Connectives and their alternatives

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Simplex and complex connectives

Languages often have more than one conjunction and more than one disjunction

Enlgish	Conjunction	Disjunction
Simplex	"A **and** B"	"A **or** B"
Complex	"**both** A **and** B"	"**either** A **or** B"

a. The king **and** the queen will come.

b. **Both** the king **and** the queen will come.

Japanese

Japanese has two complex conjunctions and (at least) two simplex disjunctions

Japanese	Conjunction	Disjunction
Simplex	"A-と B"	"A-か B" "A-もしくは B"
Complex	"A-も B-も" "A-と B-と"	"A-か B-か"

There's also "A-や B", which is analyzed as a disjunction (Sudo 2014, Sauerland et al. 2017, Nicolae et al. 2024)

Romanian and French

Romanian	Conjunction	Disjunction
Simplex	"A **și** B"	"A **sau** B" "A **ori** B"
Complex	"**și** A **și** B"	"**ori** A **ori** B" "**fie** A **fie** B"

French	Conjunction	Disjunction
Simplex	"A **et** B"	"A **ou** B"
Complex	"**et** A **et** B"	"**ou** A **ou** B" "**ou bien** A **ou bien** B" "**soit** A **soit** B"

Semantic uniformity hypothesis

We'll mostly focus on English today

Tentative assumptions:

- The complex conjunction ("both A and B") and simplex conjunction ("A and B") both denote $\wedge$ (and/or plurality formation $\sqcup$)
- The complex disjunction ("either A or B") and simplex disjunction ("A or B") both denote $\vee$

However, the complex and simplex varieties are not (always) interchangeable

Some known differences

- Crosslinguistically, complex conjunctions tend to be associated with **distributivity**, while simplex conjunctions can be distributive or collective (Flor et al. 2017)
- Simplex conjunction sometimes shows **homogeneity**; complex conjunction never does (cf. Szabolcsi & Haddican 2002)
- Complex disjunction tends to have **exclusivity** and **exhaustivity inferences** more robustly than simplex disjunction (Nicolae & Sauerland 2016, Nicolae et al. 2024, 2025; but see Tieu et al. 2017)

We'll come back to these observations with examples later

This study

We propose that the difference between the complex and simplex connectives lies in the **alternatives** they can be associated with

- Alternatives to a complex connective ("both A and B", "either A or B") must be a (non-trivial) subset of {"A", "B", "both A and B", "either A or B'" }
- Alternatives to a simplex connective ("A and B", "A or B") must be different from those admissible for its complex counterpart

Consequently, complex and simplex connectives show differences with respect to **alternative-sensitive phenomena** like **association with focus**, **QuD-sensitivity**, and **scalar inferences**

Alternatives for complex conjunction

Alt(Both K and Q will come) can be any of the following (we'll discuss further restrictions):

- {"K will come", "Both K and Q will come"}
- {"Q will come", "Both K and Q will come"}
- {"K will come", "Q will come", "Both K and Q will come"}
- {"Either K or Q will come", "Both K and Q will come"}
- {"K will come", "Either K or Q will come", "Both K and Q will come"}
- {"Q will come", "Either K or Q will come", "Both K and Q will come"}
- {"K will come", "Q will come", "Either K or Q will come", "Both K and Q will come"}

Alternative-sensitivity

If our analysis is on the right track, it provides further evidence that natural language semantics/pragmatics involves reference to **alternatives**

Working hypotheses:

- Single notion of alternatives (Rooth 1992, Fox & Katzir 2011)
- Alternatives are linguistic expressions (Katzir 2007, Fox & Katzir 2011, Sudo & Donáti 2026)
- Grammartical properties like F-marking put constraints on what else can be alternatives; every expression is always an alternative to itself, and
    - Some mapping from F-marking to phonology (Jackendoff 1972, Selkirk 1977, 1995, etc.)
    - Alternatives differ from prejacent only with respect to F-marked constituents (+ necessary grammatical changes)

Roadmap

1. **Conjunction in simple sentences**
   - Association with focus
   - QuD-sensitivity
   - Distributivity
2. **Disjunction vs. conjunction**
   - Scalar inference
   - Homogeneity

Conjunction

Association with focus

Association with *only*

Observation: complex conjunction, unlike simplex conjunction, is incompatible with "only"

> a. The archduke only invited [the king and the queen]$_F$.
>
> b. #The archduke only invited [both the king and the queen]$_F$.

