(e, \pi) \land \text{Pencil}(\pi)] \}}
\end{align*} \]

maybe

no ‘\exists’ is due to ‘a’

(30) guests heard screams

\[ \exists E \{ \text{PastSimple}(E) \land \exists \Pi [\text{By}(E, \Pi) \land \text{Guests}(\Pi)] \land \exists \Pi [\text{Hearings-of}(E, \Pi) \land \text{Screams}(\Pi)] \}

(31) guests heard guests scream

\[ \exists E \{ \text{PastSimple}(E) \land \exists \Pi [\text{By}(E, \Pi) \land \text{Guests}(\Pi)] \land \exists \Pi [\text{Hearings-of}(E, \Pi) \land \text{Guests-Scream}(\Pi)] \}

(32) guests heard noise

\[ \exists E \{ \text{PastSimple}(E) \land \exists \Pi [\text{By}(E, \Pi) \land \text{Guests}(\Pi)] \land \exists \Pi [\text{Hearings-of}(E, \Pi) \land \text{Noise}(\Pi)] \}

(33) three guests ate beef

\[ \exists E \{ \text{PastSimple}(E) \land \exists \Pi [\text{By}(E, \Pi) \land \text{Three}(\Pi) \land \text{Guests}(\Pi)] \land \exists \Pi [\text{Eatings-of}(E, \Pi) \land \text{Beef}(\Pi)] \}

It is often assumed that (30-33) have existential implications of another kind. But let’s come back to this.

(30) guests heard screams

(30a) \[ \exists P \exists P' [\text{Guests}(P) \land \text{Heard}(P, P') \land \text{Screams}(P')] \]

(30b) \[ \exists P \exists P' [\text{Plurality}(P) \land \forall x : x \in P [\text{Guest}(x)] \land \text{Heard}(P, P') \land \text{Plurality}(P') \land \forall x : x \in P' [\text{Scream}(x)] \}

(34) the dogs surrounded the cats

(34a) \[ \exists P \exists P' [\text{The-dogs}(P) \land \text{Surrounded}(P, P') \land \text{The-cats}(P')] \]

(34b) \[ \exists P \exists P' [\text{Plurality}(P) \land \forall x : (x \in P) \equiv \text{Dog}(x)] \land \text{Surrounded}(P, P') \land \text{Plurality}(P') \land \forall x : (x \in P) \equiv \text{Cat}(x)] \}

3
3. Two Common Patterns...Who ordered these?

\[ \Phi(\_ \_ ) \& \Psi(\_ \_ ) \quad \exists[\Delta(\_ \_ ) \& \Pi(\_ \_ )] \]

**entity/event**                            **participant**

*Caveat*: if the goal is to *characterize natural phenomena* regarding linguistic understanding, then we’ll probably have to tweak formalism that was *invented for different purposes*.

*More specifically*: Davidson used Tarski’s ampersand and existential quantifier, which allow for expressions like ‘\( \exists x[Rxy \& Syzw] \)’, in which a two-place sentence is conjoined with a three-place sentence to form a four-place sentence that is converted to a three-place sentence by existential closure.

Davidsonians (in the 21st century) need a “*natural logic analog*” of the schema: \( \exists e[\Phi(e) \& \Psi(e)] \)

\( \exists e[\Phi(e)] \)

(35) Some professors watched brown cows eat green grass.

\( \exists E\{PastSimple(E) \& \exists[By(E, \Pi) \& Professors(\Pi)] \& Watch\cdot\text{brown-cows-eat-green-grass}(E)\} \)

(A) The common patterns reflect logically substantive *covert constituents*

Watch-brown-cows-eat-green-grass(\_)

\[ \exists F[Watch\cdot\text{-of}(\_, F) \& \exists[By(F, \Pi) \& Brown(\Pi) \& Cows(\Pi)] \& \exists M[Eat\cdot\text{-of}(F, M) \& Green(M) \& Grass(M)] \]

(B) The common patterns reflect logically substantive *modes of combination*

‘green’ + ‘grass’ \( \Rightarrow \) Green(\_ \_ ) & Grass(\_ \_ )

‘eat’ + [green grass] \( \Rightarrow \) \( \exists M[\text{Eat\cdot\text{-of}(\_, M) \& Green(M) \& Grass(M)] \)

‘brown’ + ‘cows’ \( \Rightarrow \) Brown(\_ \_ ) & Cows(\_ \_ )

(‘by’) + [brown cows] \( \Rightarrow \) \( \exists[By(\_, \Pi) \& Brown(\Pi) \& Cows(\Pi)] \)

\[ (by) \ [\text{brown cows}] + [\text{eat} \ [\text{brown grass}]] \Rightarrow \exists[By(\_, \Pi) \& Brown(\Pi) \& Cows(\Pi)] \& \exists M[\text{Eat\cdot\text{-of}(\_, M) \& Green(M) \& Grass(M)] \)

‘watch’ + \( \ [\text{by} \ [\text{brown cows}] \ [\text{eat} \ [\text{brown grass}]]] \Rightarrow \exists F[Watch\cdot\text{-of}(\_, F) \& \exists[By(F, \Pi) \& Brown(\Pi) \& Cows(\Pi)] \& \exists M[\text{Eat\cdot\text{-of}(F, M) \& Green(M) \& Grass(M)] \]

4
It’s a very old idea that negating, disjoining, and conditionalizing are exceptions to a default principle that *lengthening*—in a discourse, or within a sentence—is a way of *strengthening*.

