0. Introduction

In developing generative theories of syntax the challenge has long been to reconcile two opposite kinds of empirical evidence. On the one hand, there is substantial evidence that languages of the world are deeply similar; on the other, there is also substantial evidence that they differ on the surface. For example, there are languages which allow sentences without a pronounced subject and those which do not, languages with prepositions and with postverbal objects and languages with postpositions and preverbal objects, languages which move question words to the front of the sentence and languages which leave question words inside the sentence.

Historically, Principles-and-Parameters Theory (P&P), dating back to Chomsky (1981), has taken one of the possible (but potentially weak) positions on the issue and claimed that principles of UG are both universal (by definition of UG) and inviolable. A system of inviolable principles can be made compatible with the irrefutable evidence of cross-linguistic variation by appealing to parameters. For example, in earlier versions of P&P, whether a given principle is active or not at individual levels of syntactic representation in individual languages is determined by parameters. On this view, parameters circumvent inviolability by turning universal principles off. An important property of such a system is that once a principle is turned off in a language, it is predicted not to show any effects in that language. That is, parameter values are set once and for all for a given language. To take only one example, in the Minimalist Program (Chomsky, 1995), the strength of functional features is specified in the lexicon as either strong or weak on a language-particular basis. This imposes restrictions on the computational system that work largely independently of one another.

Empirically, however, the presence of a particular syntactic pattern within a given language is frequently only partial. The expletive es subject in German impersonal passives illustrates this point. Sentences (1a) and (1b), but not (1c) are grammatical:

(1)   a. Es wurde schön getanzt.  
      it was  beautifully danced  
      'The dancing was beautiful'
   b. Schön wurde getanzt.  

On the standard V2 analysis of German whereby the finite verb is located in C (den Besten, 1977; Vikner, 1995, and many others), the abverbal phrase schön is in specCP in (1b) and (1c) while SpecIP is empty in (1b) but filled with es in (1c).

If - as everyone assumes - presence of expletive subjects is to satisfy the EPP (Extended Projection Principle), a principle requiring that every clause has a subject (Chomsky, 1982), then the EPP is satisfied in (1a) above, but not obviously in (1b): schön is an adverb in SpecCP (V2 constraint) and the expletive is missing.1, 2 Note that the EPP is also satisfied in (1c) and so is V2, yet the sentence is ungrammatical. Hence, any system of inviolable principles will require some fine tuning in light of these facts: either the EPP or the principle linking expletives to the EPP would have to be complicated on a language-specific basis.
Alternatively, violable constraints are involved and the surface pattern is the result of constraint interaction. As mentioned in Vikner (1995:186), Cardinaletti (1990:17), for example, appeals to ‘Avoid Pronoun’, a violable principle which is ‘outranked’ by a V2 constraint.

The intuition pursued in the line of work represented in this volume is that it is incorrect to assume that UG principles are inviolable while supplemented by language-particular parameters. The correct assumption, we claim, is that principles or constraints are pure or uncomplicated in their form but violable. So, we can assume that the EPP is indeed satisfied in (1a), but violated in (1b), under compulsion from some higher-ranked constraint, yet to be determined. This is the strong position taken in Optimality Theory (Prince and Smolensky, 1993). Principles of UG are universal but violable if necessary to allow satisfaction of a higher-ranked (more important) principle. The concepts of violability and constraint interaction are formalized in such a way that cross-linguistic variation derives from alternative rankings of the same principles.

This introductory chapter reviews the main claims of Prince and Smolensky's original OT as they pertain to syntax and illustrates them, based on some appropriate examples (including an analysis of the above German pattern). This chapter also addresses a number of theoretical issues that syntax poses for OT, including the nature of the input and the question of 'ineffable' structures (inputs for which a given language may not have a grammatical output). Its purpose, however, is merely to present a somewhat simplified overview and make the rest of the volume accessible to a reader knowledgeable in syntax but not previously exposed to OT. It is not to articulate nor defend many remaining subtleties of OT syntax.

In fact, the rest of the volume builds on the claims that are reviewed in the present chapter and offers a rich set of OT analyses that, to some extent, stretch the boundaries of the theory presented here. This is to be expected and welcome, as this approach to syntax is now just coming of age by confronting the daunting complexity of cross-linguistic patterns.

The remaining sections of the chapter each focus on one major aspect of the theory aside from Section 1 that sets the stage. Section 2 presents the general architecture of the theory. Section 3 discusses the notion of competition central to OT constraint interaction. Section 4 focuses on the general and universal character of OT constraints, while Section 5 discusses patterns of violations. Section 6 deals with typological issues. The concept of economy, central to OT, is discussed in Section 7. Optionality is the topic of Section 8. In Section 9, we take on the question of 'ineffability' which, in turn, leads to a discussion of the input in Section 10. Section 10 also includes some final comments on the unified OT approach to both syntax and phonology.

1. What is Optimality Theory?

OT is a formal theory of constraint interaction in UG. It is not a substantive theory of any phenomenon, syntactic or otherwise. It is not committed to any specific type of structural (or markedness) constraints. This is why OT analyses inspired by different types of substantive theories of syntax can be found in the literature, including Government-Binding Theory (e.g., Legendre et al. 1995, 1998; Grimshaw, 1997; as well as many papers in the present volume), Lexical-Functional Grammar (e.g., Bresnan, Sells, this volume), and the Minimalist Program (e.g., Speas, 1997, this volume; Müller, this volume).

Rather, OT's main hypotheses are the following:

(ii) UG is an optimizing system of universal well-formedness constraints on linguistic forms.
(iii) Well-formedness constraints are simple and general. They routinely come into conflict and are (often) violated by the surfacing form.
(iii) Conflicts are resolved through hierarchical rankings of constraints. The effect of a given constraint is relative to its ranking, which is determined on a language-particular basis.
(iv) Evaluation of candidates by the set of constraints is based on strict domination. For any two
constraints $C_1$ and $C_2$, either $C_1$ outranks $C_2$ or $C_2$ outranks $C_1$.

(v) Alternative structural realizations of an input compete for the status of being the optimal output of a particular input. The most harmonic output -- the one which best satisfies, or minimally violates, the full set of ranked constraints in a given language -- is the optimal one. Only the optimal structure is grammatical.

(vi) Every competition yields an optimal output.

Each point is addressed in turn in the next sections, starting with some remarks on the general architecture of OT.

2. The Architecture of OT

OT relies on an input-output mapping architecture. Provisionally, the input to optimization in syntax can be assumed to consist of predicate-argument structure, functional features, and lexical items (See Sections 3, 8 and 10 for further discussion). For a given input, the grammar generates and evaluates a potentially infinite set of output candidates -- the candidate set -- which consists of alternative structural realizations of that input. The component of the grammar responsible for generating the candidate set corresponding to a particular input is called Gen (for Generator). In syntax, Gen has so far been assumed to generate only candidate structures which respect basic X’ theory principles (thus in effect taking X’ theory to be a system of inviolable constraints). The set of universal well-formedness constraints is called Con (for Constraints). The component responsible for evaluating the candidate outputs is called Eval (for Evaluator). Evaluation of candidate outputs relies on a set of hierarchically ranked constraints of Con: $C_1 >> C_2 >> ... C_n$. Note that the constraint ranking constitutes the language-particular component of the grammar, that is, it is the only component that admits variation, while the set of constraints itself is claimed to be universal.

