Is the Best Good Enough?
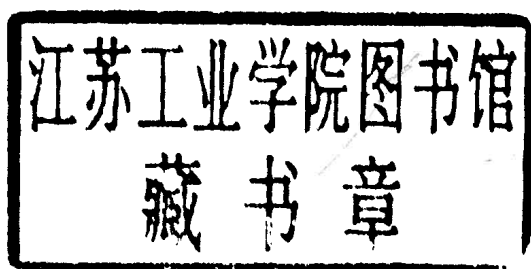
Optimality and Competition in Syntax

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Introduction

The central assumption of modern linguistics is the possibility of *explanation*. Linguists assume that there are reasons why things are the way they are—and that these reasons can be discovered. This assumption is confirmed in individual instances whenever we can uncover systematicity underlying facts, and whenever we discover deeper patterns underlying the superficial systematicity we have already discerned.

What do explanations look like, and how do we know one when we've found it? In many areas of linguistics, there has not been much debate over these questions in recent years—due, perhaps, to a long-standing tradition as to what our best explanations will look like. This tradition supported a style of explanation that can be characterized by two ideas of interest to us, which we may call the *Standard Scenario* of grammatical explanation:

Standard Scenario

St1. The status of a linguistic object O is a consequence of how O (and only O) is analyzed by the principles of the grammar. The status of a particular form with respect to a particular constraint, for example, does not depend on the status of any other form with respect to that constraint.

St2. Constraints, rule systems and principles are *inviolable*. If a form violates a particular principle, for example, that violation has an effect on the grammatical status of that object. Whether or not a violation of some principle P_1 has an effect on the grammatical status of O does not depend on how O fares with respect to some other principle P_2.

At the same time, analyses of certain phenomena have often invoked a somewhat different set of ideas, which we might call the *Optimality Scenario*:

Optimality Scenario

Op1. The status of a linguistic object *O* with respect to a given grammatical principle P is determined by comparing the analysis of *O* by P with the analysis of other, competing linguistic objects by P. The grammar favors the competitor that best satisfies P.

Op2. Constraints, rule systems and other principles are *violable.* If form *O* violates P, for example, but no competing form presents a lesser violation, the violation of P may result in no detectable deviance.

The Optimality Scenario (henceforth *Optimality*) examines interactions among different components of the grammar and picks the best choices from a set of options. The violability of grammatical constraints is a necessary feature of a competition in which "the best is good enough"—hence the link between the denial of St1 and the denial of St2.

1.   **Historical Antecedents**

Although choice among competitors has rarely been regarded as a central aspect of grammatical theory, the concept nonetheless has surfaced repeatedly throughout the history of generative grammar, in practically every field of linguistic research.

Consider, for instance, the principle of **phonology** according to which the application of a rule depends on the failure of a more specific competing rule to apply. This principle, which was already recognized by Pāṇini (Kiparsky 1979), chooses a rule (and consequently, a linguistic object) from a set of competitors, and as such can be viewed as a principle of Optimality.[1] Let us take a closer look at a version of Pāṇini's principle which was proposed for **morphology** by Halle & Marantz (1993). This principle states that the most specified vocabulary entry among a set of competitors takes precedence over less specified entries. More concretely, it states that insertion of a morphophonological unit depends on the failure of a more optimal competitor to be inserted. As is evident from these examples, a principle of grammar in an Optimality setting contains at least two parts. First, it must provide the set of competitors from which the most optimal is to be chosen, variously called a *candidate set* or a *reference set.* Second, it must specify a metric (in this case, specificity) on the basis of which the "best choice" can be determined. This principle governing vocabulary insertion can be stated in the following way, making these two parts explicit:

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[1] For extensive discussion, see Prince & Smolensky (1993).

(1)   <u>Pāninian principle of lexical insertion</u>

Insert the optimal element of (a) in a terminal node according to the metric in (b):

(a) *Reference set*:

All vocabulary items whose features do not contradict the features of the terminal node[2]

(b) *Metric*:

A vocabulary item φ is preferred over another item ω whose features are a proper subset of the features of φ.

In the area of **pragmatics**, the Gricean conversational maxims have a very similar logical structure. These maxims license an utterance of a particular proposition in a given context only if it fares better than a set of competitors, as measured by certain considerations of appropriateness (Grice 1975). For example, according to the maxims that fall under the Gricean category of Quantity, a speaker must use the most *relevant* proposition in a given context. Although precise formalization is hard to achieve, it is clear that this should be viewed as a principle of Optimality. The reference set for this principle includes all truthful propositions; the Optimality metric chooses the best proposition as measured by degree of relevance.

