

Chapter 1

An Introduction to Optimality Theory in Syntax

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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 that allow sentences without a pronounced subject and those that do not, languages with prepositions and with postverbal objects and languages with postpositions and preverbal objects, languages that move question words to the front of the sentence and languages that 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 universal grammar (UG) are both universal (by definition of UG) and inviolable. A system of inviolable principles can be made compatible with the irrefutable evidence of crosslinguistic 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. In 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.
- c. *Schön wurde es getanzt.

In the standard V2 analysis of German whereby the finite verb is located in C (den Besten 1983; Vikner 1995; and many others), the adverbial 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—the presence of expletive subjects is to satisfy the Extended Projection Principle (EPP), a principle requiring that every clause has a subject (Chomsky 1982), then the EPP is satisfied in (1a), 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 “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 (OT; 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 crosslinguistic 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.³ It does not articulate or defend many remaining subtleties of OT syntax.

In fact, the rest of the volume builds on the claims 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, since this approach to

syntax is now just coming of age by confronting the daunting complexity of cross-linguistic patterns.

Aside from section 1.1, which sets the stage, each section of the chapter focuses on one major aspect of the theory. Section 1.2 presents the general architecture of the theory. Section 1.3 discusses the notion of competition central to OT constraint interaction. Section 1.4 focuses on the general and universal character of OT constraints, while section 1.5 discusses patterns of violations. Section 1.6 deals with typological issues. The concept of economy, central to OT, is discussed in section 1.7. Optionality is the topic of section 1.8. In section 1.9, we take up the question of “ineffability,” which, in turn, leads to a discussion of the input in section 1.10. Section 1.10 also includes some final comments on the unified OT approach to both syntax and phonology.

1.1 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; Legendre, Smolensky, and Wilson 1998; Grimshaw 1997; as well as many chapters in the present volume), Lexical-Functional Grammar (e.g., Bresnan, chap. 5, and Sells, chap. 12, this volume), and the Minimalist Program (e.g., Müller, chap. 10, and Speas, chap. 13, this volume).

Rather, OT’s main hypotheses are the following:

- (2) a. UG is an optimizing system of universal well-formedness constraints on linguistic forms.
- b. Well-formedness constraints are simple and general. They routinely come into conflict and are (often) violated by the surfacing form.
- c. 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.
- d. 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 .
- e. 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 that 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.
- f. Every competition yields an optimal output.

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

1.2 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 1.3, 1.8, and 1.10 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 that 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*: $C_1 \gg C_2 \gg \dots C_n$. 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.

1.3 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.⁴ 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 (4). 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. FULLINT: Lexical items must contribute to the interpretation of a structure.⁵

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 FULLINT (the corresponding structure [*rains*] contains no lexical item that 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 FULLINT, because the expletive *it* does not contribute to the interpretation of the structure. Thus, there is no possible output that 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.⁶

Competitions can be made formally explicit in tableaux like T1.1. The optimal candidate is identified by the pointing finger \Rightarrow . 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 \otimes are violations incurred by optimal candidates. As mentioned, 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.⁷ 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, FULLINT}.⁸ If FULLINT outranks SUBJECT, as it does in tableau T1.1, it is less important to satisfy the lower-ranked constraint, SUBJECT, than the higher-ranked one, FULLINT. The result is that candidate (b) is better or *more harmonic* than (a) with respect to the constraint ranking in tableau T1.1. Hence (b) emerges from the comparative evaluation as the *optimal* candidate and is thus the only one to be grammatical.

Tableau T1.1Italian (Input: *piovere_V* [present])

	FULLINT	SUBJ
a. EXPL piove	*!	
☞ b. Piove		⊗

Tableau T1.2English (Input: *rain_V* [present])

	SUBJ	FULLINT
☞ a. It rained		⊗
b. Rained	*!	

In tableau T1.1, 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 FULLINT, the structure containing an expletive subject will be optimal. As shown in tableau T1.2, the minimal violation incurred by the optimal candidate is of lower-ranked FULLINT. Its competitor (b) fares worse because it violates the higher-ranked constraint, SUBJECT. Thus, the different English and Italian patterns result from the two logically possible rankings of the two constraints.⁹

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 FULLINT. In other words, it is not the case that some languages have an expletive subject in their lexicon while others do not. It is the syntax that determines whether some element should be drafted to serve as an expletive.¹⁰

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-and-answer pairs. If the question is a general one about the event (5a), only an answer with *es* (5b) is natural.