It’s also a very old idea that universal quantification is a logically special case, and that *existential* quantification is the default way of converting a predicate into a thought.

If we grant that modes of combination can be logically substantive, it’s no big leap to allow for existential closure as a default clausal operation.

So we should at least consider the following hypothesis (Pietroski 2005, 2018); see Appendix A.

\[ \Phi(\_ \_ \_) & \Psi(\_ \_ \_) \quad \exists[\Delta(\_, \_ \_) & \Pi(\_ \_ \_)] \]

both adjunction and complementation reflect a combinatorics that is not logically innocent

On this view…

—the patterns reflect modes of combination that are employed at an *early stage of computing meanings*—this leaves room for *later stages* of computation (cp. Chomsky 57, Marr 82)—but not even verb-noun combination is logically innocent

4. Sidebar: Neo-Montagovian Minimalism

It is sometimes assumed/asserted/avowed that *natural* modes of composition are no more logically substantive than Function Application

---

*Caveat*: distinguish Function Application from Fregean Saturation…

\[ \text{PRECEDES}(\_, \_ \_) + \text{OSCAR} \Rightarrow \text{PRECEDES}(\_, \text{OSCAR}) \]
\[ \text{PRECEDES}(\_, \text{OSCAR}) + \text{ZIGGY} \Rightarrow \text{PRECEDES(ZIGGY, OSCAR)} \]
\[ \text{SOMETHING}[\Phi(\_ \_ \_)] + \text{NUMBER}(\_ \_) \Rightarrow \text{SOMETHING}[\text{NUMBER}(\_ \_) \_ \_] \]
\[ \text{SOMETHING}[\Phi(\_ \_ \_)] + \text{PRECEDES}(\_, \text{OSCAR}) \Rightarrow \text{SOMETHING}[\text{PRECEDES}(\_, \text{OSCAR})] \]

*here, all the implications reflect atomic expressions*

But for good reasons, Church didn’t want to rely on Fregean Saturation.

\[ \text{SOMETHING}[\Phi(\_ \_ \_)] + \text{PRECEDES}(\_, \_ \_) \Rightarrow ??? \]
\[ <\text{et}, \text{t}> + <\text{e}, \text{et}> \Rightarrow ??? \]

*cp. \( \exists x[\text{PRECEDES}(x', x)] \)
\( \exists x[\text{PRECEDES}(x, x')] \)

‘\( \exists \)’ is *syncategorematic* for Tarski

\[ \lambda x. \lambda x'. T \equiv \text{PRECEDES}(x', x) + \text{OSCAR} \Rightarrow \lambda x'. T \equiv \text{PRECEDES}(x', \text{OSCAR}) \]

*cp. PRECEDES(\_, \text{OSCAR})]*

\[ \text{denoter} + \text{denoter} \Rightarrow \text{denoter} \]

‘\( \_ \)’ is unsaturated for Frege
If *natural* composition is “logically spare” in this sense, then the logically substantive patterns presumably reflect lexical items

—Covert Constituents (see page 4 above)
—Type Shifting (lexical items are flexible in ways that mimic covert constituents)

\[
||\text{cow}|| = \lambda x. \text{T}\text{iff } \text{Cow}(x) \\
= \lambda x. \text{Cow}(x)
\]

\[
||\text{brown}|| = \lambda x. \text{Brown}(x)
\]

\[
||\text{brown cow}|| = \uparrow ||\text{brown}||(||\text{cow}||) = \lambda \Phi. \lambda e. \Phi(e) & \text{Brown}(e) & \text{Cow}(e)
\]

\[
||\text{tall banker from Dallas who wore a hat}|| = ???
\]

*And if we want to explain the network of Davidsonian implications, we can’t just say...*

\[
||\text{poked Mustard with a pencil}|| = \lambda \Phi. \text{With-a-pencil}(\Phi)(\lambda x. \text{Poked}(x, \text{Mustard}))
\]

\[
||\text{poked Mustard in the library}|| = \lambda \Phi. \text{In-the-library}(\Phi)(\lambda x. \text{Poked}(x, \text{Mustard}))
\]

**Massachusetts Variation:** natural modes of composition are *no more* logically substantive than Predicate Modification and Function Application

\[
||\text{brown}_{\text{et}} \text{cow}_{\text{et}}|| = \lambda e. ||\text{brown}_{\text{et}}||/(e) & ||\text{cow}_{\text{et}}||/(e)
\]

\[
= \lambda e. \lambda x. \text{Brown}(x)(e) & \lambda x. \text{Cow}(x)(e) = \lambda e. \text{Brown}(e) & \text{Cow}(e)
\]

\[
||[\text{with a pencil}]_{\text{et}}|| = \lambda e. \exists x [\text{With}(e, x) & \text{Pencil}(x)]
\]

\[
||[\text{poke}_{\text{et}} \text{Mustard}_{\text{et}}]_{\text{et}}|| = \lambda x. \lambda e. \text{Poke-of}(e, x)(\text{Mustard}) = \lambda e. \text{Poke-of}(e, \text{Mustard})
\]

\[
||[\text{poke Mustard}]_{\text{et}} [\text{with a pencil}]_{\text{et}}|| = \lambda e. ||[\text{poke Mustard}]_{\text{et}}||/(e) & ||[\text{with a pencil}]_{\text{et}}||/(e)
\]

\[
= \lambda e. \text{Poke-of}(e, \text{Mustard}) & \exists x [\text{With}(e, x) & \text{Pencil}(x)]
\]