- What only negates for (a) is alternatives about other people, e.g. "The president invited the princess" (or maybe "...the king, the queen, and the princess")
- According to our account, the complex conjunction cannot have such alternatives and none of the admissible alternatives can be negated consistently with the prejacent

Japanese

Same contrast in Japanese, but might be due to a morphosyntactic restriction on the sequence "も+だけ/しか"

> a. 信長は　[秀吉と家康]だけ　招待した。
>
> b. #信長は　[秀吉も家康も]だけ　招待した。

> a. 信長は　[秀吉と家康]しか　招待しなかった。
>
> b. #信長は　[秀吉も家康も]しか　招待しなかった。

Association with *even*

complex conjunction, as well as simplex conjunction, is compatible with "even", as expected

> a. The archduke even invited [the king and the queen]$_F$.
>
> b. The archduke even invited [both the king and the queen]$_F$.

But the scalar inference is not identical

- (a) suggests that inviting the royal pair is more remarkable than inviting other people
- (b) suggests that inviting both the king and the queen is more remarkable than inviting the king alone, or inviting the queen alone

Conjunction

QuD-sensitivity

QuD-sensitivity of conjunctions

Observation: Complex conjunction ("both A and B") and (unstressed) simplex conjunction ("A and B") in simple sentences exhibit QuD-sensitivity (Nicolae & Sudo 2019)

(1) Who in the royal family, if any, will come to the banquet?

a. ??Both the king and the queen will come.

b. The king and the queen will be come.

(2) Which of the royal pair, if any, will come to the banquet?

a. Both the king and the queen will come.

b. ??The king and the queen will come.

Towards an analysis

- A conversational context includes a Stalnakerian context set c, the set of all possible worlds that are compatible with what the conversational participants mutually believe
- A QuD is a partition on c
- A question speech act is a proposal to set the current QuD to be the one that corresponds to the question (we'll be silent about question semantics)
- A set X of sentences inductes a partition on c (denoted by $c/\sim_X$) through the equivalence relation $\sim_X$ (cf. Heim 1994)

$$w \sim_X w' \text{ iff for each } S \in X, w \vDash S \Leftrightarrow w' \vDash S$$

(i.e., w and w' agree on which sentences in X are true and which are false)

QuD-sensitivity

Research on free focus has suggested a condition like this (cf. Rooth 1992, Krifka 2001, Roberts 2012, Büring 2003)

> A declarative sentence φ is an admissible answer to a QuD Q over c only if $Q = c/\sim_{\mathsf{Alt}(\varphi)}$

(It makes sense to assume that $\mathsf{Alt}(\varphi)$ is the smallest set of alternatives that satisfies this condition)

Example: Free focus

```
Who will come to the banquet?

a. STEphanie will come to the banguet.
b. #Stephanie will COME to the banquet.
```

The QUD Q is the set of strongly exhaustive answers to the wh-question (Groenendijk & Stokhof 1984, Heim 1994)

Alt(STEphanie$_F$ will come to the banquet) $\subseteq$ {"Stephanie will come to the banquet", "John will come to the banquet", "Maria will come to the banquet", $\cdots$}

- The partition that Alt(STEphanie$_F$ will come to the banquet) induces on c will be Q
- The partition that Alt(Stephanie will COME$_F$ to the banquet) induces won't.

Complex conjunction

Alt(Both the king and the queen will come) $=$ {"The king will come", "The queen will come", "Both the king and the queen will come", "Either the king or the queen will come"}

This set of alternatives induces the following partition when $c = \mathcal{W}$:

$$\left\{\begin{array}{l}\{w \mid \text{the king and the queen will come in } w\},\\ \{w \mid \text{the king will come but the queen won't come in } w\},\\ \{w \mid \text{the queen will come but the king won't come in } w\},\\ \{w \mid \text{neither the king nor the queen will come in } w\}\end{array}\right\}$$

This matches the question 'Which of the royal pair, if any, will come?', but not 'Who in the royal family, if any, will come?'

Non-initial contexts

"Both the king and the queen will come" is felicitous in non-initial contexts that entail one of the following, as long as the QuD is an appropriate one

1. at least one of the royal pair will come
2. if the queen comes, the king will come too
3. if the king comes, the queen will come too
4. either both the king and the queen will come, or neither will come

These cases are accounted for with Alt(Both the king and the queen will come) being different subsets of {"The king will come", "The queen will come", "Both the king and the queen will come", "Either the king or the queen will come"}

Alternatives for complex conjunction

Under the current hypothesis, Alt(Both K and Q will come) can be any of the following:

- {"K will come', 'Both K and Q will come"}
- {"Q will come', 'Both K and Q will come"}
- {"K will come", "Q will come", "Both K and Q will come"}
- {"Either K or Q will come", "Both K and Q will come"}
- {"K will come", "Either K or Q will come", "Both K and Q will come"}
- {"Q will come", "Either K or Q will come", "Both K and Q will come"}
- {"K will come", "Q will come", "Either K or Q will come", "Both K and Q will come"}

Simplex conjunction

The simplex counterpart "The king and the queen will come" is used when the set of alternatives is not compatible with a complex conjunction, i.e., the current QuD cannot be just about the king and the queen (e.g., "Who in the royal family, if any, will come?")