- (5) a. Was geschah?
 ‘What happened?’
 b. Es wurde schön getanzt.
 it was beautifully danced
 c. #Schön wurde getanzt.¹¹
 beautifully was danced
 d. *Schön wurde es getanzt.
 beautifully was it danced

If, however, the question is about a property (or location) of the dancing itself, 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), 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.¹²

- (6) 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 was it danced

In any discourse situation, the answer with *es* plus fronted adverb (5d–6d) is ungrammatical.¹³ The intuitive explanation for the distribution of expletive *es* in (5) and (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], and so on (see Choi 1996; Samek-Lodovici 1996, 1998; Costa 1998; Legendre 1999; and several chapters in the present volume for related proposals). As discussed in these references, elements focalized by virtue of encoding these input features are subject to alignment constraints (McCarthy and Prince 1993a, 1993b) operating in a particular syntactic domain. Because German treats “new” information differently from “new and noteworthy” information, it is necessary to assume two constraints—ALIGNNEW and ALIGNNOTEWORTHY, which align the focalized element with the left edge of VP and the clause, respectively.¹⁴ Alignment constraints interact with the two constraints discussed earlier, SUBJECT and FULLINT. Recall that SUBJECT, as its name indicates,

requires every clause to have the highest A-specifier (SpecIP) 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. 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 FULLINT. The result is *es wurde schön getanzt*. 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 (MINPROJ, Grimshaw 1993) penalizes the building up of maximal projections in syntax. (See further discussion and tableaux below.)

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; Legendre, Smolensky, and Wilson 1998; Grimshaw 1997) since they do not affect the outcome. Finally, CP structures compete with IP structures, with the former systematically violating MINPROJ. I am discounting maximal projections (IP,

Tableau T1.3

German (Input: *tanzen*_V(x); x = 0; [past]; *schön*_{Adv} [new])

	AL- NEW _{VP}	MIN- PROJ	SUBJ	FULL-INT
☞ a. [IP es wurde [VP SCHÖN getanzt]]				⊕
b. [IP wurde [VP SCHÖN getanzt]]			*!	
c. [IP SCHÖN _j wurde [VP t _j getanzt]]	*!		*	
d. [CP SCHÖN _j wurde _i [IP es t _i [VP t _j getanzt]]]	*!	*		*
e. [CP SCHÖN _j wurde _i [IP t _i [VP t _j getanzt]]]	*!	*	*	

VP) that do not distinguish candidates from one another in tableaux T1.3–T1.5 (pp. 8–11); hence only MINPROJ violations incurred by CPs are recorded.

Tableau T1.3 represents the competition for an input in which *schön* carries the input feature [new].¹⁵ An IP structure is all that is needed to best satisfy the constraint ranking in tableau T1.3. As we saw earlier in English, expletive subjects result from the basic ranking: SUBJECT » FULLINT, which also eliminates candidate (b). Candidate (c) is eliminated because it violates ALIGNNEW: *schön* is aligned with the left edge of IP, not VP. Candidates (d) and (e) violate ALIGNNEW and Economy (MINPROJ), hence they also are eliminated. Only candidate (a) incurs a minimal violation (FULLINT), hence it is optimal and grammatical.

The fact that German has expletive subjects does not, however, imply that the expletive subject structure is always optimal. This is shown in tableau T1.4, where *schön* carries two input features [new] and [noteworthy]. Assuming that each feature is sensitive to its own alignment requirement, candidate (c) is optimal if ALIGNNOTEWORTHY outranks ALIGNNEW. In fact, candidate (c) is optimal in tableau T1.4 despite the absence of an expletive subject because all its competitors fare worse. IP structures in which *schön* is not fronted (candidates (a) and (b)) fatally violate ALIGNNOTEWORTHY, while other competitors succumb to MINPROJ (candidates (d) and (e)). Note that the optimal candidate (c) in tableau T1.4 violates SUBJECT, resulting in the focalized adverb appearing in SpecIP, with no violation of MINPROJ.