*But how much work does this leave for appeal to Functions and Application, as opposed to just...*

\[
\Phi() & \Psi() \\
\exists [\Delta(_, _) & \Pi()] \\
\text{entity/event} & \text{participant}
\]

*Don’t forget article-free languages, or Kamp-Heim accounts of English indefinites; see page 3 above.*

\[
\exists \pi [\text{PokeOf}(e, \pi) & \text{Mustard}(\pi)] & \exists \pi [\text{With}(e, \pi) & \text{Pencil}(\pi)]
\]

‘a Mustard’

‘a pencil’
5. Logical Neutrality, Ontological Price

(30) guests heard screams
(30a) \( \exists P \exists P'[\text{Guests}(P) \land \text{Heard}(P, P') \land \text{Screams}(P')] \)
(30b) \( \exists P \exists P' \{\text{Plurality}(P) \land \forall x : x \in P[\text{Guest}(x)] \land \text{Heard}(P, P') \land \text{Plurality}(P') \land \forall x : x \in P'[\text{Scream}(x)] \} \)
(30c) \( \exists E \exists P \exists P' \{\text{PastSimple}(E) \land \text{Plurality}(P) \land \forall x : x \in P[\text{Guest}(x)] \land \text{Hear-by-of}(E, P, P') \land \text{Plurality}(P') \land \forall x : x \in P'[\text{Scream}(x)] \} \)

Really? Is (30) understood as implying that a plurality of guests heard a plurality of screams?

Davidsonians offer arguments that (30) is understood as implying past events of guests hearing screams. But does this imply—for ordinary speakers—that some collection of events was a hearing of a collection of screams by a collection of guests?

(34) the dogs surrounded the cats
(34a) \( \exists P \exists P'[\text{The-dogs}(P) \land \text{Surrounded}(P, P') \land \text{The-cats}(P')] \)
(34b) \( \exists P \exists P' \{\text{Plurality}(P) \land \forall x [(x \in P) \equiv \text{Dog}(x)] \land \text{Surrounded}(P, P') \land \text{Plurality}(P') \land \forall x [(x \in P) \equiv \text{Cat}(x)] \} \)

(36) the logicians specified the sets
(36a) \( \exists P \exists P' \{\text{The-logicians}(P) \land \text{Specified}(P, P') \land \text{The-Sets}(P') \} \)
(36b) \( \exists P \exists P' \{\text{Plurality}(P) \land \forall x [(x \in P) \equiv \text{Logician}(x)] \land \text{Specified}(P, P') \land \text{Plurality}(P') \land \forall x [(x \in P') \equiv \text{Set}(x)] \} \)


We don’t have to say that each assignment of values to variables assigns exactly one thing to each variable, and that special entities get assigned to upper-case variables. We can say that each assignment assigns one or more things to each variable, allowing for special cases: lower case (first-order) variables impose a constraint of singularity—i.e., the one or more values assigned are not more than one; upper case (second-order) variables are neutral; but “essentially plural” expressions, like ‘formed a trio’, require that their one or more values be more than one.

<table>
<thead>
<tr>
<th>abc</th>
<th>abd</th>
<th>acd</th>
<th>bcd</th>
<th>0001</th>
<th>0010</th>
<th>0011</th>
</tr>
</thead>
<tbody>
<tr>
<td>ab</td>
<td>ac</td>
<td>ad</td>
<td>bd</td>
<td>0100</td>
<td>0101</td>
<td>0110</td>
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<td>bc</td>
<td>cd</td>
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<td>1010</td>
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<td>a</td>
<td>b</td>
<td>c</td>
<td>d</td>
<td>1100</td>
<td>1101</td>
<td>1110</td>
</tr>
</tbody>
</table>

The diagram on the left invites a “lattice” conception of assignments; see Cartwright 1965, Link 1983. The bottom row is for things in the basic domain. Every other lattice-point indicates an entity in an extended domain that includes sets or “sums” of basic entities—e.g., \{a, b, d\} or a\oplus b \oplus d. The bottom row also corresponds to the “singletons” of the extended domain. We can say that each assignment assigns an entity in the extended domain to each second-order (capitalized) variable. But invoking more things is not mandatory. We can view ‘abd’ as an assignment of three (basic) entities to an unsingular variable. Recoding in binary makes this vivid: a = 1; b = 10; c = 100; d = 1000. Then ‘1011’ indicates for each entity, whether or not it is one of the one or more assigned values: d, yes; c, no; b, yes; a, yes.
**Truism:** the interpretations differ, even if for many purposes, we can talk either way.

(37) $\exists X \forall x [Xx \equiv (x \not\in x)]$

stipulated domain: Fred, Bert (and nothing else)

facts: Fred $\not\in$ Fred; Bert $\not\in$ Bert; Fred $\neq$ Bert

Given the stipulated domain and the set-theoretic construal, (37) is **false**.

But given the same domain and the Boolos construal, (37) is **true**.

While nothing in this domain includes Fred and Bert, there are some things—viz., Fred and Bert—such that each thing (in the domain) is one of them if and only if it isn’t selfelemental.

Now suppose that Fred = $\emptyset$, Bert = $\{\emptyset\}$, and the domain is extended to include all of the other pure Zermelo-Frankl sets (but nothing else).

Given the Boolos construal, (37) is still **true**, while (37) is still **false** on the set-theoretic construal.