QuD-accommodation

"Both the king and the queen will come" is not entirely infelicitous wrt "Who in the royal family will come to the banquet?"

We analyze this as involving accommodation of a narrower question that's just about the king and the queen, like "Which of the king and the queen will come?", "Will both the king and the queen come?", etc.

Stressed 'and'

```
(1) Who in the royal family, if any, will come to the banquet?

a. ??The king AND the queen will come.

b. The king and the queen will be come.
```

```
(2) Which of the royal pair, if any, will come to the banquet?
a. The king AND the queen will come.

b. ??The king and the queen will come.
```

This makes sense if the admissible alternatives to 'A AND B' are members of {'A or B', 'A', 'B'}; but 'A AND B' and 'both A and B' might not be always interchangeable due to other differences (e.g., correction focus)

Japanese

（1） 身体のどこが痛いですか？

a. 右腕と左腕が痛いです

b. ??右腕も左腕も痛いです

（2） どちらかの腕、もしくは、両方の腕に痛みがありますか？

a. ??右腕と左腕が痛いです

b. 右腕も左腕も痛いです

'AとBと' behaves like 'AとBと'

Conjunction

Distributivity

Distributivity

Complex conjunction is incompatible with collective predicates (wrt predicates in its scope) (Flor et al. 2017)

```
a. The king and the queen look alike.

b. #Both the king and the queen look alike.
```

The alternatives to (b) are bound to be infelicitous:

{"Both K and Q look alike", "K looks alike", "Q looks alike", "Either K or Q looks alike"}

Mixed predicates

We predict that complex conjunction should be compatible with mixed predicates, provided that the QuD is compatible (e.g., for (b), "Was it John that wrote this song? Or was it Paul? Or was it both of them?")

> a. John and Paul wrote this song.
>
> b. Both John and Paul wrote this song.

Japanese

"AもBも" is incompatible with collective predicates, unlike "AとB"

> a. 太郎と次郎がそっくりだ
>
> b. #太郎も次郎もそっくりだ

"AもBもCも" is better with collective predicates

> a. 太郎と次郎と三郎がそっくりだ
>
> b. ?太郎も次郎も三郎もそっくりだ

This makes sense if "AもBもCも" can have felicitous alternatives like "AもBも", "BもCも", "AもCも"

Disjunction vs. Conjunction

Scalar inference

Lack of QuD-sensitivity

Disjunctions do not show Qud-sensitivity in simple sentences

> (1) Who in the royal family, if any, will come to the banquet?
>
> a. Either the king or the queen will come.
>
> b. The king or the queen will come.

> (2) Which of the royal pair, if any, will come to the banquet?
>
> a. Either the king or the queen will come (but definitely not both).
>
> b. The king or the queen will come (but definitely not both).

Scalar inference

We claim that this is because disjunction can have a 'not both' scalar inference

- Scalar inferences = negations of alternatives
- Let us assume Exh as the negation mechanism (more on the next slide)

Idea: Once alternatives are used by an alternative-sensitive operator (e.g., Exh), the constraint on alternatives will not project above it

- "Either K or Q" has the same constraint on alternatives as "Both K and Q"
- But that constraint is not inherited by "Exh(either K or Q)"

The parse without Exh should show QuD-sensitivity, but it's masked by the parse with Exh

Exh

Exh negates all 'innocently excludable' alternatives given the prejacent φ and a set A of its alternatives (Fox 2007)

$$[\![\mathsf{Exh}_A(\varphi)]\!](w) = 1 \quad \Leftrightarrow \quad [\![\varphi]\!](w) = 1 \wedge \bigwedge_{\psi \in \mathtt{IE}(\varphi, A)} [\![\psi]\!](w) = 0$$

The innocently exludalbe alternatives are those that are 'safe' to negate, as they belong to all maximal subsets of A whose negations are consistent with the prejacent

$$\mathtt{IE}(\varphi, A) = \bigcap \max \{A' \subseteq A \mid \exists w [[\![\varphi]\!](w) = 1 \wedge \bigwedge_{\psi \in A'} [\![\psi]\!](w) = 0]\}$$

