Composing CPs: evidence from disjunction and conjunction

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Overview We offer a new compositional account of clausal embedding, which incorporates themes from Kratzer (2013) (henceforth Kra') and Elliott (2017) (Ell'). Our proposal is motivated by observations about the interpretation of CP disjunction and CP conjunction, both in English and cross-linguistically, and overcomes difficulties faced by previous accounts.

Our proposal is in (1). Attitude verbs and CPs denote predicates of events; they combine by Predicate Modification (PM). Complementizer (COMP) *that* relates the embedded proposition to the matrix event through a CONT(ent) function (as in Kra'), and we follow Ell' in taking that relation to be **identity** (as opposed to the subset relation, as in Kra').

(1) a. $[\![\text{think}]\!]^w = \lambda e_v.\text{think}(e)$ c. $[\![\text{that}]\!]^w = \lambda p_{st}.\lambda e_v.\text{CONT}(e)=p$

b. $[\![\text{that Ann came}]\!]^w = \lambda e_v.\text{CONT}(e)=\lambda w'.\text{came}(\text{Ann})_{w'}$

our predictions for (Boolean) disjunctions and conjunctions are in (2-3). CP disjunction entails that the content of the attitude equals one of two propositions, (2a); this is not equivalent to TP disjunction, (2b). Unlike TP conjunction, (3b), CP conjunction is predicted to produce a pathological interpretation, since CONT can't return two different propositions when applied to the same event, (3a). We now test these predictions.

(2) $[\![\text{that Ann came or that/}\emptyset\text{ Lucy came}]\!]^w =$ **DISJUNCTION**

a. $\lambda e_v.[\text{CONT}(e)=\lambda w'.\text{came}(\text{Ann})_{w'}] \vee [\text{CONT}(e)=\lambda w'.\text{came}(\text{Lucy})_{w'}]$ CP

b. $\lambda e_v.\ \text{CONT}(e) = \lambda w'.\text{came}(\text{Ann})_{w'} \vee \text{came}(\text{Lucy})_{w'}$ TP

(3) $[\![\text{that Ann came and that/}\emptyset\text{ Lucy came}]\!]^w =$ **CONJUNCTION**

a. $*\ \lambda e_v.[\text{CONT}(e)=\lambda w'.\text{came}(\text{Ann})_{w'}] \wedge [\text{CONT}(e)=\lambda w'.\text{came}(\text{Lucy})_{w'}]\ (=\emptyset)$ CP

b. $\lambda e_v.\ \text{CONT}(e) = \lambda w'.\text{came}(\text{Ann})_{w'} \wedge \text{came}(\text{Lucy})_{w'}$ TP

I CP Disjunction in English, Hebrew, Russian and Italian, behaves as predicted: it entails that the content is one of two propositions ($\vee$>CONT). While (4a) has the meaning in (2a), it cannot mean (2b), where the content of the attitude is a disjunctive proposition. This scopal difference is brought to light if (4a)-(4b) are continued with 'but not both': (4b) entails that according to the attitude holder, Ann and Lucy did not both come, whereas (4a) doesn't have that entailment. This result speaks against the analyses of Ell' and Hintikka(1969) which take *that* to be semantically vacuous; they wouldn't expect the difference.

(4) a. Mary knows/believes/reported that Ann came or that Lucy came.

b. Mary knows/believes/reported that Ann came or Lucy came.

c. *...but not both:* knows $[p \wedge q \wedge \neg[p \wedge q]]$ *(4a), ^{OK}(4b)

II CP Conjunction: for equality semantics The meanings for a string 'COMP p and COMP q' differ in Hebrew and Russian (H&R) as opposed to English and Italian (E&I).

H&R behave again as predicted: CP conjunction under an attitude like *angry* cannot convey a conjunction of propositions under the scope of *angry*. (5a-5b) are incompatible with an anger merely about the two comings co-occurring (5c) (a scope which is available for TP conjunction) and instead must entail anger about each coming, (5d). In the talk, we show additional data from other scope-bearing matrix predicates supporting the conclusion about the scope possibilities of CP conjunction. We suggest that the existing meaning in (5d) is derived from a matrix-conjunction reduction strategy (Bruening 2015 a.o.).

(5) a. Ja razozlilas', [čto Maša prišla] i [čto Dina prišla]. (*Russian*)
I got.angry COMP Masha came and COMP Dina came

b. ani ko'es [še maša higi'a] ve [še dina higi'a]. (*Hebrew*)
I angry [COMP Masha came] and [COMP Dina came]

c. $*angry > and$: I'm angry that both M. came and D. came (without necessarily being angry about each coming individually)

d. $^{OK}and > angry$: I'm angry that M. came and I'm angry that D. came.