(38) $\exists x (Fx) \equiv \exists X \forall x (Xx \equiv Fx)$

(trivial on the Boolos construal)

(39) $\forall X \neg \exists x (Xx \land \neg Xx)$

(fully general on the Boolos construal)

(40) $\neg \exists \emptyset \exists x (Xx \land \neg Xx)$

(41) $\neg \exists \emptyset \exists \emptyset [\text{OneOf}(\emptyset, \emptyset) \equiv \neg \text{OneOf}(\emptyset, \emptyset)]$

(42) $\neg \exists s \exists x [(x \in s) \land (x \not\in s)]$

(trivial, but not fully general)

(43) $\neg \exists y \exists x [\text{In}(x, y) \land \neg \text{In}(x, y)]$

Empirical Question: is either interpretation better than the other for purposes of characterizing how expressions of English (and other natural languages) are understood?

(44) every set is a set

Seems **trivial**, even if you think that nothing includes every set.

(45) $\{x: x \text{ is a set} \} \subseteq \{x: x \text{ is a set} \}$

Seems **wrong** if you think that nothing includes every set.

So *prima facie*, (45) mischaracterizes the logical form of (44), even if this characterization is **useful** for many purposes.

(46) Some barber shaves all and only the barbers who do not shave themselves.

Seems **wrong** once you realize what it implies.

Even if many speakers of English don’t (or can’t) work out the implications of (46), semanticists should not posit a barber who does so much shaving. And even if semantics is a branch of cognitive science, semanticists don’t get to *posit* impossible barbers (or square circles).

(47) every one of the sets is a set

Seems **trivial**, at least if there are some sets

(48) $\exists Y \forall x [Yx \equiv \text{Set}(x)] \land \forall x: Yx[\text{Set}(x)]$

Seems as **trivial** as (47)

(49) $\exists Y: \forall x [Yx \equiv \text{Set}(x)] \forall x: Yx[\text{Set}(x)]$

Positing settish implications that speakers *can’t* recognize requires justification; see Schein (1993).

Thought Experiment: imagine a Fregean semanticist sent to Planet Tarski, where (50) implies no function from cows to truth values—and then to Planet Boolos, where (51) doesn’t imply any sets.

(50) every dot is blue

(51) most of the cows are blue
7. No Fact of the Matter Hypotheses: Insert Friday’s talk (“Meaning, Most, and Mass”) here

—weak version: if a theory \(\Theta\) pairs each expression of language \(L\) with a logical form \(\lambda\),
and a theory \(\Theta^*\) pairs each expression of \(L\) with a \textit{logically equivalent} logical form \(\lambda^*\),
then \(\Theta\) and \(\Theta^*\) provide equally good specifications of what the expressions of \(L\) mean

—stronger versions: … and in some cases, \textit{logically inequivalent} specifications are equally good

\[(52)\] every cow is brown  \(\text{---}(53)\) most of the dots are blue
\[(52a)\] \(\forall x: \text{Cow}(x)[\text{Brown}(x)]\)  \(\text{---}(53a)\) \(\{x: \text{Dot}(x) & \text{Blue}(x)\} > \{x: \text{Dot}(x) & \sim \text{Blue}(x)\}\)
\[(52b)\] \(\forall x[\text{Cow}(x) \supset \text{Brown}(x)]\)  \(\text{---}(53b)\) \(\{x: \text{Dot}(x) & \text{Blue}(x)\} > \{x: \text{Dot}(x) & \sim \text{Blue}(x)\}\)
\[(52c)\] \(\exists x[\text{Cow}(x) & \sim \text{Brown}(x)]\)  \(\text{---}(53c)\) \(#\{x: \text{Dot}(x)\} > #\{x: \text{Dot}(x) & \text{Blue}(x)\}\)
\[(52d)\] \(\{x: \text{Cow}(x)\} \subseteq \{x: \text{Brown}(x)\}\)  \(\text{---}(53d)\) \(\{x: \text{Dot}(x)\} > \{x: \text{Dot}(x) & \text{Blue}(x)\}\)

(21) a spy poked a soldier
\[(21a)\] \(\exists e \exists x \exists y[\text{Spy}(x) & \text{Past-poke-by-off}(e, x, y) & \text{Soldier}(y)]\)
\[(21b)\] \(\exists e[\text{PastSimple}(e) & \exists x \exists y[\text{Spy}(x) & \text{Poke-by-off}(e, x, y) & \text{Soldier}(y)]\)
\[(21c)\] \(\exists e[\text{PastSimple}(e) & \exists y[\text{By}(e, \pi) & \text{Spy}(\pi)] & \exists \pi[\text{Poke-off}(e, \pi) & \text{Soldier}(\pi)]\}

…

Why think there’s (often) a fact of matter when the alternatives are logically inequivalent, but not when the alternatives are \textit{logically} equivalent? Why is \textit{logic} special with regard to \textit{meaning}?

With regard to \textit{meaning}, why think that \textit{logic} is more important than \textit{psychology}?

(If you’re an externalist, why think \textit{logic} is more important than \textit{metaphysical} possibility?)

How could \textit{logic} tell us whether or not—or even if there is a fact of the matter about whether or not—\(\textit{(53) is understood}\) in terms of comparing the number of blue dots to the number of dots that \textit{aren’t} blue, as opposed to comparing the number of blue dots to \textit{that number subtracted from} the number of dots?

