On the Variable Strength of Island Constraints*

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1. Families of Transformations

Classes of transformations have generally been distinguished one from another by their formal characteristics. A class of transformations can be defined by first comparing the structural description and structural change of a set of transformations, and then identifying what is in common in the comparison for all members of the set. For example, in every deletion transformation some element in the structural description is replaced by the null element in the structural change.

There are four major families of transformations: chopping, copying, deletion, and feature-changing. Chopping rules are those such as Wh-Q Movement and Tough Movement, in which some element of a phrase marker is moved. In copying rules (such as Left Dislocation) some element is copied into a new position, with the original or some reduced version of it left behind. Feature-changing rules add a feature to some element of the structural description. Deletion rules are those in which some part of a phrase marker p_i does not appear anywhere in phrase marker p_{i+1}. It is possible to give more precise, formal definitions of the terms 'chopping rule', 'deletion rule', etc. I relegate these definitions to a footnote, however, as they bristle with algebraic formalism.[1]

In this paper I show that we can use these formal definitions, in conjunction with the applicational principles of rules, in order to express significant generalizations about English syntax. The applicational principles I refer to are island constraints,[2] principles which prohibit transformations from applying in certain cases, even though the Structural Descriptions of these rules are met. When we examine the relationship between island constraints and families of transformations we are led to the conclusion that a given family of transformations may be stronger or weaker than other families, and that some island constraints may be stronger or weaker than others.

2. Variable Strength

The investigation is conducted within the framework of non-discrete grammar, as developed by Ross (see Ross 1972). Although not made explicit, the requirement of discreteness has been a basic assumption of generative grammar. It is widely held that there is a finite list of categories and construction types, that sentences are either grammatical or not grammatical, that a transformation either applies or it does not apply. These assumptions have recently been called into question. For example Ross (1972) claims that there is not a finite list of categories, but that there is a continuum moving from more verb-like to more noun-like. Island constraints also were originally viewed as discrete phenomena, but Ross has more recently shown that transformations have a variable strength associated with them. For

example, Relative Clause Formation is stronger than Question Formation, since the set of environments in which the former can apply properly includes the set of environments in which the latter can apply. Furthermore, some environments are more restrictive than others, so that, for example, the set of transformations that can apply into the that S complement after make the claim is a subset of the set of transformations that can apply into the that S object of V_{think}.[3] The interaction of these two gradients will impose a matrix on the data, indicating that a strong rule in a non-restrictive environment will produce a relatively acceptable sentence, while a weak rule in a restrictive environment will produce a relatively unacceptable sentence. Ross concludes that whether a rule can apply in a particular case is a function of three things: (a) the inherent strength of the rule, (b) the inherent freedom of the context, and (c) the variable strength which is provided by the language.

The concept of variable strength must be extended beyond individual transformations, so that families and island constraints can be rated in terms of relative strength as well. The rating is accomplished in the following manner. We examine each family of transformations and determine how it functions with respect to each constraint. There are three possibilities, which I symbolize in the following manner:

✓ all rules of the family are subject to the constraint
% some rules of the family are subject to the constraint
x no rules of the family are subject to the constraint

We can represent the results by means of a matrix where the rows represent families of transformations, the columns represent different constraints, and the square where a column intersects with a row says whether some, all, or no rules of the family are subject to the constraint. I shall be concerned with four families of rules mentioned above, and the following four constraints:[4] (a) the Complex Noun Phrase Constraint, (b) the Sentential Subject Constraint, (c) the Coordinate Conjunct Constraint, and (d) the Coordinate Element Constraint. This list differs from that in Ross (1967) in that I accept Alexander Grosu's proposal that the Coordinate Structure Constraint is not a unitary constraint, but actually consists of two separate constraints involving coordinate structures. These two constraints are:[5]

c. The Conjunct Constraint: no conjunct of a coordinate structure may be moved out of that structure.

d. The Element Constraint: no element under the domination of one of the conjuncts of a coordinate structure may be moved out of that structure.

The relative ranking of families and constraints is given in matrix (1).

(1)

	Conjunct Constraint	SSC, CNPC	Element Constraint
copying	x	x	x
feature-changing	%	x	x
deletion	✓	%	x
chopping	✓	✓	✓

I shall discuss how each family of rules interacts with the constraints, and then return to the implications of matrix (1).