The nature of the competition changes again for an input in which *schön* does not carry any information structure features. ALIGNNEW and ALIGNNOTEWORTHY are vacuously satisfied, which I have represented by their absence in tableau T1.5. The effect of MINPROJ and SUBJECT becomes visible as they eliminate suboptimal candidates. Once more, nothing is gained from the addition of structure. SpecIP can be filled, either with expletive *es* (a) or adverbial *schön* (c). The difference is a violation of SUBJECT, fatally incurred by *schön*. Candidate (c)—optimal in tableau T1.4—now loses, given the ranking SUBJECT » FULLINT established earlier. Candidate (a), in fact, beats all its competitors, all of which violate a constraint that outranks FULLINT.^{16,17} The outcome of the competition in tableau T1.5 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).¹⁸

The comparative discussion of tableaux T1.3–T1.5 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 features [new] and [noteworthy] activating alignment constraints in two competitions.

Tableau T1.4
 German (Input: *tanzen*_V(x); x = 0; [past]; *schön*_{Adv}, [new], [noteworthy])

	AL- NOTEW _{IP}	AL- NEW _{VP}	MIN- PROJ	SUBJ	FULL- INT
a. [IP es wurde [VP SCHÖN getanzt]]	*!				*
b. [IP wurde [VP SCHÖN getanzt]]	*!			*	
c. [IP SCHÖN _j wurde [VP t _j getanzt]]		⊗		⊗	
d. [CP SCHÖN _j wurde _i [IP es t _i [VP t _j getanzt]]]		*	*!		*
e. [CP SCHÖN _j wurde _i [IP t _i [VP t _j getanzt]]]		*	*!	*	

Tableau T1.5German (Input: *tanzen*_V(x); x = 0; [past]; schön_{Adv})

	MIN- PROJ	SUBJ	FULL- INT
☞ a. [_{IP} es wurde [_{VP} schön getanzt]]			⊗
b. [_{IP} wurde [_{VP} schön getanzt]]		*!	
c. [_{IP} schön _j wurde [_{VP} t _j getanzt]]		*!	
d. [_{CP} schön _j wurde _i [_{IP} es t _i [_{VP} t _j getanzt]]]	*!		*
e. [_{CP} schön _j wurde _i [_{IP} t _i [_{VP} t _j getanzt]]]	*!	*	

Further comparison between the competitions in tableaux T1.3–T1.5 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, SUBJECT is both violated by a grammatical structure (optimal candidate (c) in tableau T1.4) and fatal to ungrammatical ones (candidates (b) in tableau T1.3 and (b, c) in tableau T1.5). ALIGNNEW is violated by the optimal candidate (c) in tableau T1.4 and fatally so by suboptimal candidates (c, d, e) in tableau T1.3.¹⁹

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 crosslinguistic parametrization. German and French have one, Italian does not. Yet German does not systematically deploy expletive *es* to satisfy EPP/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 *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: (1) posit a little pro in SpecIP in (6c) and ensure the inviolability of SUBJECT—but German does not allow null subjects, (2) stipulate that *es* may only occur in SpecCP position in German in order to eliminate (6d), and so on.

A mixed pattern, however, is what is to be expected under a system of universal constraints that (1) are activated by features of the input, (2) are ranked for priority in a given language, and (3) 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.

1.4 Constraints Are General and Universal

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

OT constraints eschew logical complexity because complexity is derivative in an OT system: It is the product of the *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 SUBJECT and FULLINT 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 that 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 subhierarchies within a single constraint family whose relative ranking is universally fixed.

Freely rankable constraints include faithfulness constraints (PARSE and FILL, Prince and Smolensky 1993) applied to syntax in Legendre et al. 1995 and Legendre, Smolensky, and Wilson 1998 and in the chapters by Baković and Keer (chap. 4), Bresnan (chap. 5), Grimshaw (chap. 8), Wilson (chap. 15), and Woolford (chap. 16) in this volume; economy constraints (STAY/*t, Grimshaw 1997, Legendre et al. 1995 and Legendre, Smolensky, and Wilson 1998; NOLEXICALMOVEMENT, Grimshaw 1997); structural constraints (SUBJECT, OBLIGATORYHEADS, Grimshaw 1997); and so on. They are, by far, the most common constraint type found in this volume and elsewhere.

