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Basic concepts of OT

(Example from introduction to Legendre, Grimshaw and Vikner, eds., *Optimality-Theoretic Syntax*.)

Optimality Theory (OT) is not a theory of syntax; in fact, it has its origins in phonology. OT is a theory of the interaction of **constraints**. Most theories of syntax are based on a concept of constraints: a constraint marks certain structures ungrammatical. For example, most theories of syntax assume that there is a constraint that says that every clause must have a subject. We will call this constraint SUBJECT. Such a constraint would mark any sentence without a subject as ungrammatical.

OT differs from other theories in that, in OT, constraints of grammar are (usually) not absolute. Instead they are **violable**. So the constraint SUBJECT would not necessarily automatically mark a subjectless sentence as ungrammatical. A violation of SUBJECT would incur some sort of penalty, but under the appropriate conditions, this penalty would not result in ungrammaticality. The appropriate conditions would be a more important constraint. The constraints are part of universal grammar; the question of what is more important is different for each language. The specification of relative importance of constraints is called the constraint **ranking**.

So an OT grammar consists of a set of universal constraints with a language-specific ranking (CON).

A grammatical form starts as an input. The generative component (GEN) generates candidate outputs, which are evaluated by EVAL against the language-specific ordering of the constraints.

The evaluation is shown graphically by means of a tableau (plural: tableaux). A violation of a constraint is shown by an asterisk (*). A "fatal" violation, one which excludes a particular candidate, is marked "*!". And the winner is marked "☞".

Back to the question of whether or not every clause has a subject. Suppose that in addition to the constraint SUBJECT, there is also a constraint Full Interpretation (FULLINT), which says that meaningless elements are not allowed in a sentence. Now consider the verb *rain*, which semantically does not take an argument. If you don't put in a subject, you violate the constraint SUBJECT. If you put in a dummy subject, you violate the constraint FULLINT. Which of these two constraints "wins" depends on the language-specific ranking. In English, SUBJECT is ranked higher than FULLINT, or **dominates** FULLINT (we write this: SUBJECT ≫ FULLINT), so we say *It is raining*. In Italian, FULLINT is ranked higher than SUBJECT, so one says *Piove*. Here are the tableaux:

English:

'rain ()'	SUBJECT	FULLINT
☞ It is raining.		*
Is raining.	*!	

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Italian:

'rain ()'		FULLINT	SUBJECT
	Lui piove.	*!	
☞	Piove.		*

This is a relatively simple example, but it gets the basic idea. The concepts that constraints of grammar can contradict each other is a central concept in OT.

OT provides a formal, theoretical framework in which it is possible to talk about universals which are not always followed. As we have seen, much of typology is like that: most of the universals are not absolutely followed by every language. For this reason, a theory like OT, with universal violable constraints, promises to advance our understanding of linguistic typology.

Differential Marking in OT

(based on Aissen, Judith (1999) "Markedness and Subject Choice in Optimality Theory" *Natural Language and Linguistic Theory* 17: 673–711; and Aissen, Judith (2003) "Differential Object Marking: Iconicity vs. Economy" *Natural Language and Linguistic Theory* 21: 435–483)

The OT formalization of differential marking is based on the concept of harmonic alignment of hierarchies. In fact, the material on harmonic alignment (and the terminology and notation) came from work in OT. Consider the following markedness hierarchy:

Oj/NSpec ≻ Oj/Spec ≻ Oj/Def ≻ Oj/PN ≻ Oj/Pron

In OT, we would need to express this in the form of constraints. Since constraints penalize structures, we want a constraint that penalizes nonspecific objects (which we can call *OJ/NSPEC), one that penalizes specific objects (*OJ/SPEC), one that penalizes definite objects (*OJ/DEF), and so on. The hierarchical relationship can be expressed by making the ranking of these constraints a linguistic universal, unlike most constraint rankings. The one that will get penalized first is the most marked combination—the one at the bottom of the markedness hierarchy. So the OT constraint ranking will be reversed relative to the markedness hierarchy.

*OJ/PRON ≫ *OJ/PN ≫ *OJ/DEF ≫ *OJ/SPEC ≫ *OJ/NSPEC

There are languages in which the operation of the high-ranked constraints is transparent; for example, Chamorro and Mam do not allow (third-person) object pronouns; instead, the sentence is intransitivized. Similar observations hold for the high-ranked constraints on the other markedness hierarchies. There are many typological facts that can be subsumed under an analysis in terms of these constraints. But to account for differential marking, we need to add something, because languages with differential marking arise precisely because these constraints (even the high-ranking ones) are violated in many languages. (For example, if the constraint penalizing sentences in which Patient is not realized as object outranks *OJ/PRON, a pronominal object Patient will be grammatical.)

