On noun coördination

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1 *Basic meaning of 'and'?*

- STARTING POINT: *and* appears to have multiple basic meanings.
- Logical conjunction, which may type-shift to intersection:[1]

(1) a. John lies and Mary cheats.

b. $[\![\text{and}_{\text{t}}]\!] = \lambda t_{\text{t}} \,.\, \lambda u_{\text{t}} \,.\, t \wedge u$

(2) a. John lies and cheats.

b. $[\![\text{and}_{\alpha,\text{t}}]\!] = \lambda P_{\alpha,\text{t}} \,.\, \lambda Q_{\alpha,\text{t}} \,.\, \lambda x_{\alpha} \,.\, P(x) \wedge Q(x)$

- A summation operator:[2]

(3) a. John and Mary met.

b. $[\![\text{and}_{\text{sum}}]\!] = \lambda x_{\text{e}} \,.\, \lambda y_{\text{e}} \,.\, x \oplus y$

- An operator which forms a predicate of pairs:[3]

(4) a. Every man and woman (who dated) met in the park.

b. $[\![\text{and}_{\text{pair}}]\!] = \lambda P_{\langle \text{e,t}\rangle} \,.\, \lambda Q_{\langle \text{e,t}\rangle} \,.\, \lambda X_{\text{e}} \,.\, \exists x, y[P(x) \wedge Q(y) \wedge X = x \oplus y]$

- WINTER, CHAMPOLLION: take steps towards unification.
  - Winter (2001): $[\![\text{and}_{\text{sum}}]\!] \rightsquigarrow [\![\text{and}_{\alpha,\text{t}}]\!]$
  - Champollion (2016), extending Winter: $[\![\text{and}_{\text{pair}}]\!] \rightsquigarrow [\![\text{and}_{\alpha,\text{t}}]\!]$.
- TODAY: focus on Champollion (2016).[4]
  - Review especially §1-5 (slightly modified).
  - Explore a possible revision in terms of $[\![\text{and}_{\text{t}}]\!]$, rather than $[\![\text{and}_{\alpha,\text{t}}]\!]$ – per Hirsch's (2017b) Semantic Inflexibility Hypothesis (SIH).

(5) SEMANTIC INFLEXIBILITY HYPOTHESIS
The grammar lacks the power to generate type-shifted meanings.

  - Attempt further simplification by reducing MIN to grammatical exhaustification via EXH.
  - Rethink Champollion's solution to the problem of overlapping individuals as domain restriction via EXH, thus dispensing with the need for choice functions.

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[1] e.g. Keenan & Faltz (1979, 1985), Gazdar (1980), Partee & Rooth (2012), Jacobson (1999)

[2] Link (1983)

[3] Link (1984)

[4] Examples throughout, unless otherwise noted, are from Champollion (2016).

2 *'Man and woman' with* INT

- REQUIRED: a reading for *man and woman* as. mw-pair.[5]

(7) $$[\![\text{man and woman}]\!] = \lambda X_{\mathsf{e}}\,.\,\exists x, y[\mathsf{man} \wedge \mathsf{woman} \wedge X = x \oplus y] \\ \equiv \lambda X_{\mathsf{e}}\,.\,\mathsf{mw\text{-}pair}(X)$$

- Relative clauses with split antecedents (as above):

(8) A man and woman who dated met in the park.

- Modification with adjectival predicates of pluralities:

(9) a. That ill-matched man and woman

b. That mutually incompatible man and woman

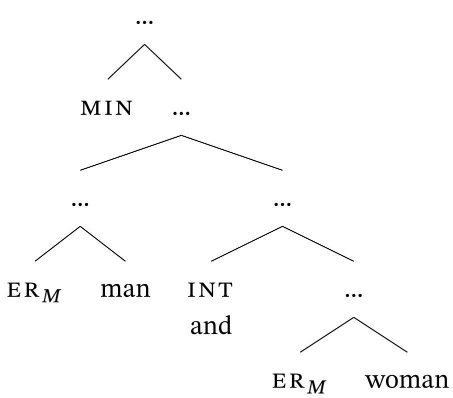
- A novel argument from local *Maximize Presupposition!*:[6]

(11) a. # A man and woman who were all angry left quickly.

b. A man and woman who were both angry left quickly.

- The anti-presupposition of the relative clause in (11a) (that $|X| > 2$) clashes with the restrictor of the quantifier *man and woman*, just in case *man and woman* ranges *only* over pairs, i.e., pluralities X s.t. $|X| = 2$.
- CHAMPOLLION: intersective *and* between two silent operators.
- Proposed LF for *man and woman*, under the mw-pair reading:

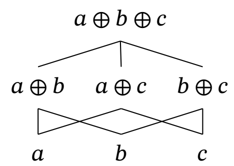
(12)



1. Raising (ER$_M$)
2. Intersection (INT)
3. Minimization (MIN)

[5] Champollion assumes a type distinction between atomic individuals and pluralities, which are taken to be type e and $\langle \mathsf{e}, \mathsf{t}\rangle$ respectively, following Bennett (1974) and Winter (2001). Following Fox's 2015 MIT lecture notes, we reframe Champollion's analysis in terms of a more orthodox, lattice-theoretic approach to plurality (Link 1983), according to which both atomic individuals and pluralities are of type e, however. The domain of entities forms a *complete atomic join semi-lattice*, closed under the summation operator $\oplus$. This is illustrated in (6) for $D_e = \{a, b, c\}$.

(6)



Note that the structure in (6) is completely isomorphic to the powerset of the domain with $\varnothing$ removed – lattice-theoretic and set-theoretic approaches to plurality are essentially equivalent.