The second type of constraints, subhierarchies, include the MINLINK family of constraints against long movements proposed in Legendre et al. 1995 and Legendre, Smolensky, and Wilson 1998, the OPSPEC family of Baković 1998, and various prominence hierarchies (Burzio 1998; Aissen, chap. 3, and Sells, chap. 12, (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, and so on. These individualized OPSPEC constraints are universally ranked with respect to one another, yielding a *markedness subhierarchy*: ARGOPSPEC » LOCOPSPEC » MANOPSPEC »

REASOPSPEC. That is, this ranking is fixed and present in all languages. A conflicting constraint like STAY (which penalizes *wh*-fronting and head movement) can be ranked anywhere in the fixed OPSPEC subhierarchy. All *wh*-operators of the type whose OPSPEC constraint is ranked below 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 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 STAY in the markedness subhierarchy, 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 subhierarchy, derives the familiar type of “referentiality” effects in *wh*-extraction that are prominent crosslinguistically.

The question of what defines the constraints of a subhierarchy in terms of type or content is at present an open question. Constraints are, however, restricted to markedness constraints. Most seem to pertain to cognitively salient categories, including referentiality distinctions (Baković 1998), person/animacy distinctions (Aissen, chap. 3, this volume), and possibly processing-related constraints such as short movement (Legendre et al. 1995; Legendre, Smolensky, and Wilson 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 $C_1 \gg C_2$ can only be exploited in the analysis of language L_1 , all other things being equal, if the reverse ranking $C_2 \gg C_1$ 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 tentative until a comparative component—more precisely, a factorial typology—is added. See section 1.6 for further discussion.

1.5 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

- (7) a. A constraint may be violated in one context but remain unviolated in another.
 b. Violation of low-ranked constraints may be fatal.
 c. Violation of high-ranked constraints is not necessarily fatal.

The first pattern of constraint violation is illustrated in German: SUBJECT is violated by the optimal candidate in tableau T1.4 but fatal to two suboptimal candidates in tableau T1.5.

Patterns (7b) and (7c) 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 the pattern in (8).

- (8) a. Which book will they read?
 b. *Which book they will read?
 c. John will read a book.
 d. *Will John read a book.

Grimshaw proposes that movement to C in (8a) is induced by an Obligatory Heads (OBHD) constraint to provide a head for a projection independently needed to house the *wh*-operator and satisfy OPSPEC (discussed earlier). Sentence (8a) only violates STAY twice (*wh*-movement and head movement). Given the ranking OPSPEC » OBHD » STAY (tableau T1.6), (8b) with an empty C head is eliminated by a fatal violation of OBHD.

Grimshaw's 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*-that 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 tableau T1.6 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 (7b) above).

The third and last pattern of constraint violations (pattern 7c) 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?

Tableau T1.6English (Input: $read_V(x, y)$, [future] $x = John_N$, $y = a\ book_{DP}$)

	OPSPEC	OBHD	STAY
☞ a. [IP John will [VP read a book]]			
b. [CP will _i [IP John t _i [VP read a book]]]			*!

Tableau T1.7English (Input: $put_V(x, y, z)$, [future] $x = they_D$, $y = what\ [wh]$, $z = where\ [wh]$)

	OP-SPEC	OB-HD	STAY
☞ a. [CP what _j will _i [IP they t _i [VP put t _j where]]]	⊕		⊗⊗
b. [CP what _j will _i [IP where _k [IP they t _i [VP put t _j t _k]]]	*		***!

Consider the pattern of violations in tableau T1.7. 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 (9a) does so to a lesser degree.