3. Chopping and Copying Rules

Chopping and copying rules represent the most straightforward cases. Ross (1967) is in large part a demonstration that chopping rules are subject to island constraints. Ross also shows (232-9) that copying rules are not subject to the constraints. These conclusions are embodied in (1), in the row for copying rules and in the row for chopping rules. I know of only one exception to this generalization, that of asymmetric conjunction, which Ross claimed was an exception to the CSC.

(2) a. I went to the store and bought some whiskey.
b. This is the whiskey which I want to the store and bought.
c. This is the store which I went to and bought some whiskey.

Note that this is an exception to the Element Constraint. The Conjunct Constraint is applicable here, as shown by (3a-d).

(3) a. John is looking forward to going to the store and buying some whiskey.
b. What John is looking forward to is going to the store and buying some whiskey.
c. *What John is looking forward to and buying some whiskey is going to the store.
d. *What John is looking forward to going to the store and is buying some whiskey.

For an explanation of the exceptionality of asymmetric coordination, see Grosu (1972:139-52).

4. Deletion Rules

Of the large number of deletion rules that have been proposed for English, many are not relevant to the point being discussed. Island constraints do not affect a rule unless that rule reorders a term around an essential variable, or unless an essential variable intervenes between the controlling element and the element to be deleted (cf. Ross 1967:245). Many rules will thus provide no evidence for the ranking of constraints, either because they do not have an essential variable in the Structural Description, or because they operate on structures which are so specific that there is no possibility that they would ever operate on an island.

There are three types of deletion transformations: Free Deletion, Coreferential Identity Deletion, and Identity of Sense Deletion. I give an example of each class in footnote six.[6] Grinder (1971:10-37) has proposed that the set of Free Deletion transformations be replaced by the mechanism of optional lexicalization. In any event, since free deletions do not involve a rule which has an essential variable in the structural description, it is not possible to test whether they are subject to island constraints.

There are a number of deletion rules that we can test to see whether they are limited by the constraints. These are: VP Deletion, Sluicing, Comparative Deletion, S-Deletion, Genitive Head Deletion, Gapping, Complement-Object Deletion, Super-Equi. These rules are not limited by the Coordinate Element Constraint, as shown in (4a-h).

(4) a. VP-Deletion: John won't play the piano, but Mary will and I'm glad of it.
b. Super-Equi: John believes it is dangerous to wash himself with soap and that he must never bathe more than once a week.
c. Sluicing: Someone left the room, but I don't know who and nobody cares anyway.
d. Genitive-Head Deletion: The company raised Bill's salary, but they didn't raise George's and that annoys me.
e. S-Deletion: John believes that the earth is flat, and I believe it and think we'll sail over the edge.
f. Gapping: John read a newspaper, and Mary a book and wrote a report on it.
g. Complement-Object Deletion: The rock is too heavy for me to pick up and walk to the river.
h. Comparative Deletion: ?The post office is taller than the courthouse is, or the jail is wide.[7]

In each case, the deleting element is inside a coordinate structure, either a coordinate S or coordinate VP, but is not itself one of the conjuncts of a coordinate structure. I conclude that deletion rules are not subject to the Coordinate Element Constraint.

But all deletion rules <u>are</u> subject to the Coordinate Conjunct Constraint. For example, VP_1 in the structure $_{VP}[VP_1$ and $VP_2]$ is a conjunct of a coordinate structure, and may not be zapped by VP Deletion. The limitation of deletion rules by the Conjunct Constraint is shown in (5).[8] These should be compared with their correspondingly lettered sentences in (4).

(5) a. VP-Deletion: Jacqueline can't play the clarinet, but I know a woman who can {*Ø / play the clarinet} and conduct the orchestra too.

b. Super-Equi: Robert thinks it would be wise for {*Ø / him} and Geraldine to leave.

c. Sluicing: Someone came in at five o'clock, but I don't know who {*Ø / came in at five} and left at ten.

d. Genitive-Head Deletion: The company raised Bill's salary, but they didn't raise George's {*Ø / salary} and commission.

e. S-Deletion: John believes that the earth is flat, and I believe {*it / that the earth is flat} and that M.I.T. is in the geographical center.

f. Gapping: John read a newspaper and Alice bought and {*Ø / read} a book.

g. Complement-Object Deletion: The rock$_i$ is too heavy for me to pick {*Ø / it$_i$} and the axe up.

h. Comparative Deletion: The sea is deeper than the lake is {*Ø / ?deep} or wide.