Theories of **sentence processing** have consistently made reference to competition. A leading research topic in the literature on processing is the nature of "garden-path" phenomena. These are typically explained as a consequence of preference principles that guide the operations of the parser—e.g. Frazier's (1978) Late Closure and Minimal Attachment. These principles compare various options for the incorporation of material in already existing structure, picking the best among them (cf. Broihier & Gibson, this volume).

Similar ideas have surfaced throughout the recent history of research on **syntax and semantics**—despite the conflict between Optimality and the dominant traditions of explanation in these fields. One example from syntax is a (once famous) analysis of the distribution of *wh*-phrases and complementizers in French relative clauses, and its counterpart for English non-finite relative clauses (Kayne 1977, Chomsky 1977). As **Pesetsky** (this volume) discusses, these clause types require deletion of the *wh*-phrase, except when deletion violates a principle of Recoverability. This requirement of "deletion up to recoverability" is clearly an Optimality principle.

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[2] In a fuller presentation, the "reference set" of (1) might itself be the set of candidates allowed by a more highly ranked constraint, as in Prince & Smolensky's (1993) picture of the grammar. See the discussion of "Faithfulness" below.

(2)   <u>Deletion up to recoverability</u>

Choose the optimal element of (a) according to the metric in (b):

(a) *Reference set*:

Relative clauses whose deletion patterns satisfy Recoverability

(b) *Metric*:

A deleted *wh*-phrase is more optimal than a pronounced *wh*-phrase.

The laws of movement (chain formation) also appear to display an Optimality character. Consider, for example, the condition on movement explored by Obenauer (1984), Rizzi (1990), and Chomsky (1993) under the rubrics of Pseudo-Opacity, Relativized Minimality, and Economy. In each case, an otherwise legal relation between two positions A and C is blocked when the same relation could also be established between A and a closer node B.

Other syntactic and semantic Optimality scenarios arise in discussions of pronouns and pronominalization. One instance is the Avoid Pronoun principle (Chomsky 1981, 65), which favors silent pronouns (*pro* and PRO) over pronounced pronouns, whenever a configuration offers a choice. Another instance, which has been particularly important in research on language development (Chien & Wexler 1991) is Reinhart's (1983) proposal about the obligatoriness of pronominal binding. Reinhart argued that speakers and hearers prefer binding (coindexation) over accidental coreference (non-coindexation) between c-commanding expressions, whenever discourse conditions permit a choice between these representations.[3] Coindexation constrains the range of interpretations available to two coindexed elements. The availability of the option to coindex, in turn, triggers the well-known disjoint reference effects of Binding Theory. The Optimality character of obligatory coindexation ("coindex when possible") explains why specific discourse environments permit apparent violations of Binding Theory. When discourse conditions narrow the reference set so as to exclude representations with coindexation, Binding Theory no longer applies to members of that reference set. Consequently, no representation with coindexation is chosen as the optimal representation, and no Binding Theory effects are found. This is the case in example like (3), where the discourse precludes a bound interpretation of the pronoun *her* in the second conjunct of the second sentence, because of parallelism with the occurrence of *her* in the first conjunct:

(3)   I know what Bill and Sue have in common. He considers her a genius, and she considers her a genius too. (*Her=she=Sue*)

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[3] See Reinhart (1983) for a connection to Gricean optimality principles. See also Grodzinsky & Reinhart (1993) for a somewhat different formulation.

2.   The State of the Art

The proposals mentioned in the previous section share a fundamental Optimality property. They each seek the best choice from a designated set of competitors, even when that choice might in some other circumstance be a bad one. If any of these proposals are correct, the *best* is indeed sometimes *good enough*.