How could \textit{logic} tell us whether or not—or even if there is a fact of the matter about whether or not—\(\textit{(53) is understood}\) in terms of numbers, as opposed to one-to-one correspondence (and leftovers)?

\[(53c)\] \(\text{OneToOnePlus}[[\{x: \text{Dot}(x) & \text{Blue}(x)\}, \{x: \text{Dot}(x) & \sim \text{Blue}(x)\}]]\)

How could \textit{logic} tell us whether or not—or even if there is a fact of the matter about whether or not—\(\textit{(52) and (53) are understood}\) in terms of sets and truth values, as opposed to some sparer Boolos-y way?

\[(52e)\] \(\lambda \Psi . \lambda \Phi . \text{T} \equiv \{x: \Psi(x) = \text{T}\} \subseteq \{x: \Phi(x) = \text{T}\}(\lambda x. \text{Cow}(x))(\lambda x. \text{Brown}(x))\)
\[(52f)\] \(\exists Y \{\forall x[Yx \equiv \text{Cow}(x)] & \forall x: Yx[\text{Brown}(x)]\}

\[(53d)\] \(\exists Y \{\forall x[Yx \equiv \text{Dot}(x)] & \forall x[\forall x[Xx \equiv Yx & \text{Blue}(x)] & \{#(X) > #(Y) - #(X)\}]\}

\textbf{Empirical Questions:} does \(\textit{(53)}\) imply cardinalities, sets, truth values, events/states, …
8. Two ways of hearing “Does S1 imply S2”?

(i) Do competent speakers of the relevant language understand S1 and S2 in ways that let these speakers recognize that an inference from (the logical form of a thought expressed with) S1 to (the logical form of a corresponding thought expressed with) S2 is valid?

(ii) Is every world at which (the content of a thought expressed with) S1 is true a world at which (the content of a corresponding thought expressed with) S2 is true?

Does ‘Scarlet poked Mustard in the library with a pencil’ imply that there was a poking of Mustard?

(i) Yes. It has something to do with conjunct reduction.

(ii) Yes. But the sentence also implies that there are infinitely many prime numbers.

Does ‘Sadie is a mare’ imply that Sadie is a horse? (Short form: does ‘mare’ imply ‘horse’?)

(i) Probably. And if so, it probably has something to do with conjunct reduction.

(ii) Yes. But ‘mare’ also implies ‘mammal such that there are infinitely many prime numbers’.

Does ‘Some odd number precedes every prime number’ have two readings, with distinct implications?

(i) Yes. And speakers should reject the “surface” reading if they think that 1 is a prime number.

(ii) No. The two grammatical structures are equivalent given that 2 is the smallest prime.

\[
\exists x:\text{Odd}(x) \{ \forall y:\text{Prime}(y) \{ \text{Precedes}(x, y) \} \} \quad \forall y:\text{Prime}(y) \{ \exists x:\text{Odd}(x) \{ \text{Precedes}(x, y) \} \}
\]

It’s been 50+ years since Davidson got a ball rolling by trying to describe semantic properties of English sentences by using off-the-shelf technology—Tarski’s first-order fragment of Frege’s Begriffsschrift—in clever ways (e.g., by allowing for event variables and putting them to work). Montague and Lewis quickly adopted more powerful technology—Church’s lambda calculus—which got put to use in many clever ways. But 60 years ago, Chomsky taught us that there is more than one kind of recursion, and that adopting powerful technology is not always the way forward in the study of cognition. Recall that the problem with “finite state automata” was not that they didn’t permit description of every string of lexical items. On the contrary, it is all too easy to describe every string of lexical items in these terms.

\[
\emptyset_a \\
\cup b
\]

So if the goal is to explain why a system recursively generates some strings but not others, one needs a different vocabulary that lets one capture the right constraints. Talking about phrase structure grammars and transformations was far from perfect, but it got a ball rolling. So we might ask what would generate the patterns discussed here without generating a lot more; see Pietroski (2018).

<table>
<thead>
<tr>
<th>2nd-order quantifiers</th>
<th>1st-order quantifiers</th>
<th>no quantifiers</th>
</tr>
</thead>
<tbody>
<tr>
<td>① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨</td>
<td>① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨</td>
<td>0 1 2 3 4 … arbitrary</td>
</tr>
</tbody>
</table>

Possible Adicities of Predicates
**Appendix A: Typology in Pietroski (2018)**

\[
\begin{align*}
\langle M \rangle & \cdot \langle D \rangle & \langle M \rangle + \langle M \rangle & \Rightarrow \langle M \rangle & \langle D \rangle + \langle M \rangle & \Rightarrow \langle M \rangle \\
\Phi(\_ \_) + \Psi(\_ \_) & \Rightarrow \Phi(\_ \_)^\Psi(\_ \_) & \Delta(\_ \_, \_) + \Phi(\_ \_) & \Rightarrow \exists[\Delta(\_ \_, \_ \_)^\Phi(\_ \_)]
\end{align*}
\]

**Core Operations:**

- Joining two monadic concepts yields a monadic concept that applies to __ if and only if both of the joined concepts apply to __
- Joining a dyadic concept with a monadic concept yields a monadic concept that applies to __ if and only if __ bears the dyadic relation to some thing(s)/stuff that the monadic concept applies to