1.6 Typology by Reranking

OT relies on *factorial typology* to explain crosslinguistic variation. To propose a constraint ranking for one language in OT is to claim that all possible rerankings 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, Raymond, and Smolensky 1993)
 b. Factorial typology of presentational focus (Samek-Lodovici, chap. 11, this volume)

It is important not to confuse the number of possible languages with the number of possible rerankings. An example taken from Legendre, Raymond, and Smolensky

1993 makes this point clearly. Legendre et al. propose a set of eight 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 thirteen possible language types (only!). Techniques for computing typologies are discussed in Prince and Smolensky 1993: sec. 9.2. In chapter 11 of the present volume, Samek-Lodovici demonstrates how cross-input typologies are determined. Computational tools for determining typologies are also available (Raymond and Hogan 1994; Hayes 1998).

1.7 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 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 tableau T1.7; the relevant constraint is STAY. When gradient constraints are involved—as is the case for alignment constraints like EDGEST, which have been argued to govern the positioning of clitics at the edge of some domain (Anderson, forthcoming; Legendre, forthcoming 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 the contributions by Grimshaw (chap. 8) and Legendre (chap. 9) in this volume.

Structural economy constraints generally fall under the *STRUCTURE family (Prince and Smolensky 1993). These are constraints that penalize the presence of elements in the output and are satisfied by their absence.²¹ A well-known one embodies the idea that movement is marked. The main economy-of-movement constraint is called STAY in Grimshaw 1997 and *t (star-trace) in Legendre et al. 1995 and Legendre, Smolensky, and Wilson 1998. They penalize chains or links, favoring “in situ” structures. Other economy-of-movement constraints include the MINLINK family (Legendre et al. 1995; Legendre, Smolensky, and Wilson 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 MINIMAL PROJECTION (see the analysis of German *es* above and Grimshaw 1993),²² ECONOMY OF EXPRESSION (Bresnan 1998), and *ADJUNCTION (Legendre 1999). Structural economy extends beyond syntax: NOMORPHOLOGY (Ackema and Neeleman, chap. 2, 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) *Who saw it?*, and the fact that *do*-support is ungrammatical (under a neutral interpretation): (b) **Who did see it?* Grimshaw (1997) demonstrates that her general analysis predicts (a) to have only as much structure as is needed to satisfy OPSPEC (any specifier position will do). The verbal projection is an IP or a VP, depending on assumptions pertaining to the licensing of finite inflection. In her analysis, vacuous movement (to SpecCP) is sub-optimal because it entails a violation of STAY, plus a violation of OBHD or FULLINT, if the C head is left empty or filled with expletive *do*, respectively.²³ In contrast, nonsubject *wh*-phrases must move to the specifier of a functional projection above IP. Otherwise, they fatally violate OPSPEC. Thus, while OT predicts minimal syntactic representations, it does not fail to predict that complex representations under appropriate circumstances are favored over simpler ones.

1.8 Optionality

Economy and optimality have the important consequence of essentially excluding optionality, except under particular types of constraint interaction. (See Müller 1999 for an overview paper.²⁴) Two candidates may incur exactly the same set of violations and thereby both be 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 (chap. 4, this volume).

A second possibility is a constraint *tie*: When two constraints C_1 and C_2 are tied in ranking, a violation of C_1 and a violation of C_2 cancel each other. If C_1 and C_2 are high ranked, lower-ranked constraints become decisive. Such an example is found in chapter 9, where I discuss masked second-position effects.

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 that might, at first glance, seem fairly innocuous. They are, however, problematic from both a learnability (Tesar and Smolensky 1998; sec. 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 (to cite only a few examples, Grimshaw and Samek-Lodovici 1998; Legendre et al. 1995; Baković and Keer, chap. 4, this volume) that optionality is most often *apparent* (except in the unlikely case of identical violations discussed earlier), hiding important differences in information status, register, dialect, and so on that 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’ versus (b) *Es wurde schön getanzt*—is only superficially synonymous. Sentence (a) is felicitous only when the adverb *schön* is specified for noteworthiness in the input. In OT terms, the (high-ranked) constraint ALIGNNOTEWORTHY favors (c) over (a) when *schön* is marked [+noteworthy] in the input—it eliminates (a) altogether from the competition (tableau T1.4). When *schön* is not marked [+noteworthy], however, ALIGNNOTEWORTHY is vacuously satisfied and lower-ranked constraints become active, favoring (a) over (c) (tableaux T1.3 and T1.5).