Recently, proposals such as the Minimalist Program (Chomsky 1995) and Optimality Theory (Prince & Smolensky 1993; first extended to syntax by Grimshaw 1997) have put Optimality center-stage in debates over the nature and architecture of grammar. Of particular interest to us is the fact that these proposals have inspired a rapidly growing, but largely unpublished, body of work on syntactic and semantic theory. Many questions are raised by this theoretical turn. The major questions that unite the papers in this volume concern the *nature* and *scope* of competition in the explanation of linguistic phenomena. Research on the nature of competition concerns the reference set and the criteria for choice among candidates (the Optimality metric). Research on the scope of competition seeks to discover what aspects of linguistic computation have an Optimality character, and what sorts of internal organization these systems have. For example, where are we dealing with complex calculations of "best fit," and where are we merely dealing with a simple choice between special case and default? Are there aspects of grammar that seem to lack an Optimality character altogether, and, if so, can we understand why different components of grammar have different computational properties?

Few of these questions have (so far) been formulated with enough precision to understand even what an answer might look like. The papers in this volume represent initial attempts to clarify as well as answer some of these questions. They do not yet paint a coherent (much less complete) picture, but they reflect, in our opinion, some of the best recent efforts in that direction.

2.1   Reference set and syntactic form

Consider the problem of determining the nature of the reference set. This problem is far from trivial even if we assume a pre-determined Optimality metric. Suppose we knew that the relevant metric is a principle (Economy) that prefers representations in which elements are pronounced close to the position where they are interpreted (or, alternatively, prefers derivations in which movement is minimized). We would then conclude from the well-formedness of both (4a) and (4b) that they do not belong to the same reference set.

(4)   a.   I hope you'll understand this argument.
         b.   This argument I hope you'll understand.

What might exclude these two examples from membership in the same reference set? Perhaps there is a set of properties that competing candidates must share. If the two examples of (4) are distinct with respect to the relevant properties, they will not belong to the same reference set, and will not compete. But the current literature contains many proposals about the properties relevant to such determinations. **Chomsky** (1995; this volume) suggests that the relevant properties are lexical. The members of the reference set are formed from a common pool of lexical elements, or Numeration. In the context of the Minimalist theory of feature-driven movement, this proposal leads us to conclude that pairs such as that in (4) do not belong to the same reference set. Movement in (4b) is triggered by morphological features absent in (4a).

Grimshaw (1997) and Epstein (1992) have presented alternative hypotheses, that lead to a different treatment of the pair in (4). According to their proposals, elements belong to the same reference set only if they share the same representation at the syntactic level of logical form (LF). The sentences in (4) have different representations at LF, and thus belong to different reference sets (see also Kitahara 1993, Collins 1994).

Since these papers presuppose the Economy theory of the Optimality metric, yet reach quite different conclusions about the reference set, it should be clear that many questions remain open. Obviously, if we also consider alternative formulations of the Optimality metric, the range of possibilities is further expanded. For example, **Poole** reconsiders the mechanism of comparison among derivations, and extends the role of ties among competing candidates by adding an additional condition to the Optimality metric.

Adding to the complexity of the discussion is the fact that questions of reference set and Optimality metric are interrelated. For example, suppose there are Optimality considerations relevant to syntax besides the Economy metric discussed above. In particular, syntactic judgments might depend in part on conditions that require *Faithfulness* to an arbitrary *input*—concepts developed by Prince & Smolensky (1993) for phonology. In Prince & Smolensky's theory, Faithfulness conditions (which promote, speaking very loosely, the ability to "say what you want to say") serve as a counterweight to markedness conditions (which often require disparities between what you "want to say" and what you "can say"). Only candidates with certain properties will survive the Faithfulness conditions. Consequently, it is tricky to discover whether homogeneities in the set of candidates evaluated by a given constraint C reflect deep conditions on the candidate set or, alternatively, reflect the influence of a Faithfulness condition F, ranked higher than C (F>>C).

Suppose, for example, that the grammar contains a Faithfulness condition that promotes the ability to "assign scope where you want to assign scope"—i.e. one that favors candidates with the same scopal properties as an (LF) input. If

this Faithfulness condition is ranked higher than Economy conditions, the winning candidate may violate Economy to satisfy Faithfulness (Faithfulness >> Economy). In such a grammar, the sentences in (4) could belong to the same reference set. Each would be licensed by Faithfulness to a different LF input representation.

How might we distinguish a theory in which Faithfulness forms part of the Optimality metric from a theory in which Faithfulness determines the initial reference set? **Legendre et al.** answer this question by suggesting that some structural markedness constraints outrank Faithfulness conditions on scope. If this suggestion is correct, and if there is reason to believe that the relevant structural constraints themselves belong to the Optimality metric, then we have a solid argument that Faithfulness conditions on scope also belong to the Optimality metric.