Some members of the set of deletion rules are subject to the SSC, and some are subject to the CNPC. It is of some interest that any given rule is subject to both constraints or neither. The following rules are not subject to the CNPC or the SSC. (The a sentence gives an example where a rule operates into a complex NP, the b sentence an example where the rule operates into a sentential subject.)

(6) VP-Deletion:
a. Siddhartha can speak Sanskrit, but Bill denied the claim that Gerhardt can.
b. John can speak French, and that Albert can too is known by everyone.

(7) Sluicing:
a. Someone was dancing, but Bill denied the claim that he knew who.
b. Someone was dancing, but the fact that I don't know who is not important.

(8) Super-Equi:
a. Farley$_i$ thought it would be futile to conceal his$_i$ desire to levitate.
b. To be excused from writing his$_i$ paper would please Mayhew$_i$.

(9) Genitive-Head Deletion:
  a. I bought John's car, and there is the man who bought Wilfred's.
  b. Nobody knows that John's car is blue, but that Percy's is pink is obvious.

(10) S-Deletion:
  a. Wesley believes the earth is flat, and another man who believes it will be here tomorrow.
  b. Wesley believes the earth is flat, and the fact that Albert believes it is not unexpected.

But some deletion rules are subject to the SSC and CNPC:

(11) Comparative Deletion:
  a. *Wilt is taller than I know a boy who it.
  b. *Wilt is taller than that Bill is is generally believed.

(12) Complement Object Deletion:
  a. The rock$_i$ is too heavy for the man who wants to pick $\{^{it_i}_{*\emptyset}\}$ up to budge.
  b. *This chair is too big for him to get through the door to be easy.
  c. This chair is too big for it to be easy for him to get through the door.

The results of this section are summarized in the row for deletion rules in matrix (1).

5. Feature-Changing Rules

The feature-changing rules that are of relevance are the following: (a) Definite Pronominalization, (b) Reflexivization, (c) Complement Object Pronominalization--this pronominalizes the underscored elements in (13),

(13) a. The rock is too heavy for me to pick it up.
  b. The tea is ready for you to drink it.

(d) Pseudo-Reflexive--this rule produces the reflexive in (14),

(14) John claims people like himself shouldn't study math.

(e) Sequence of Tenses--this rule changes the tense on a verb so that it agrees with the tense of some other verb in the sentence. In some cases it is obligatory, in other cases optional (see Ross 1967:181),

(15) I thought that the sun $\{^{*is}_{was}\}$ out.

and (f) Indefinite Incorporation (Ross 1967:169-73)--this rule

changes indeterminate quantifiers like some to indefinite ones like any. The triggering elements are negatives, questions, the word only in certain contexts, and certain other lexical items.

Feature-changing rules are not subject to the Coordinate Element Constraint (shown by the a sentences in (16)-(21) below), the CNPC (shown by b) or the SSC (shown by c).

(16) Definite pronominalization:
  a. John$_i$ entered the room and Mary kissed him$_i$ and hit George.
  b. John$_i$ kissed the girl who he$_i$ loved.
  c. The fact that he$_i$ passed the exam pleases John$_i$.

(17) Reflexivization:
  a. John admires Mary and despises himself.[9]

(18) Complement Object Pronominalization:
  a. This rock$_i$ is too heavy for me to pick it$_i$ up and lift the crowbar at the same time.
  b. The rock$_i$ was too heavy for the man who tried to pick it$_i$ up to budge.
  c. The rock$_i$ was so light that for John to lift it$_i$ was easy.

(19) Pseudo-Reflexive:
  a. John likes musicians like himself and ignores others.
  b. John said that the woman who hired a lot of chemists like himself had been fired.
  c. The fact that many companies hire chemists like himself pleases John.

(20) Sequence of Tenses:
  a. John thought that Mary was in France and that she would return in April.
  b. John denied the report that he was the ringleader of the revolt.
  c. That the sun was out was obvious.

(21) Indefinite Incorporation:
  a. We don't know any Germans or want to visit Heidelberg.
  b. I never met a man who anybody would want to kill.[10]
  c. That John gave her any money is not what I said.

Contrast (22a) with (22b).

(22) a. *I met a man who anybody would want to kill.
  b. I met a man who somebody would want to kill.