**Example:**

\[
\begin{align*}
\text{POKE-OF}(\_ \_, \_ \_) + \text{SOLDIER}(\_ \_) & \Rightarrow \exists[\text{POKE-OF}(\_ \_, \_ \_)^\text{SOLDIER}(\_ \_)]
\end{align*}
\]

\[
\begin{align*}
\text{IN}(\_ \_, \_ \_) + \text{LIBRARY}(\_ \_) & \Rightarrow \exists[\text{IN}(\_ \_, \_ \_)^\text{LIBRARY}(\_ \_)]
\end{align*}
\]

\[
\begin{align*}
\exists[\text{POKE-OF}(\_ \_, \_ \_)^\text{SOLDIER}(\_ \_) + \exists[\text{IN}(\_ \_, \_ \_)^\text{LIBRARY}(\_ \_) & \Rightarrow \exists[\text{POKE-OF}(\_ \_, \_ \_)^\text{SOLDIER}(\_ \_) + \exists[\text{IN}(\_ \_, \_ \_)^\text{LIBRARY}(\_ \_)]
\end{align*}
\]

\[
\begin{align*}
\text{BY}(\_ \_, \_ \_) + \text{SPY}(\_ \_) & \Rightarrow \exists[\text{BY}(\_ \_, \_ \_)^\text{SPY}(\_ \_)]
\end{align*}
\]

\[
\begin{align*}
\text{PAST-SIMPLE}(\_ \_) + \exists[\text{BY}(\_ \_, \_ \_)^\text{SPY}(\_ \_) & \Rightarrow \text{PAST-SIMPLE}(\_ \_)^\exists[\text{BY}(\_ \_, \_ \_)^\text{SPY}(\_ \_)]
\end{align*}
\]

**Main Idea:** In the simplest case (M-junction), combination indicates restriction; in the next simplest case (D-junction), combination still involves restriction together with a kind of (variable-free) existential closure; this allows for atomic dyadic concepts, but the system only generates monadic concepts.

**Appendix B: Limited Quantification, not Generalized Quantifiers** (numbers from another handout)

(30) every cow ran
(31) every cow is a cow that ran
(32) \{x: Cow(x)\} \subseteq \{x: Ran(x)\} equivalent for ‘\subseteq’ but not for ‘\subseteq’ or ‘\subseteq’
(33) \{x: Cow(x)\} \subseteq \{x: Cow(x) & Ran(x)\}
(34) \exists Y[\forall x(Yx \equiv \text{Cow}(x)) & \exists X[\forall x(Xx \equiv \text{Ran}(x)) & \forall x:Yx(Xx)]]
(35) \exists Y[\forall x(Yx \equiv \text{Cow}(x)) & \exists X[\forall x(Xx \equiv Yx & \text{Ran}(x)) & \forall x:Yx(Xx)]]
(13d) \exists Y[\forall x(Yx \equiv \text{Dot}(x)) & \exists X[\forall x(Xx \equiv Yx & \text{Blue}(x)) & \{\#X > \#Y - \#(X)\}]]
(36) every cow which ran \[\text{OK as a restricted quantifier, but not as a sentence}\]
(37) *\{S [ every cow ] OP [ which ran ] RC\}
(38) ![\text{should be OK, or at least comprehensible, as a sentence}]
(39) Finn chased every cow
(40) \exists Y[\forall x(Yx \equiv \text{Cow}(x)) & \exists X[\forall x(Xx \equiv Yx & \text{Chased}(\text{Finn}, x)) & \forall x:Yx(Xx)]] But how do we get
(40) from (39)?
**First Step: Treat Sentences as Polarized Predicates**

(41) Finn chased Bess
(42) \(|[s \text{ Finn chased Bess}]|^\mathfrak{A} = T \iff \text{CHASED(FINN, BESS)}\)
(43) Val(_, [s Finn chased Bess])^\mathfrak{A} \iff \text{CHASED(FINN, BESS)}

Instead of saying that (41) denotes a truth value, we can say that (41) applies to everything or nothing, depending on whether or not Finn chased Bess. On this Tarskian view, if Finn chased Bess, then (41) applies to you, me, Finn, Bess, the number six, etc. (In general: if P, then we’re all such that P.) Similarly, we can say that relative to any particular assignment, (44) applies to everything or nothing.

(44) Finn chased it
(45) Val(_, [s Finn chased it])^\mathfrak{A} \iff \text{CHASED(FINN, A[1])}

In which case, relative to each assignment \(\mathfrak{A}\), (44) applies to \(\mathfrak{A}[1]\)—and everything else—if and only if Finn chased \(\mathfrak{A}[1]\). So we don’t need truth values, together with lambda abstraction, to accommodate relative clauses. Given (46), ‘which Finn chased’ applies to an entity if and only if Finn chased it.

(46) Val(_, [which1 [s Finn chased t1]])^\mathfrak{A} \iff 
  
  \text{for some/the assignment } \mathfrak{A}^* \text{ such that } =(_, \mathfrak{A}^*[1]) \& \mathfrak{A}^* \text{ is otherwise just like } \mathfrak{A}, 
  
  Val(\mathfrak{A}^*[1], [s Finn chased t1])^{\mathfrak{A}^*}

When we’re not worrying about truth values or sets, we can replace (46) with (47).

(47) \(|\text{which1 [s Finn chased t1]}|^\mathfrak{A} = \lambda x. T \iff \text{CHASED(FINN, x)}\)

But (47) is no simpler than (46). Relative to any assignment \(\mathfrak{A}\), ‘\(\lambda x. T \iff \text{CHASED(FINN, x)}\)’ is shorthand for the following mouthful: the smallest function that maps each entity \(e\) to \(T\) or \(\bot\) depending on whether or not ‘\(\text{CHASED(FINN, x)}\)’ is satisfied by the ‘\(x\)’-variant of \(\mathfrak{A}\) that assigns \(e\) to ‘\(x\)’

Though before trying to run without sets/functions, let’s be clear that we can walk without truth values, at least if we assume that quantifiers displace as in (48).