[6] This is modelled on Percus's (2006) example (10). Percus discovered that *Maximize Presupposition* applies to embedded constituents (see also Singh 2011), giving rise to oddness effects when the anti-presupposition (in this case, that x has more than two students) clashes with the restrictor of the determiner.

(10) a. Everyone with exactly two students assigned the same exercise to both his students.

b. # Everyone with exactly two students assigned the same exercise to all his students.

2.1 Existential raising

- (13) takes a set of individuals P, and returns the set of individuals that have one or more members of P as a part.

(13) $[\![\text{ER}_M]\!] = \lambda P_{\langle e,t\rangle} \,.\, \lambda X_e \,.\, \exists x[P(x) \wedge x \leq X]$

- For example, when we apply ER_M to *man*, we get back the set of (plural) individuals which have at least one (atomic) man as a part.[7]

[7] We assume here that singular NPs range over atoms only, following Sauerland, Anderssen & Yatsushiro (2005).

(14) $[\![\text{ER}_M]\!]([\![\text{man}]\!]) = \lambda X_e \,.\, \exists x[\mathsf{man}(x) \wedge x \leq X]$
$\equiv \lambda X \,.\, \mathsf{man}_{ER}(X)$

2.2 Intersection

- *and* is interpreted as one instantiation of $[\![\text{and}_{\alpha,t}]\!]$:

(15) $[\![\text{INT}]\!] = \lambda P_{\langle e,t\rangle} \,.\, \lambda Q_{\langle e,t\rangle} \,.\, \lambda X_e \,.\, P(X) \wedge Q(X)$

- INT takes the ER_M-ed NPs and intersects them. The result is the set of all pluralities with at least an atomic man part and an atomic woman part.

(16) $[\![\text{INT}]\!](\mathsf{woman}_{ER})(\mathsf{man}_{ER})$
$= \lambda X_e \,.\, \exists x, y[\mathsf{man}(x) \wedge \mathsf{woman}(y) \wedge x, y \leq X]$

2.3 Minimization

- MIN takes a set of pluralities, and returns the *minimal* pluralities from that set, i.e., those pluralities which do not have any other elements of the set as proper parts.

(17) $[\![\text{MIN}]\!] = \lambda P_{\langle e,t\rangle} \,.\, \lambda X_e \,.\, P(X) \wedge \forall X'[X' > X \rightarrow \neg P(X')]$[8]

[8] Here, > is to be understood as "has as a proper part".

- Assuming contextual knowledge that a given individual cannot be both a man and a woman, when we apply INT to the intersected ER_M-ed NPs, we get back the set of man-woman pairs, i.e. those pluralities which have a man part, a woman part, and no other.

2.4 Putting it all together

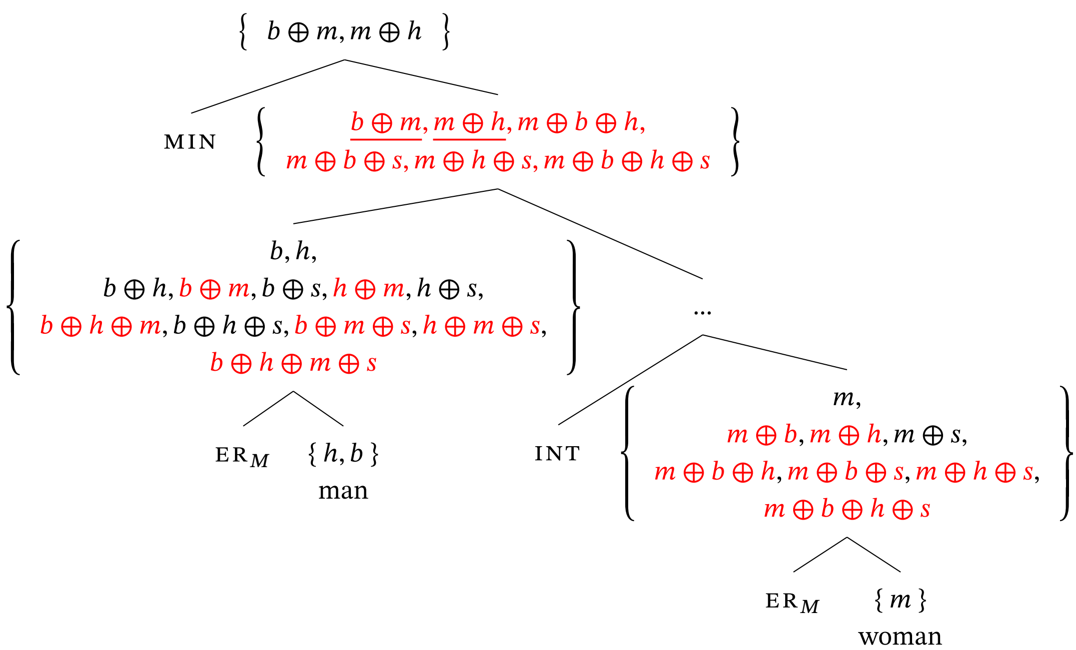
- We can see how these operations work more intuitively from an extensional perspective. Assume the following model:

(18) a. $[\![\text{man}]\!] = \{\, \mathsf{homer}, \mathsf{bart} \,\}$

b. $[\![\text{woman}]\!] = \{\, \mathsf{marge} \,\}$

c. $[\![\text{dog}]\!] = \{\, \mathsf{santasLittleHelper} \,\}$

(19)



2.5 *Extension: DP conjunction (Winter 2001)*

(20) John and Mary met in the park last night.

- To account for DP conjunction, we need one more ingredient – Partee's (1986) IDENT-shifter.[9]. IDENT takes an individual, and returns the property of being identical to that individual.