Ross (1967:248-59) claimed that Indefinite Incorporation is subject to the SSC and CNPC. But Ross cites examples where the affected element is inside a definite NP, and the fact relevant to blocking

the rule seems to be that the affected element is inside a definite NP, rather than that it is inside a complex NP.[11] Ross cites (23), but here the complex NP is definite.

(23) *I never met that man who anybody tried to kill.

Notice also the difference between (24) and (25).

(24) *I don't believe the report that anybody wants to kill John.
(25) I wouldn't believe a report that anybody wants to kill John.

Thus an explanation can be provided without using the SSC or CNPC. Ross claimed that feature-changing rules are all subject to all constraints, but the data cited here provides counterevidence, and Ross himself presented counterevidence to his claim (Ross 1967:257). I suspect that the ungrammatical sentences that Ross cites in section 6.4.1 can be blocked on grounds other than the violation of island constraints.

A subset of feature-changing rules are subject to the Coordinate Conjunct Constraint. The following rules are subject to the Conjunct Constraint.

(26) a. Reflexivization: ??John admires Mary and himself. (compare with (17))
b. Complement Object Pronominalization: ??This rock$_i$ is too heavy for me to pick it$_i$ and the crowbar up. (compare with (18a))
c. Indefinite Incorporation: *John didn't eat any ice cream or the cake.[12] (compare with (21))

But the following rules are not subject to the Conjunct Constraint.

(27) a. Definite Pronominalization: John$_i$ entered the room and Mary kissed him$_i$ and George.
b. Pseudo-Reflexive: John hires people like himself and Alice.
c. Sequence of Tenses: John thought that Mary sang and danced.

The data given in this section enables us to fill in the feature-changing row in matrix (1).

6. Implications of the Results.

There are two major conclusions: (a) families of transformations differ in how tightly they are constrained, (b) some island constraints are stronger than others. In (1), families of rules become weaker moving from top to bottom. Chopping rules are weaker than deletion rules, for example, because they are limited by more

island constraints than other rules, and more of them are limited by island constraints than other rules. Constraints become weaker as we move from left to right across the matrix. The Conjunct Constraint is stronger than the SSC, for example, since the former limits more classes of rules than the latter. The northeast corner of the matrix represents those cases where sentences are most acceptable: a strong rule operates on a structure defining a weak constraint. The a sentences of (16)-(21) are examples. The southwest corner gives sentences which are relatively ungrammatical. Examples appear in (5), where deletion rules violate the Conjunct Constraint. Notice that the CNPC is weaker than the Conjunct Constraint. In accordance with this ranking, (28a) seems to be less deviant than (28b).

(28) a. ?*The rock is too heavy for the man who wants to pick up to budge.
b. *The rock is too heavy for me to lift and the crowbar.

Certain implicational relations can be stated: If a rule is limited by the Element Constraint, then it is limited by the Conjunct Constraint. That is, no rule is limited by the Element Constraint, but not by the Conjunct Constraint. In general terms, if a rule x is limited by a certain constraint, it is also limited by any constraint to the left of x in (1). If it is not limited by a constraint y, then neither is it limited by a constraint to the right of y in (1).

The matrix given in (1) represents a strong empirical hypothesis about the grammar of English. In addition, it is of relevance to a general topic in the theory of syntax, that of interpretive vs. generative semantics. Generative Semantics has claimed that there exist deletion rules, such as Super-Equi and VP-Deletion, which account for the semantics of sentences with missing constituents. Interpretive Semantics, on the other hand, has denied the existence of such transformations, and claimed that the interpretation of the missing constituents is filled in by a set of semantic interpretation rules. Grinder and Postal (1971), and the literature cited there, provide an extensive discussion of this issue.

But notice the consequences of replacing deletion rules by semantic interpretation rules. I pointed out above that some deletion rules are subject to island constraints. The concept of island constraint would have to be extended to the semantic component, although it was developed and justified for the syntactic component. The result would be that the same constraints would have to be stated for both the syntactic and semantic component, although these components are supposed to be separate. In addition, an implicational hierarchy would have to be set up for semantic rules: if a semantic rule is limited by the SSC, it is also limited by the Conjunct Constraint. But the hierarchy for semantic rules would be exactly the same as that established for

syntactic rules. Thereby, the same ranking would be established for both parts of the grammar. In Interpretive Semantics, the correlation would be accidental, while in Generative Semantics the correlation would be due to the fact that the hierarchy here discussed is a unitary phenomenon stated over transformations.