Alt(Either K or Q will come)

Supppose $A =$Alt(Either K or Q will come) can be any of the following

- {"K will come", "Either K or Q will come"}
- {"Q will come", "Either K or Q will come"}
- {"K will come", "Q will come", "Either K or Q will come"}
- {"Both K and Q will come", "Either K or Q will come"}
- {"K will come", "Both K and Q will come", "Either K or Q will come"}
- {"Q will come", "Both K and Q will come", "Either K or Q will come"}
- {"K will come", "Q will come", "Both K and Q will come", "Either K or Q will come"}

Alt(Either K or Q will come) (cont.)

Exh would generate unattested inferences with some of these sets of alternatives

Alt(either K or Q)	Reading
{"K", "either K or Q"}	not K (but Q)
{"Q", "either K or Q"}	not Q (but K)
{"K", "both K and Q", "either K or Q"}	not K (but Q)
{"Q", "both K and Q", "either K or Q"}	not Q (but K)

Let us assume that somehow these alternatives are not compatible with Exh (cf. Crnič et al. 2015)

Scalar inferences of Exh(Either K or Q will come)

Exh would be vacuous with {"K will come", "Q will come", "Either K or Q will come"}

Assuming vacuous uses of Exh are banned, we are left with two options for Alt(Either K or Q will come)

- {"K will come", "Q will come", "Both K and Q will come", "Either K or Q will come"}
- {"Both K and Q will come", "Either K or Q will come"}

In both cases, Exh negates the innocently excludable alternative "Both K and Q will come", deriving an **exclusive inference**

An **exhaustive inference** could be derived either pragmatically or by applying another instance of Exh above Exh(Either K or Q will come)

Scalar inferences of Exh(K or Q will come)

Exh(The king or the queen will come)

- At least one alternative should mention someone other than K and Q, e.g., "J will come"
- "K and Q will come" can also be an alternative

Exh will negate these alternatives, giving rise to exhaustive and exclusive inferences in one go

Negation over disjunction

When negated, Exh can no longer apply and we observe QuD-sensitivity with disjunction

```
(1) Who in the royal family, if any, will come to the banquet?

a. ??I don't think either the king or the queen will come.

b. I don't think the king or the queen will come.
```

```
(2) Which of the royal pair, if any, will come to the banquet?

a. I don't think either the king or the queen will come.

b. ??I don't think the king or the queen will come.
```

Negation over "both A and B"

"Not(both A and B)" has a scalar inference 'either A or B'

This is accounted for with Exh negating the stronger alternative "not(either A or B)"

As expected, "not(both A and B)" does not show QuD-sensitivity

```
(1)
Who in the royal family, if any, will come to the banquet?

I don't think both the king and the queen will come
```

```
(2)
Which of the royal pair, if any, will come to the banquet?
I don't think both the king and the queen will come.
```

Notes on negation over "A and B"

"A and B", but not "both A and B", can show **homogeneity effect** with respect to negation

(Szabolcsi & Haddican 2002)

```
On this list, I don't think I've taken (both) Hockey and Algebra.
```

Possible analysis:

- Assume Bar-Lev's (2018, 2021) theory of homogeneity with Exh with 'innocent inclusion'
- If "both A and B" obligatorily has "either A or B", "not(both A and B)" will also have an exclusion inference 'either A or B'
- If "A and B" can have "A" and "B" without also having "either A or B" as alternatives, "not(A and B)" will have an inclusion inference 'not A' and 'not B'

Future directions

QuD-sensitivity and Exh

We would like to have empirical evidence that QuD-sensitivty and the presence of Exh are in complementary distribution for disjunction and negated conjunction

Compositional system with constraints on alts

Roothian Alternative Semantics

- $[\![\cdot]\!]_{\text{alt}}$ specifies the set of admissible alternatives
- $\sim$ 'eats up' the alternatives; Erlewine 2025 postulates a version that ineherits the alternatives

We want a theory where the alternatives are structural, and an operator like $\sim$ can remove constraints on alternatives

Variation and universals

- What's the difference between complex connectives and stressed simplex connectives in English?
- English doesn't have non-dual versions of "both A and B"
- What's going on in languages with more than two connectives of the same type, e.g. "AとB", "AもBも", "AとBと" in Japanese; "A ou B", "ou A ou B", "soit A soit B" in French
- Is it always true that in a language with a simplex and complex connective, the complex one has the same constraint as "both A and B" and "either A or B" in English?
- Are there languages with only complex connectives?