(21) a. $[\![\text{IDENT}]\!] = \lambda x_{\mathsf{e}} \,.\, \lambda y_{\mathsf{e}} \,.\, y = x$

b. $[\![\text{IDENT}]\!]([\![\text{John}]\!]) = \lambda x \,.\, x = \mathsf{John}$

$\equiv \mathsf{John}_{ID}$

- We can now derive the collective interpretation via IDENT, followed by ER, INT, and MIN:

[9] Alternatively, we could simply assume that the basic meaning of a proper name is its IDENT-shifted meaning, as argued for on independent grounds by Fara (2015).

(22) $\lambda X_{\mathrm{e}} \,.\, X = \text{John} \oplus \text{Mary}$
- MIN
- $\lambda X_{\mathrm{e}} \,.\, \exists x, y[x = \text{John} \wedge y = \text{Mary} \wedge x, y \leq X]$
  - $\lambda X_{\mathrm{e}} \,.\, \exists x[x = \text{John} \wedge x \leq X]$
    - ER_M
    - John_{ID}
  - ...
    - INT
    - $\lambda X_{\mathrm{e}} \,.\, \exists x[x = \text{Mary} \wedge x \leq X]$
      - ER_M
      - Mary_{ID}

- N.b. that rather than using IDENT, Champollion uses Partee's (1986) LIFT, but we believe that the differences are insignificant since LIFT is simply the composition of ER and IDENT.[10]

[10] Informal demonstration of this fact. N.b. that since we have defined ER via the parthood relation, we must define LIFT via the parthood relation too.

(23) $[\![\text{LIFT}_M]\!] = \lambda x \,.\, \lambda X \,.\, x \leq X$

(24) $[\![\text{LIFT}_M]\!] = [\![\text{ER}_M]\!] \cdot [\![\text{IDENT}]\!]$

(25) $([\![\text{ER}_M]\!] \cdot [\![\text{IDENT}]\!])([\![\text{John}]\!])$
$= \lambda X_{\mathrm{e}} \,.\, \exists x[x = \text{John} \wedge x \leq X]$
$\equiv \lambda X_{\mathrm{e}} \,.\, \text{John} \leq X$

2.6 The problem of overlapping individuals

- In the example of NP coordination we considered, the sets denoted by the NPs were (crucially) taken to be disjoint. What happens if the sets are not disjoint?

(26) A doctor and lawyer met.

- Assume that, contingently, all of the doctors happen to also be lawyers, and vice versa.

(27) $[\![\text{doctor}]\!] = [\![\text{lawyer}]\!] = \{\, a, b, c \,\}$

(28) Existential raising:
$[\![\text{doctor}_{ER}]\!] = [\![\text{lawyer}_{ER}]\!] = \{\, a, b, c, a \oplus b, a \oplus c, b \oplus c, a \oplus d, \ldots \,\}$

(29) Intersection (of set with self):
$([\![\text{doctor}_{ER}]\!] \cap [\![\text{lawyer}_{ER}]\!]) = [\![\text{doctor}_{ER}]\!] = [\![\text{lawyer}_{ER}]\!]$

(30) Minimization:
$[\![\text{MIN}]\!]([\![\text{doctor}_{ER}]\!] \cap [\![\text{lawyer}_{ER}]\!]) = \{\, a, b, c \,\}$

- In this instance, applying MIN will return a set of atomic doctor-lawyer individuals, and the sentence is incorrectly predicted to be deviant in this context, since collective predicates such as *meet* are undefined for atomic individuals.

(31) a. # A doctor met.

b. # A lawyer met.

- GENERALIZING: a similar problem arises when just one individual overlaps:

(32) a. $[\![\text{doctor}]\!] = \{ a, b \}$

b. $[\![\text{lawyer}]\!] = \{ a, c \}$

(33) Existential raising + intersection:
$[\![\text{doctor}_{ER}]\!] \cap [\![\text{lawyer}_{ER}]\!] = \{ a, a \oplus b, a \oplus c, b \oplus c, \dots \}$

(34) Minimization:
$[\![\textsc{min}]\!]([\![\text{doctor}_{ER}]\!] \cap [\![\text{lawyer}_{ER}]\!]) = \{ a, b \oplus c \}$

- The output contains the atom a, but no plurality with a.
- If, e.g. a met c, *a doctor and lawyer met* is intuitively true, but is predicted to be false!
- More problematic data involving QPs conjoined with proper names:

(35) John and some man met.[11]

[11] Note that for ease of exposition, we assume that $\textsc{er}_M$ can be spelled-out as *some*. This is by no means trivial however, and may well lead to problems with other determiners.
An alternative LF would involve scoping *some* out of the conjunction, and lifting its trace.

- Assume that John is a man.

(36) a. $[\![\text{John}_{ID}]\!] = \{ j \}$

b. $[\![\text{man}]\!] = \{ j, a, b \}$

(37) Existential raising + intersection:
$([\![\text{ER}]\!]([\![\text{John}_{ID}]\!])) \cap [\![\text{man}_{ER}]\!]) = \{ j, j \oplus a, j \oplus b, \dots \}$

(38) Minimization:
$[\![\textsc{min}]\!]([\![\text{ER}]\!]([\![\text{John}_{ID}]\!])) \cap [\![\text{man}_{ER}]\!]) = \{ j \}$

- Incorrectly predicted baseline:

(39) #John met.

- Champollion's solution is to introduce *choice functions* into the system, replacing *existential raising* with so-called *choice-raising*.

3 *Choice raising*

- RESPONSE: split the raising operation into two pieces, using choice functions.