OT relies on a unique type of constraints to regulate the input-output mapping. These input-output faithfulness constraints limit how far candidate outputs may differ from the input. They require the output to express all and only the properties of the input. Faithfulness constraints are crucial to the OT conception and have played a pivotal role since the theory’s inception (contra Chomsky 1995:380, note 4). Without them all input structures would map to the same, least marked, output.

3. Constraint Conflict and Ranking

OT makes the claim that languages cannot differ in their well-formedness criteria but only in which criteria have priority in cases of conflict. Two constraints conflict when satisfying one entails violating the other.

A simple case of constraint conflict can be postulated for the existence of expletive elements like it in English which has no counterpart in Italian, as discussed in Grimshaw and Samek-Lodovici (1998:203-208).

(3) a. It rained.
   b. Piove.

The relevant constraints are two that have been proposed on the basis of do-support in English (Grimshaw, 1997), and are given in (3). They capture the core ideas of the EPP and the Principle of Full Interpretation (Chomsky, 1991), respectively. Grimshaw and Samek-Lodovici (1998:194) explicitly note that their SUBJECT is violated by clauses without a subject in the canonical position.

(4) a. SUBJECT: The highest A-specifier in an extended projection must be filled. (Grimshaw and Samek-Lodovici, 1998)
   b. FULL-INT: Lexical items must contribute to the interpretation of a structure.
These two constraints conflict in the case of weather verbs because the latter do not select for a thematic argument. One option is for a weather verb to surface without a subject, in which case it satisfies FULL-INT (the corresponding structure [rains] contains no lexical item which does not contribute to its interpretation). This, however, entails a necessary violation of SUBJECT (the structure is an IP whose specifier is not filled). Alternatively, a weather verb may satisfy SUBJECT by surfacing with an expletive subject. This, however, entails a necessary violation of FULL-INT, as expletive it does not contribute to the interpretation of the structure. Thus, there is no possible output which satisfies both constraints.

The conflict is resolved by hierarchically ranking the constraints. Note that 'strict domination' is assumed to hold over the rankings (rather than weighting), which means that any higher-ranked constraint takes absolute priority over any lower-ranked constraint (i.e. a single violation of a higher-ranked constraint is always worse than any number of violations of any number of lower-ranked constraints). Note that strict domination is a particular theoretical assumption, which further specifies constraint violability.

Competitions can be made formally explicit in tableaux like T1 below. The optimal candidate is identified by the pointing finger. Constraint ranking is indicated by the left-to-right order, each constraint dominating the ones on its right. Violations of constraints are recorded as * in individual cells; *! are fatal violations for suboptimal candidates while Ç are violations incurred by optimal candidates. As mentioned above, the input includes lexical items such as verbs, their argument structure, and tense specifications. In the case of weather verbs, however, the argument structure contains no argument position.

### T1. Italian (Input: piovere, [present])

<table>
<thead>
<tr>
<th></th>
<th>FULL-INT</th>
<th>SUBJ</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. EXPL piove</td>
<td>*!</td>
<td></td>
</tr>
<tr>
<td>b. Piove</td>
<td></td>
<td>Ç</td>
</tr>
</tbody>
</table>

The two options -- surfacing with a subject and surfacing without -- constitute the candidate set of structures to be evaluated by the constraints in Con {SUBJECT, FULL-INT}. If FULL-INT outranks SUBJECT, as it does in T1, it is less important to satisfy the lower-ranked constraint, SUBJECT, than the higher-ranked one, FULL-INT. The result is that candidate (b) is better or more harmonic than (a) with respect to the constraint ranking in T1. Hence (b) emerges from the comparative evaluation as the optimal candidate and is thus the only one to be grammatical.

On this analysis, the grammatical structure, piove, ends up violating some universal constraint: SUBJECT. Violations are relative, however, and the one incurred by optimal candidate (b) is only of the lower-ranked constraint. Hence, it is a minimal violation.

If, however, SUBJECT outranks FULL-INT, the structure containing an expletive subject will be optimal. As shown in T2, the minimal violation incurred by the optimal candidate is of lower-ranked FULL-INT. Its competitor (b) fares worse because it violates the higher-ranked constraint, SUBJECT.

### T2. English (Input: rain, [present])

<table>
<thead>
<tr>
<th></th>
<th>SUBJ</th>
<th>FULL-INT</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. It rained</td>
<td></td>
<td>Ç</td>
</tr>
<tr>
<td>b. Rained</td>
<td>*!</td>
<td></td>
</tr>
</tbody>
</table>

Thus, the different English and Italian patterns result from the two logically possible rankings of the two
constraints. Note an important aspect of this analysis of expletives. Whether a given language has expletive subjects or not depends on the relative ranking of SUBJECT and FULL-INT. In other words, it is not the case that some languages have an expletive subject in their lexicon while others don’t. It is the syntax that determines whether some element should be drafted to serve as an expletive.

We can further exploit this analysis of expletive subjects, based on constraint interaction and minimal constraint violations, to explain the fact that German has expletive subjects though they need not be systematically deployed in impersonal passives lacking a thematic subject. The discussion of German also serves to illustrate the role of the input in OT syntax as well as various possible patterns of constraint interaction.

The appropriateness of expletive es in impersonal passives is best seen in the context of question-answer pairs. If the question is a general one about the event (5a), only an answer with es (5b), is natural.

(5)  
\begin{tabular}{ll}
  a. & Was geschah?  
  'what happened?'  
  b. & Es wurde schön getanzt.  
  it was beautifully danced  
  c. & #Schön wurde getanzt.  
  beautifully was danced  
  d. & *Schön wurde es getanzt.  
  beautifully it danced  
\end{tabular}

If, however, the question is about a property (or location) of the dancing itself, then the pattern is a bit more complicated. If the answer simply conveys new information, then (6b) with es, is the natural answer. The only difference with (5b) lies with additional stress falling on the adverb schön in (6b), represented in caps. If the adverb conveys information that is not only new but noteworthy (i.e. unexpected), then the natural answer is (6c) with additional stress on the fronted adverb. Native speakers report that (6b) and (6c) are not instances of contrastive stress which, in German, requires heavier stressing than new information does.