(48) \(\forall s [\text{every}_Q \text{ cow}_N @1 [s \text{ Finn chased t1}]]\)

And for these purposes, let’s not worry about how \(\text{CHASED(FINN, A[1])}\) gets spelled out eventishly.

(49) \(\exists e \{\text{SIMPLE-PAST(E) \& CHASE(E, FINN, A[1])}\}\)
(49a) \(\exists e \{\text{SIMPLE-PAST(E) \& BY(E, FINN) \& CHASE-OF(E, A[1])}\}\)
(49b) \(\exists_\langle \text{SIMPLE-PAST(_)} \rangle \exists[\text{BY(_)} \neg= \langle, \text{FINN})] \exists \text{CHASE-OF}(_) = \langle, A[1])\rangle\)
(49c) \(\hat{\top} \{\text{SIMPLE-PAST(_)} \rangle \exists[\text{BY(_)} \neg= \langle, \text{FINN})] \exists \text{CHASE-OF}(_) = \langle, A[1])\rangle\}

where \(\hat{\top} \{\Phi(_)}\) is a polarized predicate that applies to everything or nothing, depending on whether or not \(\Phi(_)\) applies to something.
1. Val(<α, β>, every <0>) iff α ≥ β [axiom]
2. Val(_, cow N)[α] iff COW(_)
3. Val(α, […O … N)]<0>) iff 3β[Val(<α, β>, […]<0>) & α = {x: Val(x, […]<0>)}
4. Val(α, [every α cow N]<0>) iff α ≥ {x: COW(x)}
5. Val(_, [s […]q1 [s …t […]])<α> iff
   \[\exists \alpha \{Val(\alpha, […]<0>) & α = \{x: \exists A^*[A^*[1] = x & A^* \equiv A^* & \text{CHASED}(Finn, A^*[1])}\}\] cp. Larson & Segal (1995)
6. Val(_, [s Finn chased t1])<α> iff CHASED(Finn, A^*[1]) [Appendix A]
7. Val(_, [s [every α cow N]q1 [s Finn chased t1]])<α> iff
   \[\exists \alpha \{Val(\alpha, […]<0>) & α = \{x: \exists A^*[A^*[1] = x & A^* \equiv A^* & \text{CHASED}(Finn, A^*[1])}\}\] cp. Larson & Segal (1995)
   \[\equiv \{x: \exists A^*[A^* \equiv A^* & \text{CHASED}(Finn, x)\}\}\]
7a. Val(_, [s [every α cow N]q1 [s Finn chased t1]])<α> iff {x: \text{CHASED}(Finn, x)} ≥ {x: COW(x)} [7, abbreviated]

**Second Step: Treat Quantifiers as Plural Predicates**

Rewrite the axiom for ‘every’: Val(O, every <0>) iff \(\exists \forall \exists Y \{\text{EXTERNALS}(O, X) & \text{INTERNALS}(O, Y) & \forall x: Y(x)\}\)

For any ordered pair \(<<, t, \ldots, a, k. \{e, e, i\}>\) — e is the pair’s external element.

But we don’t have to say that the Os are pairs of sets that meet a certain set-theoretic condition.

Let the Os be pairs of entities that meet a plural condition: each of their Internals is one of their Externals.

\(\text{EVERY}(O)\) iff \(\exists \forall \exists Y \{\text{EXTERNALS}(O, X) & \forall y (Y(y) \equiv \exists o: \text{INTERNAL}(o, y)) & \forall x: Y(x)\}\)

\(\exists \forall \exists Y \{\text{EXTERNALS}(O, X) & \text{INTERNALS}(O, Y) & \forall x: Y(x)\}\)

Now we can rewrite the derivation above without assuming an extended domain that includes a set of cows.

1. Val(O, every <0>) iff EVERY(O) [axiom]
2. Val(_, cow N[α]) iff COW(_)
3. Val(O, […O … N]<0>) iff Val(O, […]<0>) & \(\exists \forall \exists \{\text{EXTERNALS}(O, Y) & \forall y (Y(y) \equiv \text{Val}(y, […]<0>)\}\) [axiom]
4. Val(O, [every α cow N]<0>) iff EVERY(O) & \(\exists \forall \exists \{\text{INTERNAL}(o, y) & \forall y (Y(y) \equiv \text{COW}(y))\}\) [1, 2, 3]
4a. Val(O, [every α cow N]<0>) iff EVERY(O) & \(\forall y \text{COW}(y)\{\text{INTERNAL}(O, Y)\}\) [4, abbreviated]
5. Val(_, [s […]q1 [s …t […]])<α> iff \(\exists \forall \{\text{Val}(O, […]<0>) & \exists X \{\text{EXTERNALS}(O, X) & \forall x (X(x) \equiv \exists A^*[A^*[1] = x & A^* \equiv A^* & \text{CHASED}(Finn, A^*[1]))\}\}\) [axiom, cp. (46)]
6. Val(_, [s Finn chased t1])<α> iff CHASED(Finn, A^*[1]) [Appendix A]
7. Val(_, [s [every α cow N]q1 [s Finn chased t1]])<α> iff
   \[\exists \forall \{\text{EVERY}(O) & \forall y \text{COW}(Y)\{\text{INTERNAL}(O, Y)\} & \exists X \{\text{EXTERNALS}(O, X) & \forall x (X(x) \equiv \exists A^*[A^*[1] = x & A^* \equiv A^* & \text{CHASED}(Finn, A^*[1]))\}\}\) [4, 5, 6]
    \[\equiv \exists A^*[A^* \equiv A^* & \text{CHASED}(Finn, x)\}\]
7a. Val(_, [s [every α cow N]q1 [s Finn chased t1]])<α> iff \(\exists \forall \{\text{EVERY}(O) & \forall y \text{COW}(Y)\{\text{INTERNAL}(O, Y)\} & \forall x \text{CHASED}(Finn, X)\{\text{EXTERNALS}(O, X)\}\} \) [7, abb.]
But this still doesn’t capture the restricted/conservative character of quantificational determiners. The axiom for ‘every’ allows for ordered pairs such that some of their external elements are not among their internal elements. (Finn may have chased many things that are not cows.) And the external/sentential argument of ‘every’ was treated as if it were the relative clause in (50).