What we need to add is two additional constraints which express long-observed properties of syntax. One of these constraints states that NPs must be marked for Case (or, alternatively, that not being marked for Case is penalized). We will call this constraint:

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$*Ø_C$
(where "C" stands for "Case")

This can be considered an "iconicity" constraint, forcing syntactic form to overtly reflect the functional/featural content of the sentence.

The other constraint is an "economy" constraint, which penalizes the use of overt material. The existence of such constraints is clear: for example, if a language allows subject pronouns to be omitted they usually are omitted unless they are needed for emphasis. The specific constraint we need here is an economy constraint for Case: one that penalizes Case.
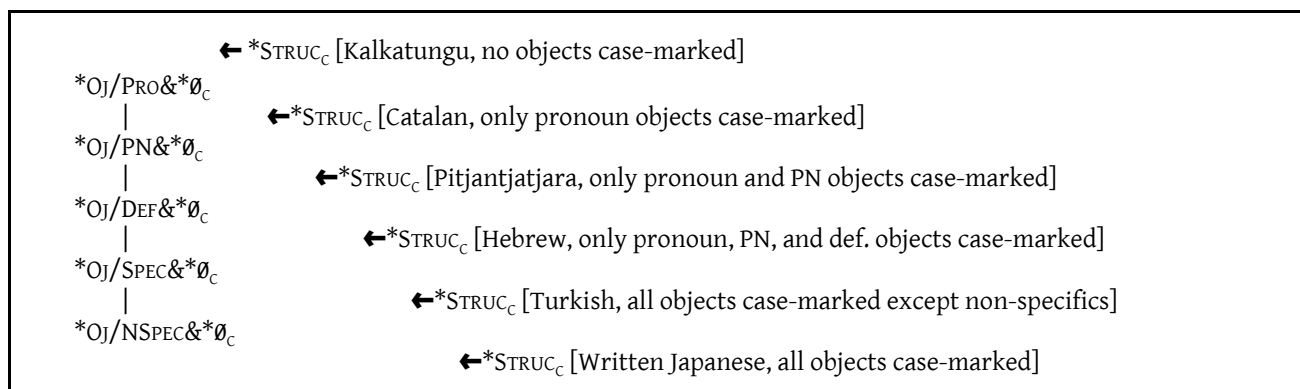
$*STRUC_C$

These two constraints contradict each other. They also differ in that, as we have seen, iconicity is required more at the lower ends of the markedness hierarchies. So $*Ø_C$ is combined with the constraints that reflect the hierarchies, as in the following example. (In the OT literature, this is known as "local conjunction" of constraints.)

$$*OJ/PRON\&*Ø_C \gg *OJ/PN\&*Ø_C \gg *OJ/DEF\&*Ø_C \gg *OJ/SPEC\&*Ø_C \gg *OJ/NSPEC\&*Ø_C$$

In other words, a pronominal object with no Case marking is penalized before a pronominal proper name with no Case marking, and so on. The constraint $*STRUC_C$ is interpolated somewhere in this constraint ranking. Any constraint ranked higher that $*STRUC_C$ will result in an NP which is Case marked; any constraint ranked lower than $*STRUC_C$ will result in an NP with no Case.

Aissen (2003) provides the following chart, showing how different languages rank $*STRUC_C$ relative to the other constraints on the object definiteness markedness hierarchy.

```
                    ← *STRUCC [Kalkatungu, no objects case-marked]
*OJ/PRO&*ØC
    |             ←*STRUCC [Catalan, only pronoun objects case-marked]
*OJ/PN&*ØC
    |               ←*STRUCC [Pitjantjatjara, only pronoun and PN objects case-marked]
*OJ/DEF&*ØC
    |                 ←*STRUCC [Hebrew, only pronoun, PN, and def. objects case-marked]
*OJ/SPEC&*ØC
    |                   ←*STRUCC [Turkish, all objects case-marked except non-specifics]
*OJ/NSPEC&*ØC
                      ←*STRUCC [Written Japanese, all objects case-marked]
```

We have seen all these languages before, with the exception of Kalkatungu and Japanese. Kalkatungu is an ergative language in which all subjects are marked and all objects are unmarked (a textbook example of ergative Case marking), so while all the object-related constraints are ranked below $*STRUC_C$, all the subject-related ones are ranked higher.

The animacy hierarchy is a little more complicated, because individual languages make finer distinctions.