(6)  
\begin{tabular}{ll}
  a. & Wie wurde getanzt?  
  how was danced  
  'How was the dancing?'  
  b. & Es wurde SCHÖN getanzt.  
  it was beautifully danced  
  c. & SCHÖN wurde getanzt.  
  beautifully was danced  
  d. & *SCHÖN wurde es getanzt.  
  beautifully it danced  
\end{tabular}

In any discourse situation, the answer with es plus fronted adverb (5-6d) is ungrammatical. The intuitive explanation for the distribution of expletive es in (5)-(6) is that es surfaces only where absolutely necessary.

The source of the contrast can be attributed to the input by assuming that it encodes information structure features like [new], [noteworthy], etc. (see Choi, 1996; Samek-Lodovici, 1996, 1998; Costa, 1998; Legendre, 1999, and several papers in the present volume for related proposals). We can further assume, along with the references mentioned above, that elements focalized by virtue of encoding these input features are subject to alignment (McCarthy and Prince, 1993a,b) in a particular syntactic domain. Because German
treats ‘new’ information differently from ‘new and noteworthy’ information, it is necessary to assume two constraints -- ALIGN-NEW and ALIGN-NOTEWORTHY which align the focalized element with the left edge of VP and the clause, respectively. Alignment interacts with the two constraints discussed earlier, SUBJECT and FULL-INT. Recall that SUBJECT, as its name indicates, requires every clause to have the highest A-specifier (SpecIP) be filled with a subject. SUBJECT is violated whenever the relevant position is filled with the adverb schön.

To see how the German competitions play out, consider initially two of the relevant inputs in German. When schön conveys ‘new and noteworthy’ information as identified in the input, SCHÖN wurde getanzt is optimal. That is, it is less costly to violate SUBJECT than the alignment constraints (see T3 below). But when schön is not focalized (i.e. no information structure feature is present in the input), the alignment constraints are vacuously satisfied; SUBJECT requires that SpecIP be filled with an expletive subject at the cost of violating FULL-INT. The result is es wurde schön getanzt (see T5 below). In neither competition can a candidate with both fronting and expletive es, *schön wurde es getanzt, emerge as a winner. The reason is economy: Either fronting or expletive es is enough to produce an optimal candidate. Doing both is overkill. Its formal account relies on a constraint family favoring economy of building blocks, *STRUCTURE (Prince and Smolensky, 1993). A particular member of the *STRUCTURE family, MINIMAL PROJECTION (MIN-PROJ, Grimshaw, 1993) penalizes the building up of maximal projections in syntax.

We now turn to the individual competitions. Because es is the focus of discussion, I have simplified the tableaux to the maximum. For example, I am ignoring the fact that prosodic constraints are relevant to a full analysis of focalization effects in German and that candidates with a particular stress pattern compete with candidates with a different stress pattern. I am also ignoring violations of *t/STAY (Legendre et al, 1995, 1998; Grimshaw, 1997) since they do not affect the outcome. Finally, CP structures compete with IP structures, with the former systematically violating MIN-PROJ. I am discounting maximal projections (IP, VP) which do not distinguish candidates from one another in T3-T5; hence only MIN-PROJ violations incurred by CPs are recorded.

T3 represents the competition for an input in which schön carries the input feature [new].

<table>
<thead>
<tr>
<th></th>
<th>AL-NEWVP</th>
<th>MIN-PROJ</th>
<th>SUBJ</th>
<th>FULL-INT</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. [IP es wurde [VP SCHÖN getanzt]]</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. [IP wurde [VP SCHÖN getanzt]]</td>
<td></td>
<td></td>
<td>*!</td>
<td></td>
</tr>
<tr>
<td>c. [IP SCHÖN wurde [VP t getanzt]]</td>
<td></td>
<td>*!</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>d. [CP SCHÖN wurde, [IP es t, [VP t getanzt]]]</td>
<td>*!</td>
<td>*</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>e. [CP SCHÖN wurde, [IP t, [VP t getanzt]]]</td>
<td>*!</td>
<td>*</td>
<td></td>
<td>*</td>
</tr>
</tbody>
</table>

An IP structure is all that is needed to best satisfy the constraint ranking in T3. As we saw earlier in English, expletive subjects result from the basic ranking: SUBJECT >> FULL-INT, which also eliminates candidate (b). Candidate c is eliminated because it violates ALIGN-NEW: schön is aligned with the left edge of IP, not VP. Candidates (d) and (e) violate ALIGN-NEW and Economy (MIN-PROJ), hence they also are eliminated. Only candidate a incurs a minimal violation (FULL-INT), hence it is optimal and grammatical.

The fact that German has expletive subjects does not, however, entail that the expletive subject structure is always optimal. This is shown in T4 where schön carries two input features [new] and [noteworthy].
T4. German (Input: \textit{tanzen}_t(x); x=0; [past]; \textit{schön}\textsubscript{Adv} [new],[noteworthy])

<table>
<thead>
<tr>
<th></th>
<th>AL-NOTEW\textsubscript{CLAUSE}</th>
<th>AL-NEW\textsubscript{VP}</th>
<th>MIN-PROJ</th>
<th>SUBJ</th>
<th>FULL-INT</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. [\textit{IP es wurde} [\textit{VP SCHÖN getanzt}]]</td>
<td>*!</td>
<td></td>
<td></td>
<td></td>
<td>*</td>
</tr>
<tr>
<td>b. [\textit{IP wurde} [\textit{VP SCHÖN getanzt}]]</td>
<td>*!</td>
<td></td>
<td></td>
<td></td>
<td>*</td>
</tr>
<tr>
<td>c. [\textit{IP SCHÖNj wurde} [\textit{VP tj getanzt}]]</td>
<td>@</td>
<td></td>
<td></td>
<td>@</td>
<td></td>
</tr>
<tr>
<td>d. [\textit{CP SCHÖNj wurdei [\textit{IP es tj [VP tj getanzt]}]}]</td>
<td>*</td>
<td>*!</td>
<td></td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>e. [\textit{CP SCHÖNj wurdei [\textit{IP ti [VP tj getanzt]}]}]</td>
<td>*</td>
<td>*!</td>
<td></td>
<td>*</td>
<td>*</td>
</tr>
</tbody>
</table>

Assuming that each feature is sensitive to its own alignment requirement, candidate (c) is optimal if ALIGN-NOTEWORTHY outranks ALIGN-NEW. In fact, candidate (c) is optimal in T4 despite the absence of an expletive subject because all its competitors fare worse. IP structures in which \textit{schön} is not fronted (candidates a and b) fatally violate ALIGN-NOTEWORTHY while other competitors succumb to MIN-PROJ (candidates d and e). Note that the optimal candidate (c) in T4 violates SUBJECT, resulting in the focalized adverb appearing in SpecIP, with no violation of MIN-PROJ.

The nature of the competition changes again for an input in which \textit{schön} does not carry any information structure features. ALIGN-NEW and ALIGN-NOTEWORTHY are vacuously satisfied, which I have represented by their absence in T5. The effect of MIN-PROJ and SUBJECT becomes visible as they eliminate sub-optimal candidates. Once more, nothing is gained from the addition of structure.

