# A dynamic alternative-pruning account of asymmetries in Hurford Disjunctions

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## Puzzle

Hurford Disjunctions (HD) are of the form $p \vee q$ where $p \Rightarrow q$ and are generally deemed infelicitous [1]: *#John lives in Paris or France*. This is known as Hurford's constraint (HC). Singh [6] however, noticed that HDs involving scalemates are subject to an asymmetry: a weak-to-strong scalar HD is felicitous (1a), while a strong-to-weak one is not (1b).

(1) a. John ate some or all of the cookies.
b. # John ate all or some of the cookies.

➤ **Since the asymmetry arises in the presence of scalar items, it must result from an interplay between scalar implicatures (SI) and Hurford's constraint.**

## Background on exhaustification

The grammatical view of SIs ([5], [7], [8]) posits that the covert exhaustivity operator $\textsc{Exh}$ ($\simeq$*only*), is merged in the syntax. $\textsc{Exh}$ takes a proposition $p$ and a set of alternatives to $p$ $\mathcal{A}_p$,[1] and returns the conjunction of $p$ with the negation of strictly stronger alternatives.[2]

$$\textsc{Exh}(p, \mathcal{A}_p) = p \wedge \bigwedge\{\neg q \mid q \in \mathcal{A}_p \wedge q \Rightarrow p \wedge q \not\Leftarrow p\}$$

This view is promising since it allows to exhaustify *within* the weak disjunct – which may rescue the whole structure from HC-violation. For instance, given that *all* ($\forall$) is an alternative to *some* ($\exists$), (1a) would yield $\textsc{Exh}(\exists, \{\forall\}) \vee \forall = (\exists \wedge \neg\forall) \vee \forall$, which is HC-compliant (exclusive disjuncts). However, the asymmetry remains, since (1b) would be rescued by $\textsc{Exh}$ as well!

➤ **$\textsc{Exh}$ must be made asymmetric somehow.**

## Previous accounts

Fox and Spector (F&S) postulated that $\textsc{Exh}$ should *not* be inserted whenever it is Incrementally Weakening (IW), i.e. when it leads to a weaker meaning of the whole sentence, for any continuation thereof [9]. This captures (1) (and also (3) and (4)!), but at the cost of positing a quite complex and global principle.

Tomioka, building on Rooth [4], proposed that HC was a matter of contrastive focus between two (scalar) items [10]. This correctly predicts that the asymmetry extends to other contrastive environments, e.g. *but*-statements (2). However, replacing *but* by *or* in (2) makes the asymmetry vanish, suggesting that HC cannot be reduced to a formal constraint between *scalemates*, but really is about the logical relation between *disjuncts*!

(2) a. Adam did some of the homework, but$_{✓}$/or$_{✓}$ Bill did all of it.
b. Adam did all of the homework but$_{\#}$/or$_{✓}$ Bill did some of it.

## Capturing the basic asymmetry *via* alternative pruning

**The key novelty of our account is that the set of alternatives to $p$, $\mathcal{A}_p$, is made sensitive to preceding elements.** Let $R$ contain a focused scalar item. We assume with Rooth [4] that $R$ has an ordinary semantic value $[\![R]\!]_o$, and a focus semantic value $[\![R]\!]_f$, defined as the set of propositions identical to $[\![R]\!]_o$, except that the focused element is replaced by a salient alternative that is at most as complex. The set of alternatives to $R$ is:

$$\mathcal{A}_R = \begin{cases} [\![R]\!]_f \setminus [\![L]\!]_o \text{ if } \exists L \prec_{\mathcal{L}} R.\ [\![R]\!]_f = [\![L]\!]_f \\ [\![R]\!]_f \text{ otherwise} \end{cases}$$

Dynamic Alternative Pruning (DAP)

**Where $\prec_{\mathcal{L}}$ represents local linear precedence within a disjunctive statement.** Following [10], we call $L$ the contrast antecedent (CE) of $R$. In (1a), applying $\textsc{Exh}$ to the 1st disjunct ($L = \exists$) yields $\exists \wedge \neg\forall$, because $L$ has no CE. The 2 disjuncts become exclusive and (1a) is rescued. In (1b), the 2nd disjunct ($R = \exists$) has the CE $L = \forall$, which is then pruned from $\mathcal{A}_R$. $\textsc{Exh}$ becomes idle, and (1b) remains HC-violating. This can be generalized to other scalar HDs, such as $(p \vee q) \vee (p \wedge q)$.

## Cases of HC-obviation

F&S noticed that the asymmetry vanishes in various cases, whereby both orders are fine (HC-*obviation*).

**1. Distant entailing disjuncts.** When the 2 scalar items are separated by a salient alternative, the strong-to-weak order appears felicitous (3).

(3) *Context: did John do most ($\mathrm{M}$) of the homework?*
John did all or some of the homework. $\forall \vee \exists$

Our account rescues (3). Indeed, $\mathcal{A}_\exists = \{\mathrm{M}, \forall\} \setminus \{\forall\} = \{\mathrm{M}\}$ by DAP. Thus, $\textsc{Exh}(\exists, \mathcal{A}_\exists) = \exists \wedge \neg\mathrm{M} \not\Rightarrow \forall$.

**2. Universally quantified disjuncts.** HC-obviation also occurs when the items are embedded under $\Box$ (4) or $\forall$.