Legendre et al.'s argument concerns *wh*-island phenomena, which (they argue) reflect the action of structural constraints ranked higher than Faithfulness conditions on scope. Island effects, for them, represent situations in which Minimal Link principles—which outrank Faithfulness—prevent certain scope assignments that may be present in the input from surfacing in the output. The demonstration that constraints characterizing islands outrank Faithfulness is presented as evidence that homogeneity of scope is not a property of the candidate set per se, but instead arises from the winnowing effect of a Faithfulness condition. The argument reconstructs aspects of Chomsky's (1986) analysis of islands—in part as a demonstration of conceptual connections between earlier research on Principles and Parameters theories and Optimality Theory.

Their account is potentially compatible with the work of **Ackema & Neeleman**, who see constraint re-ranking as an explanation for systematic variation in the typology of *wh*-interrogatives. Ackema & Neeleman propose that the variation among languages in the formation of multiple *wh*-questions follows from the re-ranking of a condition disfavoring (overt) movement, STAY, and two general constraints on question formation, Q-MARKING (which favors one instance of *wh*-movement to SPEC,CP as well as verb fronting) and Q-SCOPE (which favors multiple movement of *wh*-phrases, though not necessarily to SPEC,CP). The various rankings of these constraints yields a typology of *wh*-constructions that corresponds quite well to attested interrogative types. Left open is the question of whether these constraints on the expression of *wh*-variable relations can be re-ranked with the Faithfulness conditions that allow such relations to exist.

Ackema & Neeleman's paper can be instructively paired with the papers by **Newson** and by **Grimshaw & Samek-Lodovici.** Newson discusses cross-linguistic variation in the syntax of negation in much the same spirit as the discussions of *wh*-movement within this volume. Grimshaw & Samek-Lodovici

propose a re-ranking account of variation in the expression of subjects. In their proposal, conditions on the expression of focus, topic, and subjecthood interact to provide an explanation of attested and unattested patterns. The reader's attention should be drawn in particular to their discussion of how variation in the lexicon can be derived from variation in syntax.

2.2   Phonological interpretation

If we add to the discussion the possibility that the pronunciation of the consequences of movement is also best described in terms of Optimality, we raise an entirely new set of questions about classic problems. We need to ask, for instance, whether the examples in (4) might not represent alternative pronunciations of the same structure, making Economy (a principle governing movement rather than pronunciation) irrelevant to the problem at hand. Both candidates in (4) could involve topicalization, but the examples would differ on whether the trace or the head of the topicalization chain receives a pronunciation. **Pesetsky** explores an approach of this kind. He restricts the reference set to possible pronunciations of a given syntactic structure, and explores the idea that superficially syntactic Optimality phenomena are actually phonological. Many of the same issues arise for him as for Legendre et al., since he invokes a Recoverability condition, whose role is similar to that of Faithfulness in other literature. Additional questions arise about interactions with laws like Economy, which might govern movement itself, rather than pronunciation—for example, is there ever competition between "best pronunciation" and "best structure"?

If we allow the reference set to support comparisons between morphological and syntactic expressions of the same grammatical properties, similar questions arise in completely different domains—such as, is there ever competition between "best word" and "best sentence"? **Bresnan** addresses exactly this question. She suggests that structural hierarchical asymmetries and linear order are competing manifestations of a unitary prominence relation relevant to binding phenomena such as Weak Crossover. This competition emerges in languages whose morphological resources permit alternative expressions of prominence. Noting micro-variation in Weak Crossover judgments, Bresnan suggests that the acquisition of weak crossover involves random ranking of empirically underdetermined constraints, rather than deductive parameter setting.

Bresnan's paper develops the research tradition of Lexical-Functional Grammar. The paper by **Nakamura**, though founded in a different research tradition (Minimalism), likewise addresses the interaction between sentence structure and morphology. Nakamura shows that there is a set of constructions in Tagalog in which wh-movement is possible only if no competing construction would result in a shorter wh-chain. The relevant set of competitors consists of all constructions with the same set of lexical items, differing at most in the case

features of the arguments. His approach, like Bresnan's, compares candidates that differ in both morphological and phrase-structural properties.