  1. CHOICE RAISING: Introduces a free choice function variable ($g(\langle i, \langle \text{et}, \text{e}\rangle\rangle)$), applies that to the input set (P), and returns the set of all pluralities containing $g(\langle i, \langle \text{et}, \text{e}\rangle\rangle)(P)$.[12]

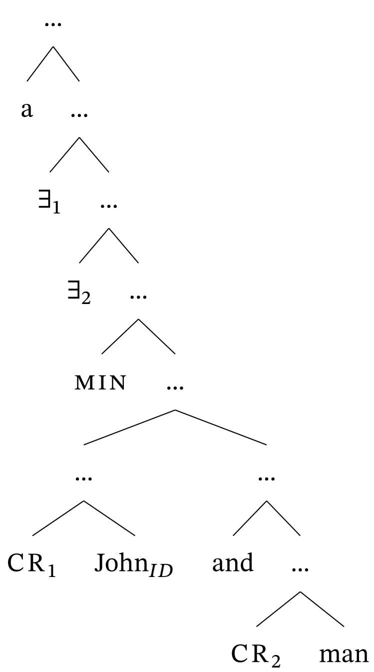
(40) $[\![\text{CR}_i]\!]^g = \lambda P_{\text{et}} \,.\, \lambda X_{\text{e}} \,.\, (g(\langle i, \langle \text{et}, \text{e}\rangle\rangle))(P) \leq X$

  2. CHOICE CLOSURE: The choice function variable is existentially bound higher in the NP.

(41) $[\![\exists]\!] = \lambda A_{\langle\langle \text{et},\text{e}\rangle,\text{et}\rangle} \,.\, \lambda X_{\text{e}} \,.\, \exists f_{\langle \text{et},\text{e}\rangle}[A(f)(X)]$

- THE TRICK: the scope of the two pieces of existential raising is split.

(42) Updated LF:



(43) Order of operations:
Choice raising < Intersection < Minimization < Choice Closure

- Choice function in the left conjunct must pick out John:

(44) $$\begin{aligned}[\![\text{CR}_1]\!](\{\,j\,\}) &= \lambda X_{\text{e}} \,.\, (g(1)(\{\,j\,\})) \leq X \\ &= \lambda X_{\text{e}} \,.\, j \leq X \\ &= \{\, j, j \oplus a, j \oplus b, j \oplus c, \ldots \,\}\end{aligned}$$

[12] We assume that indices are a pair consisting of a numerical index and a type. We omit the type from here on out, where it is $\langle \text{et}, \text{e}\rangle$.

- Choice function in the right conjunct picks one man (John or someone else):

(45) $[\![\text{CR}_i]\!](\{\, j, a, b \,\}) = \lambda X_e \,.\, (g(i)(\{\, j, a, b \,\})) \leq X$

- Suppose g(2) picks out John, i.e., $g(2)(\{\, j, a, b \,\}) = j$

(46) OUTPUT OF CHOICE RAISING

$$[\![\text{CR}_2]\!](\{\, j \,\}) = \lambda X_{\text{e}} \,.\, (g(2)(\{\, j, a, b \,\})) \leq X$$
$$= \lambda X_{\text{e}} \,.\, j \leq X = \{\, j, j \oplus a, j \oplus b, j \oplus c, \ldots \,\}$$

(47) INTERSECTION + MINIMIZATION

$$[\![\text{MIN}]\!]([\![\text{CR}_1]\!]([\![\text{John}_{ID}]\!]) \cap [\![\text{CR}_2]\!]([\![\text{man}]\!])) = \{\, j \,\}$$

- Suppose g(2) picks out someone else, e.g., $g(2)\{\, j, a, b \,\} = a$.

(48) OUTPUT OF CHOICE RAISING

$$[\![\text{CR}_2]\!](\{\, j \,\}) = \lambda X_{\text{e}} \,.\, (g(2)(\{\, j, a, b \,\})) \leq X$$
$$= \lambda X_{\text{e}} \,.\, a \leq X$$
$$= \{\, j \oplus a, b \oplus a, c \oplus a, \ldots \,\}$$

(49) INTERSECTION + MINIMIZATION

$$[\![\text{MIN}]\!]([\![\text{CR}_1]\!]([\![\text{John}_{ID}]\!]) \cap [\![\text{CR}_2]\!]([\![\text{man}]\!])) = \{\, j \oplus a \,\}$$

- The effect of Choice Closure is to return the *union* of the sets output with CR-INT-MIN for any value of g(2) – which includes pairs containing John!

(50) OUTPUT OF CHOICE CLOSURE

$$\{\, j, j \oplus a, j \oplus b \,\}$$

- If John met another man, the sentence now rightly comes out true.
- The system extends to other cases of predicate overlap (*doctor and lawyer*).

4 *Extension to plurals*

- Champollion observes that (51) is ambiguous - it may refer to a group of ten individuals, five of whom are men and five of whom are women (10-people reading), or it may refer to a group of five individuals each of whom is either a man or a woman, and containing at least one man, and at least one woman.

(51) Five men and women

a. $\lambda X \,.\, \exists Y, Z \begin{bmatrix} X = Y \oplus Z \\ \wedge\ |Y|, |Z| = 5 \\ \wedge\ \forall y \leq_{\text{atom}} Y[\mathsf{man}] \\ \wedge\ \forall z \leq_{\text{atom}} Z[\mathsf{woman}] \end{bmatrix}$

"Ten people total total, including five men and ten women."

b. $\lambda X \,.\, |X| = 5$
$\exists y \leq_{\text{atom}} X[\mathsf{man}(y)]$
$\exists z \leq_{\text{atom}} X[\mathsf{woman}(z)]$
$\forall x \leq_{\text{atom}} X[\mathsf{man}(x) \vee \mathsf{woman}(x)]$

"Five people total – mixture of men and women."