Footnotes

*This paper could not have been written without the pioneering work of Haj Ross and Alex Grosu on island constraints, and I would like to express my appreciation to them. I would also like to thank Rick Wojcik, Arnold Zwicky and David Dowty for many hours of stimulating discussion of syntax.

1. Ross (1967) defines copying, chopping, and feature-changing rules as follows (p. 235):

> If the structural index of a transformation has n terms, a_1, a_2, ...a_n, it is a <u>reordering transformation</u> if its structural change has any a_i as its k^{th} term, or if a_i is adjoined to its k^{th} germ, where $i \neq k$.
> If a transformation reorders a_i, and its structural change substitutes the identity element or some a_k, $i \neq k$, for the i^{th} term of the structural index, the transformation is a <u>chopping transformation</u>. Other reordering transformations are called <u>copying transformations</u>.
> By 'feature-changing' rule I mean any rule whose structural index is of the form (5.78a), and whose structural change is of the form of either (5.78b) or 5.78c).

(5.78) a. ... A_1 ... A_2 ...

b. ... A_1 ... $\begin{bmatrix} A_2 \\ +F \end{bmatrix}$ ...

c. ... $\begin{bmatrix} A_1 \\ +F \end{bmatrix}$ ... A_2 ...

In a similiar fashion, Grinder (1971) defines 'deletion transformation':

> If in the i^{th} position of the structural change of the transformation under consideration we find a null term, we need only check to see what the i^{th} term of the structural index of that transformation was. If the i^{th} term of the structural index never appears in the structural change, then the transformation under consideration is a member of the set of deletion transformations.

2. See Ross (1967), Grosu (1972) for a more extended discussion of the concept of 'island constraint'.

3. This refers to the set of verbs which includes <u>think</u>, <u>assume</u>, <u>reckon</u>, etc.

4. The Sentential Subject Constraint was defined by Ross (1967:134) as follows:

No element dominated by an S may be moved out of that S if that node S is dominated by an NP which itself is immediately dominated by S.

The Complex NP Constraint is:

No element contained in a sentence dominated by a noun phrase with a lexical head noun may be moved out of that noun phrase by a transformation.

5. Grosu shows that certain transformations distinguish between two two parts of the CSC. For example, VP-Deletion is no subject to the Element Constraint, but it is subject to the Conjunct Constraint.

(i) I can't play tennis but my son can and I am proud of him.
(ii) *I can't play tennis, but I know a man who can and run the marathon, too.

In (ii) there is a conjoined VP at the point at which VP-Deletion applies. Neither VP may be deleted, since each VP is itself a conjunct. In (i) each VP is only a member of a conjunct.

6. Agent Deletion is an example of a Free Deletion rule, Equi is the classic example of a rule of Coreferential Identity Deletion, and VP-Deletion is an example of Identity of Sense Deletion. These rules have applied in the derivations of (i), (ii), and (iii) respectively.

(i) Greta was contacted.
(ii) Maxwell wants to leave.
(iii) Mary can speak French, and John can too.

7. I am concerned with the reading where this sentence means 'the tallness of the post office exceeds both the tallness of the courthouse and the width of the jail.' Intonation here is crucial. There must be a heavy pause after the comma, and stress on wide. While this sentence is difficult to interpret, I believe that the lessened grammaticality is not due to violation of an island constraint.

8. Grosu (1973) shows that ordering Coordination Reduction before deletion rules cannot explain the unacceptability of the sentences in (8). In particular, unacceptability results only if an entire coordinate term is deleted: 'if Coordination Reduction does not create an input to VP-Deletion such that the latter can destroy a whole term, the result of deletion is acceptable.' Compare (8a) with (i).

(i) Jacqueline can't play the clarinet, but I know a woman who can and who can conduct the orchestra too.

9. The clause mate condition on this rule prohibits testing for the CNPC or SSC.

10. The word anybody which is the variant of somebody in affective contexts should not be confused with the homophonoun lexical item in (i).

(i) Anybody can solve that problem.

11. The distinction may also involve specific vs. nonspecific indefinites. It is my intuition that (i) is grammatical if a linguist is nonspecific, but ungrammatical if it is specific.

(i) I'll never find a linguist who anybody wants to hire.

12. Note that the quantifier any is not one of the conjuncts of a coordinate structure. However, we can easily conceive of Indefinite Incorporation as adding the feature onto an NP node, with the feature then flowing down to the modifier.

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