(4) a. John must solve HW1 **or** HW2, or he must solve **both**. $\textsc{Exh}(\underbrace{\Box(p_1 \vee p_2)}_{L}) \vee \underbrace{\Box(p_1 \wedge p_2)}_{R}$
b. John must solve HW1 **and** HW2, or he must solve **either**. $\underbrace{\Box(p_1 \wedge p_2)}_{L} \vee \textsc{Exh}(\underbrace{\Box(p_1 \vee p_2)}_{R})$

In (4a), $\mathcal{A}_L = \{\Box p_1, \Box p_2, \Box(p_1 \wedge p_2)\}$. $\Box p_1$ and $\Box p_2$ being the only 2 stronger alternatives, $\textsc{Exh}$ yields $\neg\Box p_1 \wedge \neg\Box p_2$, contradicting $R$. In (4b), $\mathcal{A}_R = \{\Box p_1, \Box p_2\}$, since $L = \Box(p_1 \wedge p_2)$ is pruned. However, this does not affect $\textsc{Exh}$, which again yields $\neg\Box p_1 \wedge \neg\Box p_2$, contradicting $L$!

**3. Scalar long-distance HDs (LDHDs).** In LDHDs [11], the strong item occurs in a lower-level disjunction. **Non-scalar LDHDs are deemed infelicitous: #John lives in France, or in Paris or London.** (5) compiles scalar LDHDs arranged in various linear orders.[3]

(5) a. John ate most of the cookies, or (else) he ate none or all of them. $\mathrm{M} \vee (\neg\exists \vee \forall)$
b. John ate most of the cookies, or (else) he ate all or none of them. $\mathrm{M} \vee (\forall \vee \neg\exists)$
c. ?John ate none or all of the cookies, or (else) he ate most of them. $(\neg\exists \vee \forall) \vee \mathrm{M}$
d. John ate all or none of the cookies, or (else) he ate most of them. $(\forall \vee \neg\exists) \vee \mathrm{M}$

Surprisingly, sentences in (5) sound fine![4] This is predicted by our account: since DAP searches CEs locally, at the level of each $\vee$, no relevant CE can be found in (5), which leads to standard exhaustification across the board. We thus have (5) = $\textsc{Exh}(\mathrm{M}, \{\exists, \forall\}) \vee (\neg\exists \vee \forall) = (\mathrm{M} \wedge \neg\forall) \vee (\neg\exists \vee \forall)$, i.e., 2 exclusive disjuncts. F&S's account on the other hand, rescues (5a) and (5b), but bans (5c) and (5d), where $\textsc{Exh}$ is IW, because: $(\neg\exists \vee \forall) \vee (\mathrm{M} \wedge \neg\forall) = (\neg\exists \vee \forall) \vee \mathrm{M} \wedge \top = (\neg\exists \vee \forall) \vee \mathrm{M}$.

## Conclusion

We accounted for Singh's asymmetry by proposing that formal alternatives are being dynamically pruned. DAP constitutes an incremental, local, and, unlike previous accounts, one-pass algorithm, which does just as well for a variety of HDs, and makes interesting predictions in the case of LDHDs. Further (experimental?) evidence would be welcome to assess the accuracy of DAP *vs* F&S's account in that respect. However, DAP, being too local, cannot capture a case of HC-obviation triggered by embedding an entire scalar HD under $\textsc{Exh}$ (6). It appears difficult to modify DAP to capture that, without having to posit some global constraint akin to IW...

(6) John **must** do all or some of the readings.
$\textsc{Exh}(\Box(\forall \vee \textsc{Exh}(\exists)))$

### Selected references

[1] J. R. Hurford, "Exclusive or inclusive disjunction," *Foundations of Language*, 1974. ★[2] G. Gazdar, *Implicature, Presupposition and Logical Form*. 1979. ★[3] J. Groenendijk and M. Stokhof, "On the semantics of questions and the pragmatics of answers,", 1984. ★[4] M. Rooth, "A theory of focus interpretation," *Natural Language Semantics*, 1992. ★[5] D. Fox, "Free choice and the theory of scalar implicatures,", 2007. ★[6] R. Singh, "On the interpretation of disjunction," *L&P*, 2008. ★[7] B. Spector, D. Fox, and G. Chierchia, "Hurford's constraint and the theory of scalar implicatures," *Manuscript*, 2008. ★[8] G. Chierchia, D. Fox, and B. Spector, "Scalar implicature as a grammatical phenomenon,", 2012. ★[9] D. Fox and B. Spector, "Economy and embedded exhaustification," *Natural Language Semantics*, 2018. ★[10] S. Tomioka, "Scalar implicature, hurford's constraint, contrastiveness and how they all come together," *Frontiers in Communication*, 2021. ★[11] P. Marty and J. Romoli, "Varieties of hurford disjunctions," *S&P*, 2022. ★

[1] Alternatives may be determined *via* a lexically encoded "scale" [2], focus [4], or a specific question-under-discussion [3].
[2] A more accurate implementation of $\textsc{Exh}$ requires the notion of INNOCENT EXCLUSION, which guarantees that the stronger alternatives are negated in a non-arbitrary way [5].
[3] We tried to eliminate a triviality issue in (5) by using *most* instead of e.g. *some* as a weak scalemate.
[4] Judgments appear shaky, perhaps because of the two levels of disjunction, causing parsing difficulties. But we think the contrast with (infelicitous) non-scalar LDHDs is sensible. The "?" on (5c) requires further investigation, as it may result from the availability of the alternative parse $\neg\exists \vee (\forall \vee \mathrm{M})$, that DAP deems infelicitous.

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