- The ten people reading can be straightforwardly derived:

(52) DETERMINER DOUBLING
five men and ~~five~~ women

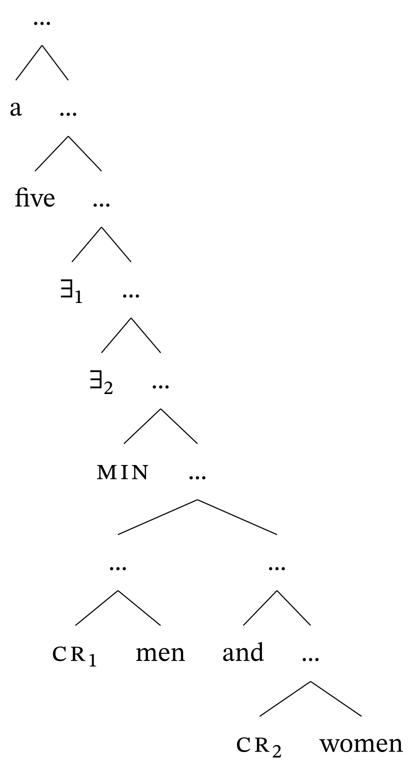
- The five people (mixture) reading is the puzzle — but in fact falls out from the system as already developed, with Choice Raising.[13]

[13] Champollion invokes different variants of Choice Raising for *man and woman* and *men and women*, since there is a type distinction between predicates of atoms (type ⟨e, t⟩) and predicates of plurals (type ⟨et, t⟩) in his system. Given the types we are presenting, both are type ⟨e, t⟩ and the earlier Choice Raising can be maintained, as far as we can tell.

4.1 Deriving mixtures

- Available parse, with Choice Raising and non-local Choice Closure.

(53)



- ASSUME: plural NPs contain only pluralities of men/women in their extension.

(54) a. $[\![\text{men}]\!] = \{ X_{\mathsf{e}} : \neg\mathsf{atom}(x) \wedge \forall x \leq X[\mathsf{man}(x)] \}$

b. $[\![\text{women}]\!] = \{ X_{\mathsf{e}} : \neg\mathsf{atom}(x) \wedge \forall x \leq X[\mathsf{woman}(x)] \}$

- Choice functions with CR pick out one of these pluralities, for instance:

(55) SUPPOSE $g(1)[\![\text{men}]\!] = j \oplus b$

$$[\![\textsc{cr}_1]\!]([\![\text{men}]\!]) = \lambda X_{\mathsf{e}} \,.\, (\mathrm{g}(1)([\![\text{men}]\!])) \leq X$$
$$= \lambda X_{\mathsf{e}} \,.\, j \oplus b \leq X$$
$$= \{ j \oplus b, j \oplus b \oplus m \oplus s, j \oplus b \oplus f \oplus m \oplus s, \ldots \}$$

(56) SUPPOSE $g(2)([\![\text{women}]\!]) = m \oplus s$

$$[\![\textsc{cr}_2]\!]([\![\text{women}]\!]) = \lambda X_{\mathsf{e}} \,.\, (\mathrm{g}(2)([\![\text{women}]\!])) \leq X$$
$$= \lambda X \,.\, m \oplus s \leq X$$
$$= \{ m \oplus s, j \oplus b \oplus m \oplus s, j \oplus b \oplus f \oplus m \oplus s, \ldots \}$$

(57) INT + MIN

$$[\![\textsc{min}]\!]([\![\textsc{cr}_1]\!]([\![\text{men}]\!]) \cap [\![\textsc{cr}_2]\!]([\![\text{women}]\!])) = \{ j \oplus b \oplus m \oplus s \}$$

- OUTPUT: the mixture of the two pluralities picked out by the choice functions.
- SCALING UP: Choice Closure returns the set of all man/woman mixtures.

(58) OUTPUT OF CHOICE CLOSURE

$$\lambda X_{\mathsf{e}} \,.\, \exists f, f'[[\![\textsc{min}]\!]((f([\![\text{men}]\!]) \leq X) \cap (f'([\![\text{women}]\!]) \leq X))]$$

"For some pluralities of men and women, X is the mixture of just them."

- *Five* whittles down to mixtures of just five men and women.

5 *Possible modifications of Champollion*

- intersective *and* is *rigidly-typed* as $\langle \mathsf{t}, \mathsf{tt} \rangle$ (i.e., no polymorphic conjunction).[14]
- No sum-formation *and* of type $\langle \mathsf{e}, \mathsf{ee} \rangle$.
- sum-formation can be reduced to intersective *and* + hidded syntactic structure, following Champollion (2016) but with a different implementation.

[14] Hirsch (2016, 2017a,b)

5.1 *Ingredients*

- EXISTENTIAL RAISING: following Champollion (2016) we're going to assume free application of Existential Raising:[15]

[15] Could we further simplify by assuming that NPs are inherently existentially raised?

(59) $[\![\textsc{er}_M]\!] = \lambda f_{\mathsf{et}} \,.\, \lambda X_{\mathsf{e}} \,.\, \exists x[f(x) \wedge x \leq X]$

- NP-INTERNAL SUBJECT HYPOTHESIS: we assume that NPs have a PRO subject, which is interpreted as a bound variable. Under ordinary circumstances, the presence of PRO makes no semantic difference. The basic LF for "a man" is therefore as follows:

(60) $\lambda P \,.\, \exists x[\mathsf{man}(x) \wedge P(x)]$
- a
- $\lambda x \,.\, \mathsf{man}(x)$
  - λx
  - 1 iff $\mathsf{man}(x)$
    - x / PRO$_x$
    - $\lambda x \,.\, \mathsf{man}(x)$ / man

- However, PRO allows us to reconcile Champollion's analysis of NP conjunction with the Semantic Inflexibility Hypothesis by getting rid of INT, and replacing it with rigidly-typed truth-functional *and*.