T5. German (Input: \textit{tanzen}_t(x); x=0; [past]; \textit{schön}\textsubscript{Adv.})

<table>
<thead>
<tr>
<th></th>
<th>MIN-PROJ</th>
<th>SUBJ</th>
<th>FULL-INT</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. [\textit{IP es wurde} [\textit{VP schönt getanzt}]]</td>
<td></td>
<td>@</td>
<td></td>
</tr>
<tr>
<td>b. [\textit{IP wurde} [\textit{VP schönt getanzt}]]</td>
<td>*!</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. [\textit{IP schöntj wurde} [\textit{VP tj getanzt}]]</td>
<td>*!</td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. [\textit{CP schöntj wurdei [\textit{IP es tj [VP tj getanzt]}]}]</td>
<td>*!</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>e. [\textit{CP schöntj wurdei [\textit{IP ti [VP tj getanzt]}]}]</td>
<td>*!</td>
<td>*</td>
<td></td>
</tr>
</tbody>
</table>

SpecIP can be filled, either with expletive \textit{es} (a) or adverbial \textit{schön} (c). The difference is a violation of SUBJECT, fatally incurred by \textit{schön}. Candidate (c) -- optimal in T4 -- now loses, given the ranking SUBJECT >> FULL-INT established earlier. Candidate (a), in fact, beats all its competitors, which all violate a constraint that outranks FULL-INT.\textsuperscript{16}\textsuperscript{17} The outcome of the competition in T5 is an instance of the ‘Emergence of the Unmarked’ (McCarthy and Prince, 1994). The unmarked pattern emerges from the effect of low-ranked constraints like SUBJECT when dominating constraints are controlled for (for example, when the latter are vacuously satisfied).\textsuperscript{18}

The comparative discussion of T3 - T5 highlights the fact that the outcome of each competition is indirectly determined by the input. If one adds or removes a feature of the input, the nature of the competition changes because the input determines which of the constraints are applicable. This was illustrated above with the feature [new] and [noteworthy] activating alignment constraints in two competitions.
Further comparison between the competitions in T3 - T5 highlights the most fundamental property of constraints in OT. Within a single language, the same constraint can be both violated by a grammatical structure in one context and fatal to an ungrammatical structure in another context. For example, \textsc{subject} is both violated by a grammatical structure (optimal candidate \textit{c} in T4) and fatal to ungrammatical ones (candidates (b) in T3 and (b,c) in T5). \textsc{align-new} is violated by the optimal candidate (c) in T4 and fatally so by sub-optimal candidates (c,d,e) in T3.\textsuperscript{19}

We may now return to the general question of constraint violability versus parameters and why the former is a desirable feature of any theory of UG. In P&P terms, having an overt expletive pronoun in one’s lexicon is subject to cross-linguistic parametrization. German and French have one, Italian does not. Yet, German does not systematically deploy expletive \textit{es} to satisfy EPP/\textsc{subject}, contrary to what is expected under a system of parameters fixed once and for all in a given language. From an OT point of view, the occurrence of \textit{es} is tied to a particular constraint interaction that is determined by a particular input. Hence, its occurrence is context-sensitive. Inviolable principles and parameters seem to necessarily require ad-hoc solutions, some of which easily come to mind: a) posit a little pro in SpecIP in (6c) and ensure the inviolability of \textsc{subject} -- but German does not allow null subjects, b) stipulate that \textit{es} may only occur in SpecCP position in German in order to eliminate (6d), etc.

A mixed pattern, however, is what is to be expected under a system of universal constraints that (a) are activated by features of the input, (b) are ranked for priority in a given language, and (c) can be violated by grammatical structures. Simply stated, the nature of the competition and its outcome will change with every input, as exemplified in German.

4. \textbf{Constraints are General and Universal}

Why do well-formedness constraints very often conflict, leading to surface-violations? It's because they are stated in very general terms. See examples in (4a,b).

OT constraints eschew logical complexity because complexity is derivative in an OT system: It is the product of the \textit{interaction} of constraints, not the constraints themselves. In fact, any empirical generalization formulated as a disjunction is the clearest clue to the existence of violable constraints, as pointed out in Speas (1997:184-185).

Unlike in P&P, the content of a OT constraint is not responsible for ensuring its universal application. That aspect of the job derives from the constraint ranking. All constraints are universal in the sense that they are present in every language-particular ranking but their relative priority in a given language will be determined by the ranking itself. Thus, the two constraints \textsc{subject} and \textsc{full-int} are equally present in the grammars of English, Italian, and German but their effect is different because their relative rankings vary with respect to one another as well as with respect to other constraints they interact with.

OT constraints belong to constraint families which instantiate two types of possible interactions between constraints. One type consists of families whose member constraints are not universally ranked with respect to one another; they simply belong to the same family by virtue of their content. The other type consists of sub-hierarchies within a single constraint family whose relative ranking is universally fixed.

Freely rankable constraints include faithfulness constraints (\textsc{parse} and \textsc{fill}, Prince and Smolensky,1993) applied to syntax in Legendre et al. (1995, 1998) -- see also papers by Bresnan, Baković and Keer, Grimshaw, Wilson, and Woolford, this volume; economy constraints (\textsc{stay}/\textsc{t}, Grimshaw (1997), Legendre et al. (1995, 1998); \textsc{no-lexical-movement} (Grimshaw, 1997), structural constraints (\textsc{subject}, \textsc{obligatory heads}, Grimshaw (1997), etc. They are, by far, the most common constraint type found in this volume and elsewhere.

The second type of constraints, sub-hierarchies, include the \textsc{minlink} family of constraints against long movements proposed in Legendre et al. (1995, 1998), the OpSpec family of Baković (1998), and various prominence hierarchies (Burzio, 1998; Aissen, Sells (this volume). To illustrate with an example, OpSpec, a general constraint requiring wh-operators to be in specifier position (Grimshaw, 1997), is individualized
in Baković (1998) for each argumental type of wh-phrase: core argument, manner, reason, etc. These individualized OpSpec constraints are universally ranked with respect to one another, yielding a markedness sub-hierarchy: \( \text{ArgOpSpec} >> \text{LocOpSpec} >> \text{ManOpSpec} >> \text{ReasonOpSpec} \). That is, this ranking is fixed and present in all languages. A conflicting constraint like \( \text{Stay} \) (which penalizes wh-fronting and head movement) can be ranked anywhere in the fixed OpSpec sub-hierarchy. All wh-operators of the type whose OpSpec constraint is ranked below \( \text{Stay} \) will be fronted, because of a scope requirement (OpScope), but to an adjoined, rather than to a specifier position, so as to minimally violate \( \text{Stay} \) -- once instead of twice if head movement is involved. (Baković assumes that fronted wh-phrases without inversion are adjoined to IP).

