

A Compositional Intersective Account of Heterofunctional Coordination

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The analysis presented in this paper makes one independently needed stipulation that achieves three goals: 1) to provide a compositional account of Heterofunctional Coordination (HC), 2) to extend the uniform intersective (“boolean”) treatment of conjunctive coordinators to HC, 3) to make Champollion’s (2015) “quantificational event semantics” compatible with derivational syntax.

HC is a kind of coordination – common in Slavic and some neighbouring languages – in which conjuncts are quantificational expressions that bear different grammatical functions, as in (12)–(13). Syntactically, it is well established that HC in Slavic and Hungarian is true coordination, not analysable in terms of “conjunction reduction” (see, e.g., Kazenin 2001, Lipták 2003, and much subsequent literature). Semantically, there are only four previous attempts at accounting for HC, three resulting in wrong truth conditions and one problematic theoretically. The three analyses are due to Paperno (2010, 2012: chs. 4 and 5). The first two of them (Paperno 2010, 2012: ch. 4) are formulated in terms of resumptive polyadic quantification. According to these two analyses (one assuming derivational syntax, the other – categorial grammar), (13) should be true iff all pairs $\langle x : person(x), y : person(y) \rangle$ are in the *criticize* relation. Paperno (2012: ch. 5) abandons such resumptive analyses in favour of a game-theoretic one, which however is equivalent to fully branching quantification (where, again, everybody criticizes everybody), with the option of treating a quantifier collectively (so, e.g., the group of all people understood as a single mereological entity criticizes everybody). As argued in the fourth, most recent, analysis – that of Przepiórkowski 2022 – the actual meaning of HC is weaker. In the case of (13) it is sufficient that everybody criticizes somebody or other and that everybody is criticized by somebody or other. That is, the right meaning is not resumptive or branching, but rather cumulative.

However, Przepiórkowski’s (2022) account in terms of a cumulative polyadic lift¹ is non-compositional and it crucially relies on constraint-based approaches to the syntax–semantics interface. By contrast, we propose a compositional account based on the mainstream derivational approach to syntax; we adopt and extend Zhang’s (2007) analysis of coordinated heterofunctional *wh*-phrases in terms of sideward movement, so that the simplified structure of (13) is given in (14).

Previous semantic analyses of HC proposed special meanings of coordinators, to the effect that Russian and Polish *i* ‘and’ are ambiguous between their uses in (12)–(13) and their uses in ordinary coordination. However, this position is undermined by the fact that any coordinators expressing logical conjunction may be used in HC, not just *i* (Patejuk 2015: §5.3), so all conjunctive coordinators would have to be treated as similarly ambiguous. An analysis that avoids such systematic ambiguity should be preferred.

There are two general approaches seeking to provide a uniform analysis of various uses of conjunctive coordinators: collective, in which the crucial operation is the sum of sets (e.g., Heycock and Zamparelli 2005), and intersective (or “boolean”), based on set intersection (e.g., Winter 2001). A well-known problem for the collective approach is coordination of non-upward entailing quantifiers (Champollion 2016: §7.1), and such quantifiers may occur in HC (e.g., in (12)); for this reason, we build on the intersective approach, as instantiated in Champollion 2015, 2016. There, as in Partee and Rooth 1983, the meaning of *and* is represented by (\rightsquigarrow) the polymorphic $\Pi_{\langle \tau, \tau \tau \rangle}$:

$$(1) \quad and \rightsquigarrow \Pi_{\langle \tau, \tau \tau \rangle} \stackrel{df}{=} \begin{cases} \lambda p_t \lambda q_t . p \wedge q & \text{if } \tau = t \\ \lambda X_\tau \lambda Y_\tau \lambda Z_{\sigma_1} . X(Z) \Pi_{\langle \sigma_2, \sigma_2 \sigma_2 \rangle} Y(Z) & \text{if } \tau = \langle \sigma_1, \sigma_2 \rangle \end{cases}$$

The final – crucial – component of the current account is Champollion’s (2015) approach to event semantics, on which verbs are not predicates of events (e.g., $\lambda e . criticize(e)$), but rather predicates of *sets* of events, with existential quantification built-in:

¹Przepiórkowski (2022) assumes a more general polyadic lift, the cover lift (Robaldo 2011), referring to Schwarzschild’s (1996) covers; it is easy to generalize the analysis proposed below accordingly.

$$(2) \textit{criticize} \rightsquigarrow \lambda f.\exists e.\textit{criticize}(e) \wedge f(e)$$

Such verb meanings are semantic arguments to the meanings expressed by syntactic arguments of the verb. For example, on Champollion’s (2015) analysis, *everybody* used as the agent argument has the representation in (3), and similarly for the *everybody* theme in (4).

$$(3) \textit{everybody}_{ag} \rightsquigarrow \lambda V\lambda f.\forall x.\textit{person}(x) \rightarrow V(\lambda e.f(e) \wedge \textit{agent}(e)=x)$$

$$(4) \textit{everybody}_{th} \rightsquigarrow \lambda V\lambda f.\forall y.\textit{person}(y) \rightarrow V(\lambda e.f(e) \wedge \textit{theme}(e)=y)$$

Such representations lead to the following representation of *Everybody criticizes everybody*, assuming that the verb combines in turn with the object, the subject, and the closure operator $\lambda e.true$:

$$(5) \forall x.\textit{person}(x) \rightarrow [\forall y.\textit{person}(y) \rightarrow \exists e.\textit{criticize}(e) \wedge \textit{agent}(e)=x \wedge \textit{theme}(e)=y]$$