(61) $\lambda X \,.\, \exists x, y[\mathsf{man}(x) \wedge \mathsf{woman}(y) \wedge X = x \oplus y]$
- MIN
- $\lambda X \,.\, \exists x, y[\mathsf{man}(x) \wedge \mathsf{woman}(y) \wedge x, y \leq X]$
  - λX
  - 1 iff $\exists x, y[\mathsf{man}(x) \wedge \mathsf{woman}(y) \wedge x, y \leq X]$
    - 1 iff $\exists x[\mathsf{man}(x) \wedge x \leq X]$
      - PRO$_X$
      - $\lambda X \,.\, \exists x[\mathsf{man}(x) \wedge x \leq X]$ / man$_{ER}$
    - ...
      - and$_{\mathsf{t}}$
      - 1 iff $\exists x[\mathsf{woman}(x) \wedge x \leq X]$
        - PRO$_X$
        - $\lambda X \,.\, \exists x[\mathsf{woman}(x) \wedge x \leq X]$ / woman$_{ER}$

- Note that we still need Champollion's (2016) MIN to winnow down the pluralities into just the pairs. At this stage we'd like to ask whether it's possible to also get rid of MIN and replace it with something more principled.

- EXHAUSTIFICATION IN THE GRAMMAR: we're going to assume the existence of a grammatical exhaustivity operator EXH, modelled after Fox (2007) (defined in terms of *innocent exclusion*):

(62) $[\![\text{EXH}]\!](w)(\varphi) = 1 \text{ iff } [\![\varphi]\!](w) \wedge \forall\psi \in \text{ALT}_{IE}(\varphi)[\neg[\![\psi]\!](w)]$

(63) $\text{ALT}_{IE}(\varphi) = \bigcap \left\{ \Psi' \subseteq \Psi \;\middle|\; \begin{array}{l} \Psi' \in \max(\Psi) \\ \wedge\, \exists w'[\forall\psi' \in \Psi'[\neg[\![\psi']\!](w')] \wedge [\![\varphi]\!](w')] \end{array} \right\}$

- In the general case, EXH will assert its prejacent φ, and negate the logically non-weaker alternatives, thus deriving scalar implicatures i.e.

(64) $[\![\text{EXH}]\!](w)([\![\text{some of the students smoke}]\!]) = 1$
iff $[\![\text{some of the students smoke}]\!](w) = 1$
$\wedge$ $[\![\text{all of the students smoke}]\!](w) = 0$

- CONJECTURE: EXH is responsible for winnowing out the groups consisting of a man, a woman, and other individuals, leaving only the man-woman pairs.[16]

[16] Note the parallel with Winter's (2001) MIN.

(65) $= \lambda Q_{\langle \tau t,t\rangle} . \lambda P_{\tau t} . P \in Q \wedge \forall P'[P' \subset P \rightarrow \neg(P' \in Q)]$

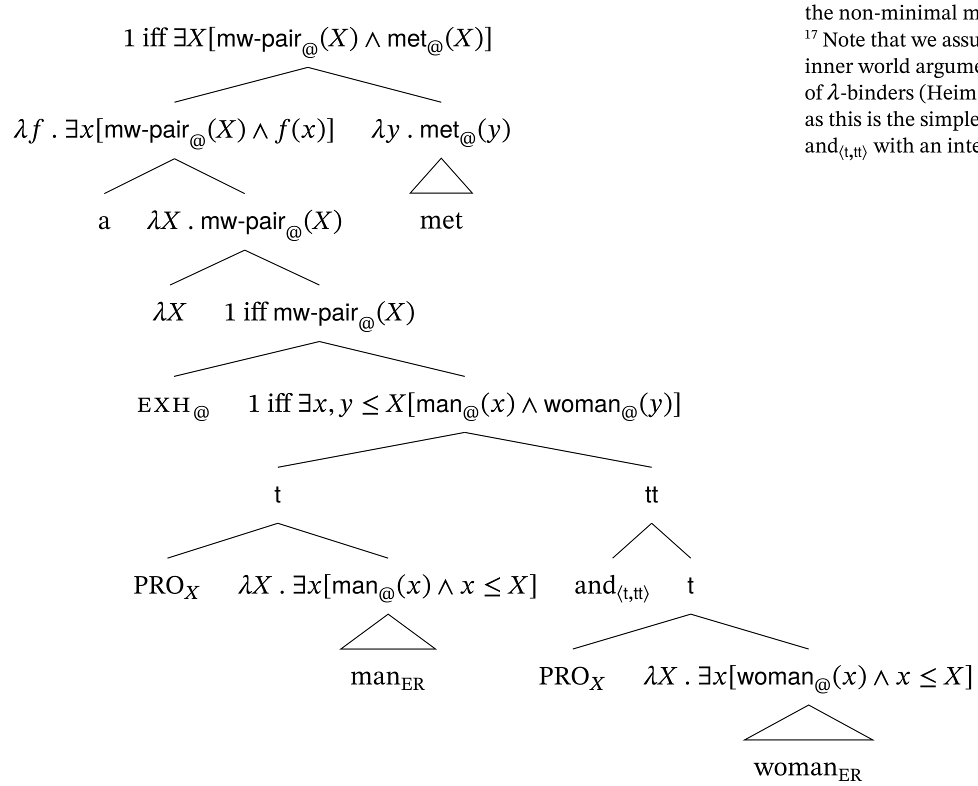
MIN takes a set of sets Q, and excludes the non-minimal members.