There are five possible ways of ranking \( \text{Stay} \) in the markedness sub-hierarchy, hence his analysis predicts five different grammars or dialects (abstracting away from additional matrix/subordinate distinctions that Baković includes in his analysis). Indeed, Spanish dialects vary as to what type of wh-phrase triggers inversion (i.e., head movement to C) in wh-questions. This type of constraint family interaction, in conjunction with the proposed sub-hierarchy, derives the familiar type of ‘referentiality’ effects in wh-extraction that are prominent cross-linguistically.

The question of what defines the constraints of a sub-hierarchy in terms of type or content is at present an open question. They are, however, restricted to markedness constraints. Most seem to pertain to cognitively salient categories, including referentiality distinctions (Baković, 1998), person/animacy distinctions (Aissen, this volume), and possibly processing-related constraints such as short movement (Legendre et al., 1995, 1998). Their use in OT syntax, however, has been limited. Much more work is needed before we can extract any generalizations.

One important consequence of constraint universality pertaining to the more common freely-rankable constraint type is that any new constraint \( C_n \) invented on the basis of some phenomenon in, say, German will need to be present in all languages. That is, positing a new constraint in a hierarchy affects the grammar of the particular language but also affects the analyses of all languages. The basic idea is that a ranking \( C_1 >> C_2 \) can only be exploited in the analysis of language \( L_1 \), all other things being equal, if the reverse ranking \( C_2 >> C_1 \) can be demonstrated in some other language. This property of the system imposes strong limitations on the constraints themselves as well as on possible analyses. In practice, this means that any analysis of language \( L_1 \) remains a tentative one until a comparative component, and more precisely, a factorial typology is added. See Section 6 for further discussion.

5. Constraint violations

As already mentioned, conflicts among general constraints are resolved by strict domination rankings (Prince and Smolensky, 1993). Violation of higher-ranked constraints cannot be compensated for by satisfaction of lower-ranked constraints. Thus, there are no trade-offs in OT.20

A constraint cannot hold in one language and simply disappear in another. It can only be subordinated to other, conflicting, universal constraints. The persistence of low-ranked constraints is supported by the following observations. In a given language

\[
\begin{align*}
\text{(7) } & \text{(i) A constraint may be violated in one context but remain unviolated in another.} \\
& \text{(ii) Violation of low-ranked constraints may be fatal.} \\
& \text{(iii) Violation of high-ranked constraints is not necessarily fatal.}
\end{align*}
\]

The first pattern of constraint violation is illustrated in German: SUBJECT is violated by the optimal candidate in T4 but fatal to two sub-optimal candidates in T5. Patterns (ii) and (iii) in (7) can be illustrated in English, on the basis of Grimshaw’s analysis of subject-auxiliary inversion (Grimshaw, 1997:377-379). Matrix interrogatives require inversion (i.e., head movement to C) while declaratives forbid it. Consider (8a-d).

\[
\begin{align*}
\text{(8) } & \text{a. Which book will they read?}
\end{align*}
\]
b. *Which book they will read?
c. John will read a book.

Grimshaw proposes that movement to C in (8a) is induced by an OBLIGATORY HEADS (OB-HD) constraint to provide a head for a projection independently needed to house the wh-operator and satisfy OPSPEC (discussed earlier). (8a) only violates STAY twice (wh-movement and head movement). Given the ranking OPSPEC >> OB-HD >> STAY (T6), (8b) with an empty C head is eliminated by a fatal violation of OB-HD.

Her account derives the basic generalization that matrix wh-questions are CP structures while matrix declaratives are IPs. That is, IP candidates systematically compete with CP candidates in both competitions. An IP competitor to the wh-question in (8a) is one with in situ wh- which incurs a fatal violation of OPSPEC. In matrix declaratives OPSPEC is vacuously satisfied since no operator is present. An extra CP projection is not needed. Candidate (a) in T6 satisfies all constraints. It is optimal. The target of discussion, however, is candidate (b) which is eliminated by the lowest-ranked constraint STAY, thereby illustrating the fact that even low-ranked constraints play a crucial role in competitions (Pattern (7ii) above).


<table>
<thead>
<tr>
<th></th>
<th>OPSPEC</th>
<th>OB-HD</th>
<th>STAY</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. [if John will [vp read a book]]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. [cp will [if John t(_i) [vp read a book]]]</td>
<td></td>
<td></td>
<td>*!</td>
</tr>
</tbody>
</table>

The third and last pattern of constraint violations (Pattern 7iii) is illustrated in multiple interrogatives (Grimshaw, 1997:379-380). As is well-known, only one wh-phrase moves; the other remains in situ.

(9) a. What will they put where?
b. *What will where they put?

T7. English (Input: put\(_V\)(x,y,z), [future] x=they\(_D\), y=what [wh], z=where [wh] )

<table>
<thead>
<tr>
<th></th>
<th>OPSPEC</th>
<th>OB-HD</th>
<th>STAY</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. [cp what(_t) will [ip they t(_t) [vp put t(_t) where]]]</td>
<td>⊢</td>
<td>⊢</td>
<td>++</td>
</tr>
<tr>
<td>b. [cp what(_t) will [ip where(_k) [ip they t(_t) [vp put t(_t) t(_k)]]]]</td>
<td>*</td>
<td></td>
<td>***!</td>
</tr>
</tbody>
</table>

Consider the pattern of violations in T7. Both candidates violate the highest-ranked constraint (OPSPEC), yet one is optimal. This illustrates the claim that violation of high-ranked constraints is not necessarily fatal. Note in passing, that exchanging the two wh-phrases and fronting where instead of what would still violate OPSPEC, and so would leaving both wh-phrases in situ (thereby incurring two violations of OPSPEC). There is simply no candidate (for this input) that fails to violate the highest-ranked constraint The decision then falls to a low-ranked one, here again STAY. In fact, both candidates violate STAY, but (a) does so to a lesser degree.

6. Typology by Reranking

OT relies on factorial typology to explain cross-linguistic variation. To propose a constraint ranking for one language in OT is to claim that all possible re-rankings of those constraints yield all and only the possible human languages. Two examples are listed in (10).
(10) a. Factorial typology of basic case marking/grammatical voice systems (Legendre et al., 1993).
b. Factorial typology of presentational focus (Samek-Lodovici, this volume)

It is important not to confuse the number of possible languages with the number of possible re-rankings. An example taken from Legendre et al. (1993) makes this point very clearly. Legendre et al. propose a set of 8 constraints governing the mapping between thematic roles and their morphosyntactic realizations. This effectively predicts about 40,000 rankings. Yet, as we show, the typology contains 13 possible language types (only!). Techniques for computing typologies are discussed in Prince and Smolensky (1993: Section 9.2). Samek-Lodovici (this volume) demonstrates how cross-input typologies are determined. Computational tools for determining typologies are also available (Raymond and Hogan, 1994; Hayes, 1998).

