CCG and Implicational Universals

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Language universals

Universal quantification over the class of all natural languages:

• *all* languages have property $P$

• *no* languages have property $Q$

Also generalised quantifiers:

• almost all, most, hardly any, comparatively few . . .

e.g. *In declarative sentences with nominal subject and object, the dominant order is almost always one in which the subject precedes the object.* (Greenberg, 1963)
Implicational universals

All languages having property $P$ also have property $Q$.

- some languages have and some lack property $P$
- some languages have and some lack property $Q$
- no languages have property $P$ and lack property $Q$

Languages with dominant VSO order are always prepositional.

All languages with nasal vowels also have oral vowels.
Formulating an implicational universal

Four steps:

1. definition of the domain of study
2. multidimensional partition of the domain
3. data collection
4. explanation of non-random distribution
There is a non-random relationship between the basic word order of a language and its gapping constructions. (Ross, 1970)

STEP ONE: definition of the domain i.e. all natural languages with the following properties:

1. a distinction between subjects and objects

2. a basic word order

3. either SOV or VSO
Example — partition

STEP TWO: multidimensional partition of the domain

A three-dimensional, binary partition:

1. SOV vs. VSO

2. B-GAP vs. B-GAP’

3. F-GAP vs. F-GAP’
Example — SOV languages

John-ga hon-o yon-da.
John-NOM book-ACC read-PAST
John read a book.

Ayse kitab-i oku-yor.
Ayse.NOM book-ACC read-PROG
Ayse reads the book.
Example — VSO languages

Chonaic Eoghan Siobhán.

saw Eoghan Siobhán

Eoghan saw Siobhán.

Nagbabasa ang-titser ng-libro.

read.PAST NOM-teacher ACC-book

The teacher read a book.
Example — B-GAP and B-GAP’ languages

John read a book and Bill read a newspaper.
John . . . a book and Bill read a newspaper.
*John a book and Bill read a newspaper.

So English \( \not\in \) B-GAP. But Japanese \( \in \) B-GAP:

John-ga hon-o, Bill-ga shimbun-o yon-da.
John-NOM book-ACC Bill-NOM newspaper-ACC read-PAST

*John read a book and Bill a newspaper.
Example — F-GAP languages

John read a book and Bill read a newspaper.
John read a book and Bill . . . a newspaper.
John read a book and Bill a newspaper.

So English $\in$ F-GAP. Also Irish $\in$ F-GAP:

Chonaic Eoghan Siobhán agus Eoghnaí Ciarán.

saw Eoghan Siobhán and Eoghnaí Ciarán

$Eoghan$ saw $Siobhán$ and $Eoghnaí$ Ciarán.
Example — F-GAP’ languages

But Japanese $\in$ F-GAP’:

*John-ga hon-o yon-da, Bill-ga shimbun-o.

John-NOM book-ACC read-PAST Bill-NOM newspaper-ACC

John read a book and Bill a newspaper.
Example — domain and partitions

Domain: SOV and VSO languages

Three-dimensional partition:

1. SOV vs. VSO (i.e. SOV’)
2. B-GAP vs. B-GAP’
3. F-GAP vs. F-GAP’
Example — a typology

SOV \cap B-GAP \cap F-GAP
SOV \cap B-GAP \cap F-GAP'
SOV \cap B-GAP' \cap F-GAP
SOV \cap B-GAP' \cap F-GAP'
VSO \cap B-GAP \cap F-GAP
VSO \cap B-GAP \cap F-GAP'
VSO \cap B-GAP' \cap F-GAP
VSO \cap B-GAP' \cap F-GAP'
Example — data collection

STEP THREE: classifying the domain into the eight subtypes and looking for statistical tendencies.

Ross’ observation:

1. languages with backward-gapping constructions are always SOV  
i.e. VSO ∩ B-GAP = ∅

2. languages with forward-gapping constructions are usually VSO  
i.e. SOV ∩ F-GAP ≈ ∅
Example — explanation?

Formalism $F$ explains universal $P \cap Q = \emptyset$ if:

- there are $F$-grammars for $P$ languages

- there are $F$-grammars for $Q$ languages

- there is no $F$-grammar for a language in $P \cap Q$. 
Example — Steedman’s explanation

Three initial assumptions:

1. SOV transitive verbs: $(S\backslash NP_{sbj})\backslash NP_{obj}$

2. VSO transitive verbs: $(S/NP_{obj})/NP_{sbj}$

3. Constituent coordination: $X \text{ CONJ } X \Rightarrow X$
Example — simple derivation

subject object verb

\[
\begin{array}{c}
\text{NP}_{\text{sbj}} \\
\text{NP}_{\text{obj}} \\
(S \setminus \text{NP}_{\text{sbj}}) \setminus \text{NP}_{\text{obj}} \\
S \setminus \text{NP}_{\text{sbj}} \\
S
\end{array}
\]

So: sentential and VP coordination

SOV and SOV
SOV and OV
Example — alternative derivation

subject

\[
\frac{\text{NP}_{\text{sbj}}}{S/((S\backslash \text{NP}_{\text{sbj}})\backslash \text{NP}_{\text{obj}})} \quad \frac{\text{NP}_{\text{obj}}}{(S\backslash \text{NP}_{\text{sbj}})/(((S\backslash \text{NP}_{\text{sbj}})\backslash \text{NP}_{\text{obj}})} \quad \frac{(S\backslash \text{NP}_{\text{sbj}})\backslash \text{NP}_{\text{obj}}}{S/((S\backslash \text{NP}_{\text{sbj}})\backslash \text{NP}_{\text{obj}})} \quad \frac{S}{S}
\]

object

verb

So: backward-gapping (i.e. argument cluster coordination)

SO and SOV
Example — conclusion

SOV transitive verbs, i.e. \((S\backslash \text{NP}_{\text{subj}})\backslash \text{NP}_{\text{obj}})\), automatically give rise to backward-gapping constructions in CCG.

But: there is no CCG which can generate an \(\text{SOV} \cap \text{F-GAP}\) language, assuming constituent coordination.

VSO transitive verbs, i.e. \((S/\text{NP}_{\text{obj}})/\text{NP}_{\text{subj}})\), automatically give rise to forward-gapping constructions in CCG.

But: there is no CCG which can generate a \(\text{VSO} \cap \text{B-GAP}\) language, assuming constituent coordination.

Therefore: CCG predicts the implicational universals \(\text{VSO} \cap \text{B-GAP} = \emptyset\) and \(\text{SOV} \cap \text{F-GAP} = \emptyset\).
Conclusion

Implicational language universals:

- \( P \cap Q = \emptyset \)

Ross’ observation:

- \( VSO \cap B\text{-GAP} = \emptyset \) and \( SOV \cap F\text{-GAP} = \emptyset \)

CCG \textit{predicts} these implicational universals since the unattested language types lie outwith its generative capacity

- these universals are \textit{theorems} of the underlying principles of CCG (Adjacency, Inheritance, Consistency, Combinatory Type Transparency) — no independent stipulation required.