In the case of (14), quantifiers with meanings identical to (3)–(4) are coordinated; assuming the representation of the coordinator *i* ‘and’ in (1), the meaning representation of the topmost DP is:

$$(6) \lambda V\lambda f.[\forall x.\textit{person}(x) \rightarrow V(\lambda e.f(e) \wedge \textit{agent}(e)=x)] \wedge [\forall y.\textit{person}(y) \rightarrow V(\lambda e.f(e) \wedge \textit{theme}(e)=y)]$$

Assuming that traces do not contribute anything to the meaning, the representation of the lower TP is the same as the representation of the verb in (2), which – after combining with the representation of the topmost DP in (6) (and closure) – results in the following representation of the topmost TP:

$$(7) [\forall x.\textit{person}(x) \rightarrow \exists e.\textit{criticize}(e) \wedge \textit{agent}(e)=x] \wedge [\forall y.\textit{person}(y) \rightarrow \exists e.\textit{criticize}(e) \wedge \textit{theme}(e)=y]$$

It is surprising that Champollion’s (2015) approach – not designed for HC – gives, out of the box, a reasonable representation of HC, but (7) is *not exactly* what (13) is saying. For example, (7) – but not (13) – is true in a situation in which everybody criticizes *a film*, one person criticizes everybody, and no other criticizing takes place. What is missing in (7) are domain restrictions on the values of all relevant thematic roles, i.e., that (13) is only about the events of *people* criticizing *people*.

This problem is solved by the following stipulation: let traces represent not variables – the usual assumption, but one that Champollion’s 2015 approach is not compatible with – but such domain restrictions on the respective thematic roles:

$$(8) t_i \rightsquigarrow \lambda V\lambda f.V(\lambda e.f(e) \wedge \textit{person}(\textit{agent}(e)))$$

$$(9) t_j \rightsquigarrow \lambda V\lambda f.V(\lambda e.f(e) \wedge \textit{person}(\textit{theme}(e)))$$

Relatively complex representations in (8)–(9) express simple information: that the agent must be a person, and similarly for the theme. Given (8)–(9), the representation of the lower TP in (14) becomes (10) (cf. the representation of the verb alone in (2)).

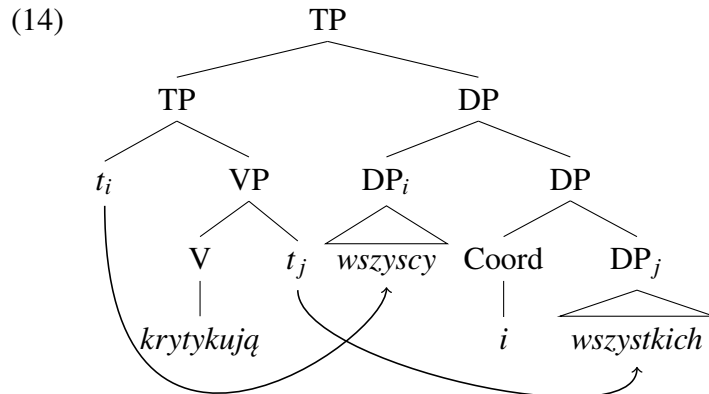
$$(10) \lambda f.\exists e.\textit{criticize}(e) \wedge f(e) \wedge \textit{person}(\textit{agent}(e)) \wedge \textit{person}(\textit{theme}(e))$$

When combined with (6) and, subsequently, with Champollion’s (2015) closure $\lambda e.true$, this leads to (11), which correctly – if a little redundantly – captures the cumulative truth conditions of (13).

$$(11) [\forall x.\textit{person}(x) \rightarrow \exists e.\textit{criticize}(e) \wedge \textit{agent}(e)=x \wedge \textit{person}(\textit{agent}(e)) \wedge \textit{person}(\textit{theme}(e))] \wedge [\forall y.\textit{person}(y) \rightarrow \exists e.\textit{criticize}(e) \wedge \textit{theme}(e)=y \wedge \textit{person}(\textit{agent}(e)) \wedge \textit{person}(\textit{theme}(e))]$$

While representations in (8)–(9) are more complex than variables, this analysis is overall much simpler than the standard view (Heim and Kratzer 1998): co-indexing and lambda abstraction are not needed, and quantifiers do not have to (covertly) move to be interpreted. Moreover, the stipulation that moved quantifiers leave behind domain restrictions is independently motivated (see Pasternak 2020: §2 and references therein) and it is built-in into semantic analyses of quantifier movement in Minimalist terms of copying or multidominance (see Pasternak 2020: §§3–4 and references therein). Hence, a single and independently motivated stipulation makes it possible to provide a compositional account of Heterofunctional Coordination which assumes the standard intersective treatment of conjunctive coordinators. An added bonus is an extension of Champollion’s (2015) quantificational event semantics to derivational frameworks which allow for movement and traces.

- (12) [Nikto i nikomu] ne pomogaet. (Russian)
 nobody.NOM and nobody.DAT NEG helps
 ‘Nobody helps anybody.’ (Mel’čuk 1988)
- (13) Tu krytykują [wszyscy i wszystkich]. (Polish)
 here criticize all.NOM and all.ACC
 ‘Here everybody criticizes (somebody) and everybody is criticized (by somebody).’
 (Przepiórkowski 2022; attested)



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