(5c) is unavailable because Boolean conjunction of CPs is pathological (recall 2b), and the pathology stems from Elliott's *equality* semantics. H&R thus challenge theories of embedding which merely encode *universal quantification* over worlds (Hintikka 1969, Kratzer 2013); such theories wrongly predict CP conjunction to be equivalent to TP conjunction, since conjoining two universals is equivalent to one universal scoping over the conjunction, see (6).

(6) $\lambda x_e.\forall w'[w' \in \text{CONT}_{x,w} \rightarrow \text{Ann came}_{w'}] \wedge \forall w'[w' \in \text{CONT}_{x,w} \rightarrow \text{Lucy came}_{w'}]$
$= \lambda x_e.\forall w'[w' \in \text{CONT}_{x,w} \rightarrow \text{Ann came}_{w'} \wedge \text{Lucy came}_{w'}]$ (Kratzer 2013)

In **E&I** (5c) is available (stressing *and* facilitates the reading), in addition to (5d),:

(7) Mary is not happy that Ann came... ((7a)=E, (7b)=I; $^{OK}happy > and$)

a. She is happy that Ann came AND that Jill came.

b. È contenta che Anna sia arrivata E che Federica sia arrivata
Is happy that Ann is.SUBJ arrived and that Federica is.SUBJ arrived

We propose that the locus of cross-linguistic variation lies in the fact that in E&I, unlike H&R, CPs have a separate life as nominal elements. Evidence for the nominal life of E&I CPs is that they can occur in subject position (CPs in H&R can't do that without overt nominalization markers). We therefore propose that E&I have an additional strategy to compose CPs with attitude predicates, through **nominalization** and **non-Boolean conjunction**, in a way that derives the low scope for $\wedge$ in these languages. Concretely, COMPs in E&I have another meaning besides (1c), which is in (8a). $that_{\uparrow}$ is defined using Barker (1992)'s (and Zhang 2018) group-forming operator $\uparrow$, and picks out the group of worlds corresponding to the TP proposition. With Barker, we take groups to be special kinds of **atomic** individuals in D_e, even though they have members which can be retrieved using the membership function f. Thus, $that_{\uparrow}$ functions much like the definite determiner in the nominal domain, picking out a unique (maximal) individual – the group. Non-Boolean conjunction ($\oplus$) forms a plurality of two groups, (8b). We relate the result to the verb by PM via the functional head θ_{CONT}, (8c), which introduces the individual whose content is identical to CONT(e); such a head might be independently needed for combining verbs with DPs with propositional content (*Mary believes this rumour*). Finally, we formulate the 'Collective Content' axiom in (8e), which says that the content of a plurality of groups (of worlds) is the set of worlds which are members in each group of the plurality. The end result, in (8f), is low-scope $\wedge$, as desired.

(8) a. $[\![\text{that}_{\uparrow}\ \text{p}]\!] = \uparrow \{w : p(w) = 1\}$ (the group (type $\langle e \rangle$) consisting of all p-worlds)

b. $[\![\text{that}_{\uparrow}\ \text{p and that}_{\uparrow}\ \text{q}]\!] = \uparrow \{w : p(w) = 1\} \oplus \uparrow \{w : q(w) = 1\}$
(non-boolean *and*: creating plurality of the two groups, this plurality is in D_e)

c. $[\![\theta_{CONT}]\!] = \lambda x \in D_e.\ \lambda e_v.\ \text{CONT}(e) = \text{CONT}(x)$

d. $[\![\theta_{CONT}]\!](8b) = \lambda e_v.\ \text{CONT}(e) = \text{CONT}(\uparrow \{w : p(w) = 1\} \oplus \uparrow \{w : q(w) = 1\})$

e. **The 'Collective Content' Axiom:**
$\textsc{cont}(G{=}{\uparrow}X_1 \oplus {\uparrow}X_2 \oplus ... \oplus {\uparrow}X_N) := \{w: \forall\, {\uparrow}X \sqsubseteq G[w \sqsubseteq_{\textsc{atom}} f({\uparrow}X)]\}$

f. $[\![(7a/b)]\!] = \lambda e_v.\ \textsc{agent}(m,e) \wedge \text{happy}(e) \wedge \textsc{cont}(e) = \{w: p(w){=}1 \wedge q(w){=}1\}$

In the talk we also discuss our predictions for CP dis-/conjunctions as complements of nouns.

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