7. Economy

Economy plays an important role in the theory. It ranges from minimal constraint violations to structural economy resulting from economy constraints, and more generally, from constraint violability.

Minimal violations govern each and every competition in the sense that constraints are violable but they are always minimally violated by optimal candidates. When two candidates fare identically except for their number of violations of a single constraint, the candidate with the fewer violations is optimal with respect to that constraint. An example can be found in the multiple interrogatives example in T7; the relevant constraint is \textsc{stay}. When gradient constraints are involved -- as is the case for alignment constraints like \textsc{edgemost} which have been argued to govern the positioning of clitics at the edge of some domain (Anderson, in press; Legendre, in press a, b) -- it is always the candidate in which the relevant constituent is closer to the domain edge that wins, all other things being equal. Alignment constraints are further discussed in contributions by Grimshaw and by Legendre (this volume).

Structural economy constraints generally fall under the \*\textsc{structure} family (Prince and Smolensky, 1993). These are constraints that penalize the presence of elements in the output and are satisfied by their absence.\footnote{A well-known one embodies the idea that movement is marked. The main economy of movement constraint is called \textsc{stay} in Grimshaw (1997) and \*t (star-trace) in Legendre et al. (1995; 1998). They penalize chains or links, favoring 'in-situ' structures. Other economy of movement constraints include the \textsc{minlink} family (Legendre et al. 1995, 1998) which penalizes longer links compared with shorter ones, for example in the domain of wh-movement.}

Other structural economy constraints invoked in the OT literature pertain to phrase structure itself, including \textsc{minimal projection} (see the analysis of German \textit{es} above and Grimshaw, 1993)\footnote{A well-known one embodies the idea that movement is marked. The main economy of movement constraint is called \textsc{stay} in Grimshaw (1997) and \*t (star-trace) in Legendre et al. (1995; 1998). They penalize chains or links, favoring 'in-situ' structures. Other economy of movement constraints include the \textsc{minlink} family (Legendre et al. 1995, 1998) which penalizes longer links compared with shorter ones, for example in the domain of wh-movement.}, \textsc{economy of expression} (Bresnan, 1998), \*\textsc{adjunction} (Legendre, 1999). Structural economy extends beyond syntax: \textsc{no morphology} (Ackema and Neeleman, this volume; see also Burzio, 1998).

More important still is the fact that economy of structure is a direct consequence of violable constraints. In P&P, abstract functional projections are routinely added in order for an element to move to its surface position or reach a particular position by LF, so as to avoid violating (inviolable) principles of the theory. Such building up of functional structure is often unnecessary in OT precisely because constraints can be violated.

Moreover, from a general OT perspective on variation, there is no principled reason why structures should universally involve multiple functional projections filled with phonologically empty material such as traces of phrases and/or heads. Functional projections do not come for free (as they essentially do in P&P), since they can result in multiple violations of economy of movement and economy of structure constraints. Hence, by the economy principles built into OT, they are expected only where they are required by higher-ranked constraints.

Consider the position of subject wh-phrases, as in (a) \textit{Who saw it?}, and the fact that \textit{do}-support is ungrammatical (under a neutral interpretation) (b) \*\textit{Who did see it?} Grimshaw (1997) demonstrates that her general analysis predicts (a) to have only as much structure as is needed to satisfy Op\textsc{spec} (any specifier
position will do). The verbal projection is an IP or a VP, depending on assumptions pertaining to the licensing of finite inflection. On her analysis, vacuous movement (to SpecCP) is sub-optimal because it entails a violation of STAY, plus a violation of OB-HD or FULL-INT, if the C head is left empty or filled with expletive do, respectively. In contrast, non-subject wh-phrases must move to the specifier of a functional projection above IP. Otherwise, they fatally violate OP_SPEC. Thus, while OT predicts minimal syntactic representations, it does not fail to predict that complex representations under appropriate circumstances are favored over simpler ones.

8. Optionality

Economy and optimality have the important consequence of essentially excluding optionality, except under particular types of constraint interaction. (See Müller (1999) for a recent overview paper). Two candidates may incur exactly the same set of violations and thereby be both optimal. In practice, this is extremely unlikely, since candidates incurring exactly the same violations would tend to be identical. See further discussion in Baković and Keer (this volume).

A second possibility is a constraint tie: When two constraints C1 and C2 are tied in ranking, a violation of C1 and a violation of C2 cancel each other. If C1 and C2 are high-ranked, lower-ranked constraints become decisive. Such an example is found in my paper on masked second-position effects (this volume).

A third possibility is that the relative ranking of two constraints may be indeterminate. This is known in the literature as partial ordering of constraints or floating constraints (e.g. Nagy and Reynolds, 1997; Antilla, 1997; Legendre et al., 1999). The difference between partial orderings and constraint ties is the following. Constraint ties pertain to a single ranking in which violations of two constraints cancel each other. A partial constraint ordering yields a set of rankings. This set of rankings yields potentially different optimal outputs (hence variation). Both constitute departures from strict domination which might, at first glance, seem fairly innocuous. They are, however, problematic from both a learnability (Tesar and Smolensky, 1998, section 4.1) and a typological point of view. They substantially complicate learnability and they can be shown to predict unattested typologies. Therefore, they should perhaps be restricted to contexts of change, with synchronic cases excluded by the theory.

By far, the most common type of constraint interaction attested is one in which every competition yields a single optimal output. In fact, there is substantial evidence from OT research (e.g., Grimshaw and Samek-Lodovici, 1998; Legendre et al., 1995; Baković and Keer, this volume, to name only a few examples) that optionality is most often apparent (except in the unlikely case of identical violations discussed earlier), hiding important differences in information status, register, dialect, etc. which can be formalized in OT in a natural way.

Two formal options exist for the treatment of apparent optionality. First, it may result from different optimizations based on different inputs. German may serve as an example of the effect of the presence or absence of the feature [noteworthy] in an input to optimization. The pair -- (a) Schön wurde getanzt 'the dancing was beautiful' vs. (b) Es wurde schön getanzt -- is only superficially synonymous. (a) is felicitous only when the adverb schön is specified for noteworthiness in the input. In OT terms, the (high-ranked) constraint ALIGN-NOTEWORTHY favors (a) over (b) when schön is marked [+noteworthy] in the input -- it eliminates (b) altogether from the competition (T4). When schön is not marked [+noteworthy], however, ALIGN-NOTEWORTHY is vacuously satisfied and lower-ranked constraints become active, favoring (b) over (a) (T4 and T5).

Another source of apparent optionality is different rankings or grammars representative of different idiolects, registers, etc. French exemplifies this possibility. It exhibits a rich typology of wh-questions which reflect register differences (Legendre, 1998). In Colloquial French, contrary to more formal varieties, wh-questions do not undergo fronting.