[17] Note that we assume a system with inner world arguments and free insertion of λ-binders (Heim & von Fintel 2011), as this is the simplest way of reconciling $\text{and}_{\langle t,tt\rangle}$ with an intensional semanticcs.

5.2 Putting the pieces together

- LF for "a man and woman met".[17]

(66)



- ER-ed man denotes a set of groups containing at least one man and possibly others. Assume again the following model:

(67) a. $[\![\text{man}]\!] = \{\,\mathsf{bart}, \mathsf{homer}\,\}$

b. $[\![\text{woman}]\!] = \{\,\mathsf{marge}\,\}$

c. $[\![\text{dog}]\!] = \{\,\mathsf{santasLittleHelper}\,\}$

(68) $$[\![\text{man}_{ER}]\!] = \left\{ \begin{array}{c} b, h, b \oplus h, b \oplus s, b \oplus m, h \oplus s, h \oplus s, \\ b \oplus h \oplus s, b \oplus h \oplus m, \\ b \oplus h \oplus s \oplus m \end{array} \right\}$$

(69) $$[\![\text{woman}_{ER}]\!] = \left\{ \begin{array}{c} m, m \oplus b, m \oplus h, m \oplus s, \\ m \oplus b \oplus h, m \oplus b \oplus s, m \oplus h \oplus s, \\ m \oplus b \oplus h \oplus s \end{array} \right\}$$

- So the prejacent of EXH denotes the following proposition:

(70) $$\begin{array}{l} X \in [\![\text{man}_{\text{ER}}]\!] \wedge X \in [\![\text{woman}_{\text{ER}}]\!] \\ \equiv X \in ([\![\text{man}_{\text{ER}}]\!] \cap [\![\text{woman}_{\text{ER}}]\!]) \\ \equiv X \in \left\{ \begin{array}{c} b \oplus m, h \oplus m \\ b \oplus m \oplus h, b \oplus m \oplus s, h \oplus m \oplus s, \\ b \oplus h \oplus m \oplus s \end{array} \right\} \end{array}$$

- INTUITION: the prejacent of EXH means the following: X has a man part and X has a woman part. We want to strengthen it to following: X has *only* a man part and a woman part.

(71) Alternatives to φ are of the form: $\text{NP}_{1,ER}$ and $\text{NP}_{2,ER}$

(72) $$[\![\text{man}_{\text{ER}} \text{ and (other) man}_{\text{ER}}]\!] = \left\{ \begin{array}{c} b \oplus h, b \oplus h \oplus m, \\ b \oplus h \oplus s, b \oplus h \oplus m \oplus s \end{array} \right\}$$

(73) $$[\![\text{man}_{\text{ER}} \text{ and dog}_{\text{ER}}]\!] = \left\{ \begin{array}{c} b \oplus s, h \oplus s, \\ b \oplus h \oplus s, b \oplus m \oplus s, h \oplus m \oplus s, \\ b \oplus h \oplus s \oplus m \end{array} \right\}$$

- Negating *man and man* cuts out the alternatives in red.

(74) $$X \in \left\{ \begin{array}{c} b \oplus m, h \oplus m \\ \color{red}{b \oplus m \oplus h}, b \oplus m \oplus s, h \oplus m \oplus s, \\ \color{red}{b \oplus h \oplus m \oplus s} \end{array} \right\}$$

- Negating *man and dog* cuts out the alternatives in blue:

(75) $$X \in \left\{ \begin{array}{c} b \oplus m, h \oplus m \\ b \oplus m \oplus h, b \oplus m \oplus s, h \oplus m \oplus s, \\ b \oplus h \oplus m \oplus s \end{array} \right\}$$

- The maximal set of alternatives of the form *NP and NP* that can be jointly negated consistently with the prejacent are the innocently excludable alternatives. This leaves us with just the pairs:

(76) $$\begin{array}{l} X \in [\![\text{man}_{ER} \text{ and woman}_{ER}]\!] \\ \wedge X \notin [\![\text{man and man}]\!] \\ \wedge X \notin [\![\text{man and dog}]\!] \end{array} \quad \Rightarrow X \in \{\, b \oplus m, h \oplus m \,\}$$

5.3 *Back to overlapping individuals*

- PROBLEM: Just like Champollion, we have a problem with sentences like (77a). Exhaustification should render (77a) and (77b) equivalent, but (77b) is in fact deviant.

(77) a. John and a man walked in.

b. #John walked in.

- Intuitively, the problem arises because one of the conjuncts contextually entails the other:

(78) $[\![\text{PRO}_X\ [\text{ER John}_{ID}]]\!] \Rightarrow_C [\![\text{PRO}_X \text{ man}_{ER}]\!]$
I.e. if X has a *John* part, then X has at least one *man* part

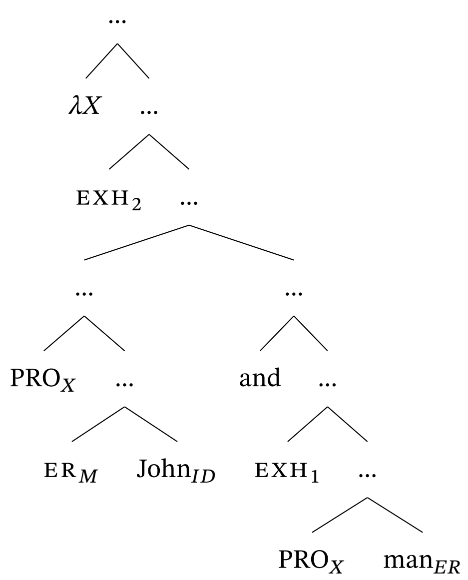
- Note the parallel with Hurford disjunctions – violations of *Hurford's constraint*, as in (79), can be avoided via application of EXH to the logically weaker disjunct:

(79) John solved all of the problems or EXH [he solved some of the problems].
⤳ *John solved all of the problems or John solved some but not all of the problems*

- We'd like to pursue the idea that uttering *John* makes *John*$_{ID}$ a relevant alternative to *man*.[18] The LF for (77a) we assume is given below:

[18] One way of thinking of this is that it breaks the symmetry between *John* and all of the other alternatives involving specific men, which can't jointly be negated consistently with *man*.