2.3   Optimality and semantic interpretation

These families of proposals (diverse though they are) generally assume that purely syntactic considerations determine the composition of the reference set and the action of the Optimality metric. Some research questions this assumption. In particular, it has been suggested that—in some cases—expressions belonging to the same reference set (or, alternatively, expressions allowed by certain Faithfulness conditions) must share interpretive properties (Golan 1993, Fox 1995, Reinhart 1995).

For example, **Fox** concludes that elements in a reference set must be logically equivalent. The Optimality metric discussed in his paper favors the representation with the shortest possible dependency between a variable and its antecedent. This condition restricts the application of QR, as well as the options for the binding of pronominal variables. Fox's paper thus exposes a connection between syntactic structure and semantic interpretation that is regulated by Optimality. In a somewhat similar vein, the paper by **Kim & Peters** exposes a connection between semantic interpretation and context that is likewise regulated by Optimality. They extend the results of Dalrymple et al. (1994) by noting the existence of eight possible interpretations for a reciprocal pronoun, which, they suggest, form a reference set. An Optimality metric chooses from this set the interpretation yielding the strongest proposition consistent with world knowledge and contextual assumptions.

2.4   Variation and acquisition

If any of these proposals are correct, they should provide natural accounts of variation among languages, and should offer some insight into the source of that variation, namely how UG and environmental factors interact in the course of language acquisition.

A number of the papers deal with constraint re-ranking as a source of variation among languages. The papers by Legendre et al., Newson, and Grimshaw & Samek-Lodovici have already been mentioned in this connection. **Baković** focuses on interactions between constraints that can be re-ranked and constraints that cannot. His paper investigates patterns of inversion in matrix and embedded interrogatives across many dialects of Spanish. He distinguishes fifteen different dialects, which differ along two distinct dimensions (matrix vs. embedded; argument vs. adjunct extraction). Baković argues that the patterning of variation is most naturally understood as a consequence of the interaction of an argumenthood constraint subhierarchy (a cluster of violable constraints

whose ranking is fixed by UG) with more general (but re-rankable) constraints governing movement in matrix and embedded clauses.

Burzio's paper develops similar themes in the area of Binding Theory. He argues that the violable constraints of OT achieve a better empirical account of the behavior of anaphoric elements than any theory relying solely on inviolable constraints. He proposes several interacting subhierarchies of constraints with a fixed ranking to capture the distribution of reflexives in Russian, Italian, French, and a range of Germanic languages. One subhierarchy governs referential economy within a language, from which an "Avoid Pronoun" effect (discussed above) emerges. Two subhierarchies result in the conflicting effect, "Avoid Reflexive". A fourth subhierarchy constrains the distribution of reflexives with different morphological forms in a given language, yielding a result we might call "Avoid Structure". As in Baković's proposal, the constraints within each subhierarchy maintain a fixed relative ranking across languages, but the constraints of the various subhierarchies can be interdigitated. The interest of this approach lies not only in its explanation of syntactic and lexical facts, but also in the implication that language acquisition is (at least in part) a process of constraint ranking and re-ranking within limits established by Universal Grammar.

The acquisition of constraint rankings within the general framework of Optimality Theory is the topic of two of the papers in this volume. **Pulleyblank & Turkel** discuss at some length the task faced by the learner of an Optimality-Theoretic grammar. Using phonological harmony processes in Kinande and Yoruba as examples, they first show the high degree of underdetermination facing the learner: a single phonetic output form can arise from several different underlying forms and from several constraint rankings. Worse yet, because constraints interact with one another, the learner cannot rank constraints incrementally, one at a time. Consideration of a version of the Triggering Learning Algorithm (Gibson & Wexler 1994) (recast into a constraint-based framework) reveals that problems relating to "local maxima" in the very large learning space of constraint rankings are at least as bad as those faced by the Triggering Learning Algorithm in a binary parameter space. Pulleyblank & Turkel's solution makes use of a global optimization strategy called a *genetic algorithm*. From a large pool of constraint rankings, the genetic algorithm takes those constraint rankings which fare well under a metric of fitness, and combines them to form new rankings.

Tesar proposes a different learning model, called the Error-Driven Constraint Demotion Algorithm, which ranks constraints by taking advantage of implicit negative data provided to the learner. Tesar takes a modular view of language acquisition as his starting point—supposing that acquisition of the lexicon and acquisition of the grammar proceed separately—and focuses on the problem of acquiring the grammar given a (hypothesized) lexicon. Given the