(11) a. Pierre est parti où ? (in situ wh-)

(12)
P has gone where

Where did Peter go?

b. Où Pierre est-il parti? (Complex Inversion)

where P has he gone

All other things being equal, (11a) is optimal under a ranking STAY >> OP$SPEC$ while (11b) is optimal under the reverse ranking OP$SPEC$ >> STAY. 25 Register differences are, formally speaking, a subcase of cross-linguistic variation. They correspond to different grammars. In Legendre (1998), I proposed that register variation differs from cross-linguistic variation only with respect to how many constraints may be re-ranked. Register variation involves minimal constraint re-ranking, typically involving one constraint only. Cross-linguistic variation is obviously not so constrained.

Note that both types of apparent optionality simply exploit existing mechanisms of the theory: inputs on the one hand, and rankings on the other.

9. Ineffability

In OT, each competition yields an optimal candidate, therefore a grammatical output. This raises a question about 'ineffable' structures, i.e. instances where some inputs yield no acceptable output. To take a simple example, some languages simply do not allow multiple questions like Who ate what? Ignoring d-linked ones, multiple questions are impossible in Standard Italian, Irish and other languages (Legendre et al., 1998).

The existence of ineffable structures has, in fact, been characterized as a fatal problem for an optimality-theoretic approach to core aspects of syntax, i.e. structure building and movement (Pesetsky, 1997:147-150). Pesetsky argues that the existence of ineffable structures suggests instead that the domain of application of OT should be restricted to the pronunciation of the consequences of movement, i.e. the phonological interpretation of the structure.

This conclusion, however, is unwarranted because it relies on arbitrarily restrictive assumptions about the nature of the candidate set. In OT, what competes is determined by the input. The main question is: To what extent must the competitors share the same LF? One answer is to incorporate an assumption inherited from P&P and posit that there is a direct mapping between the input and the interpretation of the structure: this entails that all competitors, which by definition, share an input, must also share an interpretation. This is the position taken, for example, in Grimshaw (1997) in the context of a study in which all inputs yield effable structures. This is also the assumption made in Pesetsky (1997) (though he briefly considers the alternative described below, pp. 150-151).

Legendre et al. (1995, 1998) confront the language-particular ineffability question and argue that competitors need not have the same LF. We reason that the output of a competition has to be semantically interpreted. Thus, it is redundant to include a semantic mapping in the input and then check it after the optimal output has been determined. We offer the following account of ineffability in Italian wh-questions: Multiple wh-outputs in Italian are sub-optimal because they lose to a competitor in which one of the input wh-features is not parsed. In other words, the optimal candidate violates the input-output faithfulness constraint PARSE(WH), resulting in a declarative structure with an indefinite reading of the argument marked [wh] in the input.26 Under this analysis, ineffability is reduced to an input-output faithfulness violation. See also Baković and Keer, and Wilson (this volume). While allowing different LFs to compete enlarges the candidate set, input-output faithfulness constraints will routinely eliminate candidates with an LF distinct from that intended in the input.

10. The Input

I have saved the question of the input for last because it is a question that cannot be addressed independently. It depends, for example, on the answer to the question of what the candidate set is. The input
and the candidate set are intimately connected under the architecture of OT. For a given input, the grammar generates and evaluates an infinite set of output candidates which represent alternative structural realizations of that input. If the candidate set includes candidates with different LFs, as argued by some, then the input to, say, a wh-question must include target [wh] and operator scope specifications.

The main role of the input is to determine what competes -- what wins is determined by the constraints. OT syntacticians generally agree that the input must specify predicate-argument structure, lexical items, information and illocutionary features, level of argument prominence, as well as familiar functional features (tense, aspect, etc.). For some, operator scope must also be included, as discussed above. Input specifications, however, are only target ones, they will be realized only if all faithfulness constraints can be satisfied. Deviations from target specifications do occur, yielding structures that are unfaithful to the input under compulsion of a high-ranked constraint.

Properties of the input and the candidate set are to a large extent determined by the underlying substantive theory of syntax. Thus the input described in the previous paragraph and the corresponding candidate set borrow extensively from the type of representation assumed in P&P. As noted earlier, the question of the substantive nature of syntactic constraints and representations is largely independent of the claims made by OT. This is, in fact, why alternative representations are often employed, as for example, in LFG-based OT work, in Legendre et al. (1993), and several papers in the present volume.

The question of the input and the candidate set helps bring out similarities and differences between syntax and phonology. Phonology offers two models of the grammar, only one of which is relevant to current syntactic theorizing. On the one hand, the standard question of the surface form of a given morpheme in phonology leads to an input/output mapping view of the grammar (i.e. a device for mapping a particular underlying form deriving from a lexicon into its correct structural description). On the other, the analysis of basic CV syllable structure in Prince and Smolensky (1993, especially Ch. 9) leads to an inventory view of the grammar, based on the question: What is the inventory of all possible output structures (e.g., syllable shapes), as the input is allowed to range over all possible inputs (e.g., strings of C's and V's)? The latter inventory view (familiar from pre-existing constraint-based approaches to syntax) entails that the 'right' sort of question to ask from an OT perspective is the following: "What is the inventory of all possible questions in a given language, deduced by considering all possible inputs?" It is not: "What is the input/output mapping?", given a particular input. In other words, it is important that no output in Italian contain multiple [wh]s -- beyond this, it is less important what the input/output mapping happens to produce, given a multiple [wh] input.

The inventory view of syntax serves to highlight the closeness that exists in OT work in syntax and phonology. Departing from the view held by many syntacticians that syntax and phonology are different in architecture and formal constraint interaction, existing work in OT syntax has made the strong claim that the two modules operate on the basis of the same formal and markedness principles. For example, economy of structure, alignment with the edge of a domain, input-output faithfulness, and universal markedness sub-hierarchies have been shown to pervade both syntax and phonology, to name only a few. The fifteen research papers contained in this volume offer additional evidence that syntax operates on optimality-theoretic principles. I believe that they contribute considerable and solid evidence for a unified grammatical theory.

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1. Evidence for movement of adverbs bypassing SpecIP comes from passive examples like (i) in which SpecIP is filled with an overt lexical subject: (i) *hier wurde sein Auto gestohlen* 'his car was stolen here'.

2. Arguably, the EPP is satisfied only by elements that share some properties with canonical subjects, such as nominative Case. This excludes adverbs. See discussion of the constraint SUBJECT (Grimshaw and Samek-Lodovici, 1998) below. Construing the EPP as a requirement that the specifier of I/T be filled instead (Chomsky, 1995:232) does not affect the point made here. On the standard V in C analysis of V2 assumed for the purpose of this illustration, SpecIP is empty in *Schön wurde getanzt*. Invoking a phonologically null category in SpecIP only serves to maintain the inviolability of the EPP.