(80)



- EXH_1 asserts:
  - *X has at least one man-and-not-John part.*
- EXH_2 asserts:
  - *X has at least one part identical to John, and at least one man part that is not identical to John*
  - *X has no other man nor non-man parts*
- But, why should this be the only possible LF for (77a)? Schlenker proposes the following maxim, which rules out (77a), just so long as *a man* includes *John* in its domain.[19]

[19] Note: just so long as it's common knowledge that *John* is a man.

(81) AVOID INCREMENTALLY REDUNDANT CONJUNCTS
$\#X \wedge Y$ if the same information could have been conveyed by X.[20]

[20] Schlenker (2008)

- The constraint in (81) correctly captures the conjunctive counterpart of Hurford disjunctions, and correctly predicts the contrast between (82a) and (82b).

(82) a. #John resides in Paris and lives in France.

b. John lives in France and resides in Paris.

- Note that we observe a similar ordering effect in the case that we're interested in:

(83) a. #A man and John walked in.

b. John and a man walked in.

- The fact that (83a) is judged # constitutes crucial evidence that the problem of overlapping individuals should be solved via mechanisms sensitive to the local context. Champollion's (2016) account, couched in terms of the mechanism of *choice-raising*, incorrectly predicts (83a) to be as acceptable as the reverse order.

5.4 A problem: downward-entailing contexts

- One signature of EXH is that its effects disappear when its presence would weaken the global meaning of the sentence.[21]
- A problem for replacing MIN with EXH: even in DE contexts, DP-internal exhaustification seems to be mandatory.

(84) a. #No man and woman who were all angry walked in together.

b. No man and woman who were both angry walked in together.

- Despite the fact that, in a DE context, leaving out EXH seems to lead to a globally stronger meaning.

(85) a. No EXH [man and woman] walked in together.
$\rightsquigarrow$ *No man-woman pair X is s.t. X walked in together.*

b. No [man and woman] walked in together.
$\rightsquigarrow$ *No plurality X with at least one man part and one woman part is s.t. X walked in together*

- Since a man-woman pair is necessarily a plurality with at least one man part and one woman part, but not vice versa, the putative reading without EXH is in fact logically stronger than the one with EXH.

6 Some remaining puzzles

6.1 Sentential adverbs

- QUESTION: is sentential structure present within all conjuncts? (with Uli)
- Possible diagnostic: distribution of sentential adverbs.
- PUZZLING RESULT: adverbs in the third conjunct, but not the second:

(86) a. #John and also Sue met.

b. John, Bill and also Sue met.

[21] This is of course a simplification for ease of exposition. See Fox & Spector (2018) for discussion.

(87) a. John and also Sue lifted a piano. distributive, *collective

b. John, Bill and also Sue lifted a piano. distributive, collective

- Delayed coordination facts align:

(88) a. #John met, and also Sue.

b. John and Sue met, and (also) Bill.

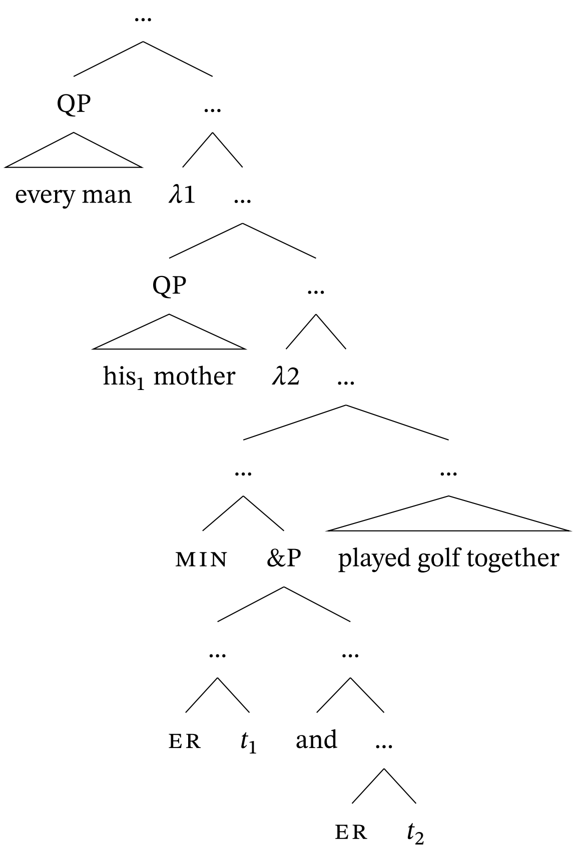
6.2 QP conjunction and binding

- OBSERVE: a quantifier can bind a pronoun across conjuncts with pair conjunction.

(89) Every man_1 and his_1 mother played golf together.

- POSSIBLE ANALYSIS: QR the two DPs, raise the traces.

(90)



- Note that generalized intersection of the QPs can't account for this datum.

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