(50) every cow which Finn chased

That’s almost as bad as appealing to quantifier raising and the idea that ‘every cow’ is of type <ct, t>. But the goal is not to recode this idea, with all its warts, a little more austere. The “minimalist” hope is that aiming for austerity will help identify which aspects of our notation do the explanatory work.


With regard to (48), we want to explain the semantic asymmetry between cowΝ and [s Finn chased t1].

(48) [s [everyQ cows]Οι [s Finn chased t1]]

So if the displaced quantifier recombines with the sentence from which it was displaced, maybe we don’t want a semantics that erases this grammatical asymmetry as in (51); cp. Heim & Kratzer (1998).

(51) [t> [every<ct, et, t> cow<ct>]-<et, t> [t> 1 [t> Finn chased t1]]]]

Maybe we should return to (40)—a claim about the cows, with no reference to the things Finn chased…

(40) ∃X[∀x(Yx ∈ Cow(x)) & ∃X[∀x(Yx ∈ Y & Chased(Finn, x)) & ∀x:Yx(Xx)]

(40a) tY:Cows(Y){∃X[∀x(Yx ∈ Y & Chased(Finn, x)) & ∀x:Yx(Xx)]

… and no reference to any relation exhibited by the (set of) cows and the (set of) things Finn chased. So let me end with two suggestions—perhaps notational variants—about how to get from (48) to (40).

(52) Val(O, […ο …οο]οο)οο iff

Val(O, …οοοο)οο & ∃Y[Internals(O, Y) & ∀y(Yy ∈ Val(y, …οοοο)) & ExternalsAreInternals(O)]

(53) Val(_., [s […ο …οο]οο [s …tιtι…]], Α) iff

∃O{Val(O, […]οο)οο & ∃X[Externals(O, X) &

∀x(Xx ≡ ∃Α*:x = Α*:ι) & Val(Α*:ι], …οοοοοοοοοο)οο & Α*:ι ≡ Α & {Val(Α*:ι[1], […ιιιιιιιιιι]οοοοοοοοοοοοοοοοοοοοοοο)}

We can deny that the Os pair their internal entities with independently selected external entities. We need not (and should not) say that quantificational determiners express second-order relations. The external/sentential argument—a polarized predicate containing a trace of the displaced quantifier—is used to make a secondary selection from values of the internal/nominal argument. On this view, the combinatorics ensures conservativity. So while identity is not a conservative second-order relation, we can still specify the meaning of ‘every’ with an identity condition, as opposed to an inclusion condition.

Val(O, everyοοοο)οο έι ff 3Y3X[Internals(O, Y) & Externals(O, X) & ∀x(Yx ∈ Xx)]

3Y[Internals(O, Y) & Externals(O, Y)]

tY:Internals(O, Y)[Externals(O, Y)]
Appendix C: Comparing Axioms and Derivations for ‘Finn chased it’

a. Val(_, -d_T)^A iff PAST-SIMPLE(_)

b. Val(_, Φ-Finn)^A iff (=, R-FINN)

c. for any index i, Val(_, t)^i iff (=, Λ[i])

d. Val(_, chase_v [⋯])^A iff

     \[\exists [CHASE-OF(_, _)^A] Val(_, _)^A\]

e. Val(_, [by_v ⋯])^A iff \[\exists [BY(_, _) Val(_, _)]^A\]

f. Val(_, [⋯<M> ⋯<M>^+])^A iff

     Val(_, [⋯<M>])^A ∧ Val(_, ⋯<M>^+)^A

h. Val(_, [Σ [⋯]])^A iff for some e, Val(e, ⋯)^A

You can blame tense for the matrix Θ-closure: \[||-d_T||^A = Φ.\exists e\{PastSimple(e) & Φ(e)\}\].

But this assigns two jobs to one morpheme: quantification and restriction.

And the restriction is already complicated. Moreover, (6-9) suggest that Θ-closure doesn’t require tense.

15
Appendix D: Composition as De-Abstraction…Bait and Switch

(1) Finn chased Bess
(1a) [Finn[chased Bess] ]

What about tense and adverbial modifiers?

(1b) [… [Finn[chase Bess] ] ]

What about passives and other motivations for “severing” external arguments?

(1c) [… [Finn[chase Bess] ] ]

Are there any simple cases that motivate the standard typology, in the way that (1) was supposed to?

(2) chase Bess
(2a) [chase Bess ]

Are names atomic expressions of type <e>? And is (3) as complicated as (3a)? Or is this just a game?

(3) chase cows
(3a) [[(sm)[cow s] [t1[chase t]] ]]

References (Very Incomplete…for more, see the list in Pietroski 2018)

Linguistics and Philosophy 4:159-219.


Natural Language Semantics 19:227-56.