3. For a larger picture of the role of OT in the language faculty see Tesar and al. (1999).

4. Hence constraint universality is logically independent of constraint violability in OT.

5. Grimshaw (1997:374), Grimshaw and Samek-Lodovici (1998:194) define FULL-INT slightly differently: ‘Lexical conceptual structure must be parsed’. Here I restate it slightly because their wording raises unnecessary questions about input and input-output faithfulness that are irrelevant to the point of the text.


7. The competitions in T1 and T2 are provided for illustrative purposes only. I am, in particular, abstracting away from the issue of whether *it* is an expletive or quasi-argument, as argued in Vikner (1995:224-228). See note 15 for further discussion.
8. The set includes any other constraints that may turn out to be relevant.

9. Grimshaw and Samek-Lodovici's analysis of null expletives in Italian is offered here as a simple enough illustration of constraint interaction in OT. Obviously, my presentation does not address the well-known generalization that null expletives are found only in null-subject languages. Grimshaw and Samek-Lodovici (1998) propose that null subjects in Italian result from dropping topic-referring subjects. As Samek-Lodovici (1996:46-48) shows, referential null subjects and overt expletives are possible only under rankings which are logically inconsistent with each other. Overt expletives only occur under the ranking SUBJECT >> FULL-INT while null subjects require the ranking FULL-INT >> SUBJECT. Thus, Samek-Lodovici derives the universal correlation from a basic property of rankings, namely that a given constraint ranking is fixed in a given language.

10. For a discussion of the form of expletives -- which pronoun in a language gets drafted for expletive purposes--, see Grimshaw and Samek-Lodovici (1998, especially footnote 1). They argue that that too is derived from the syntax, under their formulation of FULL-INT. It is the pronoun that incurs minimal violations of FULL-INT, i.e. the one that has the fewer number of phi features. This eliminates the pronoun he for example. See Grimshaw (this volume) for a demonstration that language-particular inventories of clitic forms are also derived from constraint rankings.

11. Ralf Vogel (p.c.) points out that preposing of adverbs or PPs in anwers to Was geschah?‘what happened?’is possible but it is associated with a presuppositional reading (Diesing, 1992) rather than with introducing a new entity in the discourse. Hence (6c) is marked #, i.e. unnatural on a non-presuppositional reading.

12. I am grateful to Ralf Vogel for his clarifications on the prosodic properties of these examples, only the most relevant of which are mentioned in the text. Among other things, the full picture involves destressing of the past participle when the adverb schön conveys new information and some idiosyncratic behavior on the part of the adverb hier ‘here’ in similar contexts.

13. Second position effects are controlled for in all examples, grammatical and ungrammatical alike.

14. The necessity to recognize different domains of alignment independently of the German pattern discussed here is amply demonstrated in the OT literature on ‘focus’ phenomena. See references mentioned in the text. The necessity of having constraints refer to features like [new] as opposed to [focus] is demonstrated in Choi (1996) and Legendre (1999).

While the present discussion assumes that the domain of ALIGN-NOTEWORTHY is the clause, it is possible that it should be characterized as the Intonational Phrase instead. Further investigation is needed to be more conclusive.

15. My specification of the input only includes the verb and its tense specification, the adverb schön, and the information structure status of the adverb. Passive is completely left out of the picture, as it derives from the mapping from theta-roles to grammatical functions. See Legendre et al. (1993) as well as the papers by Aissen, Sells, and Woolford in the present volume for alternative OT analyses of grammatical voice.

16. It is interesting to note that expletive es in weather verb constructions has a different distribution: hier regnet es ‘it's raining HERE’. Under focalization of hier, es must appear, contrary to the impersonal passive pattern in (6d). If we adopt the idea that weather verbs take a quasi-argument (Vikner, 1995), then a candidate like *hier regnet would fatally fail to parse the quasi-argument specified in its input. This, in turn, is likely to lead to a refinement of the analysis of weather verb constructions in English and Italian discussed earlier.
17. The present analysis entails an asymmetric approach to V2 phenomena, to some extent similar to that proposed in Travis (1991:355-356) and Zwart (1997:191-196). They propose that finite verbs are in I in subject-initial root clauses but in C in non-subject-initial root clauses. On the present analysis, finite verbs are not even in C in non-subject-initial root clauses. V2 clauses are CPs only if a CP projection is needed to house an operator-like element.

18. The relative ranking of MIN-PROJ in German cannot be fully determined on the basis of the present competitions. The only evidence we have is that MIN-PROJ outranks SUBJECT in T4 (hence justifying ranking it just above SUBJECT). It could equally well outrank one or both of the alignment constraints with no effect on the outcome.

19. The discussion of T3 - T5 also highlights a practical aspect of any OT analysis, namely that a given competition typically yields only pieces of the total constraint ranking.

20. Local conjunctions of constraints (Smolensky 1993, 1995, 1997) might appear to constitute a counterexample to this generalization. Local conjunctions express the intuition that two constraint violations are worse when they occur in the same location. While most constraints pertain to a single dimension of structure, a local conjunction of two constraints pertains to two dimensions simultaneously. To have any effect, local conjunctions must outrank the constraints they are conjunctions of. See Legendre (in press a, b) for analyses of clitic patterns and Legendre et al. (1995, 1998) for analyses of wh-extraction which exploit local conjunctions. See also contributions by Aissen, Choi, and Grimshaw in the present volume. While their existence is amply motivated, their status is still being debated. Smolensky (1997) argues that OT relies on two mechanisms working together: (i) ranking (universal) and (ii) local conjunction (language-particular).

21. The overall constraint typology includes constraints on elements (*STRUCTURE), constraints on relations (e.g. theta-case mapping), and faithfulness constraints.

22. MINIMAL PROJECTION is eliminated in the published version, Grimshaw (1997).

23. The idea that subject wh-phrases do not involve wh-movement is not novel to Grimshaw (1997) -- see her extended list of references (p. 389) -- but the optimality-theoretic explanation for it is.

24. The Minimalist Program essentially excludes optionality as well, thanks to its incorporating concepts of economy and optimality (Chomsky, 1995). In MP, however, optimality is restricted to the determination of the next step in a syntactic derivation and economy is the only optimality metric.

25. Additional considerations pertaining to information status are ignored here, in the interest of exposition. See Legendre (1998, 1999) for details.

26. Ackema and Neeleman (1998a, 1998b) propose instead that the optimal output in a case of ineffability is the Null Parse of Prince and Smolensky (1993), that is, an empty structure. Legendre et al. (1998) argue, however, that, based on the fact that an empty structure violates many Input-Output faithfulness constraints, a structure in which only one feature [wh] is unparsed is to be preferred. An empty structure does not minimally violate Input-Output faithfulness.

27. See Speas (this volume) for an alternative conception of the input. See also Wilson (this volume) for an interesting take on inputs and candidate sets in the context of bidirectional optimization.
The assumption that the set of possible inputs to grammar is universal and not subject to any language-particular restrictions is known as the \textit{Richness of the Base Principle} (Prince and Smolensky, 1993: Ch. 9).