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```
                        ← *STRUC_C [Kalkatungu, no objects case-marked]
*OJ/HUM&*Ø_C
    :              ← *STRUC_C [Yiddish, only some human objects case-marked]
*OJ/ANIM&*Ø_C
    :                  ← *STRUC_C [Ritharngu, all human objects and some animates case-marked]

    :                   ← *STRUC_C [Dhargari, all animate objects case-marked]
*OJ/INAN&*Ø_C
    :                       ← *STRUC_C [Bayungo, all animates, some inanimates case-marked]

    :                          ← *STRUC_C [Written Japanese, all objects case-marked]
```

(The person hierarchy does not appear to be implicated in differential object marking.)

In languages where multiple hierarchies are involved, the computation gets more complicated, but the basic idea is the same. Cases of optional marking also complicate the system (what is needed is some sort of flexible ranking for *STRUC_C).
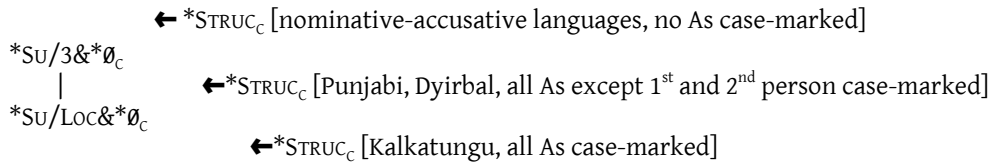
Differential subject marking is less widespread than differential object marking. To a large extent, this may be because so many languages are nominative-accusative (i.e. never mark the subject). Also related may be the fact that subjects are more likely to be of the unmarked kind than objects (i.e. nonhuman subjects are much less common than human objects; many languages require subjects to be definite; etc.) As a consequence, not all the possibilities for ranking of *STRUC_C are attested in the subject-related hierarchies.

Although Aissen does not provide charts like this for differential subject (split ergative) marking, the text of the article suggests the following:

```
                        ← *STRUC_C [nominative-accusative languages, no As case-marked]
*SU/NSPEC&*Ø_C
    |              ← *STRUC_C [?]
*SU/SPEC&*Ø_C
    |                  ← *STRUC_C [?]
*SU/DEF&*Ø_C
    |                  ← *STRUC_C [?]
*SU/PN&*Ø_C
    |                      ← *STRUC_C [Gugu Yimidhirr, all As case-marked except pronouns]
*SU/PRO&*Ø_C
                          ← *STRUC_C [Kalkatungu, all As case-marked]
```

```
                        ← *STRUC_C [nominative-accusative languages, no As case-marked]
*SU/INAN&*Ø_C
    |              ← *STRUC_C [Lakhota, inanimate As case-marked]
*SU/ANIM&*Ø_C
    |                  ← *STRUC_C [?]
*SU/HUM&*Ø_C
                      ← *STRUC_C [Kalkatungu, all As case-marked]
```

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$\leftarrow$ *STRUC$_C$ [nominative-accusative languages, no As case-marked]

*SU/3&*Ø$_C$

| $\leftarrow$*STRUC$_C$ [Punjabi, Dyirbal, all As except 1st and 2nd person case-marked]

*SU/LOC&*Ø$_C$

$\leftarrow$*STRUC$_C$ [Kalkatungu, all As case-marked]

Here are tableaux for Hebrew and Turkish. The sentence is 'Chomsky bought a (specific) ox'. The markedness hierarchy that is relevant is the one for object definiteness. The rankings in the two languages are as follows:

Hebrew:
*OJ/PRON&*Ø$_C$ ≫ *OJ/PN&*Ø$_C$ ≫ *OJ/DEF&*Ø$_C$ ≫ *STRUC$_C$ ≫ *OJ/SPEC&*Ø$_C$ ≫ *OJ/NSPEC&*Ø$_C$

Turkish:
*OJ/PRON&*Ø$_C$ ≫ *OJ/PN&*Ø$_C$ ≫ *OJ/DEF&*Ø$_C$ ≫ *OJ/SPEC&*Ø$_C$ ≫ *STRUC$_C$ ≫ *OJ/NSPEC&*Ø$_C$

Hebrew:

'Ch. bought a (specific) ox'	*OJ/PRON&*Ø$_C$	*OJ/PN&*Ø$_C$	*OJ/DEF&*Ø$_C$	*STRUC$_C$	*OJ/SPEC&*Ø$_C$	*OJ/NSPEC&*Ø$_C$
Chomsky kana **et** šor.				*!		
☞ Chomsky kana šor.					*	

Turkish:

'Ch. bought a (specific) ox'	*OJ/PRON&*Ø$_C$	*OJ/PN&*Ø$_C$	*OJ/DEF&*Ø$_C$	*OJ/SPEC&*Ø$_C$	*STRUC$_C$	*OJ/NSPEC&*Ø$_C$
☞ Chomsky bir öküz**ü** aldı.					*	
Chomsky bir öküz aldı.				*!		

More complex local conjunctions of constraints can account for direct/inverse systems as well, as discussed by Aissen (1999).

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In conclusion, OT provides an insightful way to express the generalizations about differential marking that typologists have discovered.