Another source of apparent optionality is different rankings or grammars representative of different idiolects, registers, and so on. French exemplifies this possibility. It exhibits a rich typology of *wh*-questions that 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*-)
 Peter has gone where
 ‘Where did Peter go?’
 b. Où Pierre est-il parti? (Complex Inversion)
 where Peter has he gone

All other things being equal, (11a) is optimal under a ranking STAY » OPSPEC while (11b) is optimal under the reverse ranking OPSPEC » STAY.²⁵ Register differences

are, formally speaking, a subcase of crosslinguistic variation. They correspond to different grammars. In Legendre 1998, I proposed that register variation differs from crosslinguistic variation only with respect to how many constraints may be reranked. Register variation involves minimal constraint reranking, typically involving one constraint only. Crosslinguistic 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.

1.9 Ineffability

In OT, each competition yields an optimal candidate, therefore a grammatical output. This raises a question about “ineffable” structures—that is, 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, Smolensky, and Wilson 1998).

The existence of ineffable structures has, in fact, been characterized as a fatal problem for an OT approach to core aspects of syntax—that is, 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 on pp. 150–151, he briefly considers the alternative described below).

Legendre et al. (1995) and Legendre, Smolensky, and Wilson (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 suboptimal 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, chap. 4, and Wilson, chap. 15, 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.

1.10 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 that 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, and so on). 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 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, Raymond, and Smolensky 1993 and several chapters in the present volume.²⁷

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: esp. chap. 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 preexisting constraint-based approaches to syntax) implies 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?”²⁸ 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 subhierarchies have been shown to pervade both syntax and phonology, to name only a few. The remaining fifteen chapters in this volume offer additional evidence that syntax operates on OT principles. I believe that they contribute considerable and solid evidence for a unified grammatical theory.

Notes

I would like to thank Luigi Burzio, Jane Grimshaw, Paul Hagstrom, Paul Smolensky, and Sten Vikner for valuable comments on earlier drafts of this chapter, as well as Tanja Schmid and Ralf Vogel for sharing their native intuitions and for helping me grasp some of the subtleties of focalization in German.

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. In 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, Grimshaw, and Prince 1999.
4. Hence constraint universality is logically independent of constraint violability in OT.
5. Grimshaw (1997:374) and Grimshaw and Samek-Lodovici (1998:194) define FULL-INT 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.

6. Historically, OT developed out of a theory called *Harmonic Grammar* (Legendre, Miyata, and Smolensky 1990, 1991), which assumed numerical weighting of constraints rather than strict domination. See Smolensky and Legendre (forthcoming) for further discussion.
7. The competitions in tableaux T1.1 and T1.2 are provided for illustrative purposes only. I am, in particular, abstracting away from the issue of whether *it* is an expletive or quasiargument, as argued in Vikner 1995:224–228. See note 16 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 that are logically inconsistent with each other. Overt expletives only occur under the ranking SUBJECT » FULLINT, while null subjects require the ranking FULLINT » 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: esp. 198, footnote 1. They argue that *that* too is derived from the syntax, under their formulation of FULLINT. It is the pronoun that incurs minimal violations of FULLINT—that is, the one that has the smaller number of phi features. This eliminates the pronoun *he*, for example. See Grimshaw (chap. 8, this volume) for a demonstration that language-particular inventories of clitic forms are also derived from constraint rankings.
11. Ralf Vogel (personal communication) points out that preposing of adverbs or PPs in answers to *Was geschah?* 'What happened?' is possible but is associated with a presuppositional reading (Diesing 1992) rather than with introducing a new entity in the discourse. Hence (6c) is marked #—that is, unnatural on a nonpresuppositional reading.
12. I am grateful to Ralf Vogel for clarifying 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 need to recognize different domains of alignment independently of the German pattern discussed here is amply demonstrated in the OT literature on "focus" phenomena. See the 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 ALIGNNOTEWORTHY 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, since it derives from the mapping from theta roles to grammatical functions. For alter-

native OT analyses of grammatical voice, see Legendre, Raymond, and Smolensky 1993 as well as the chapters by Aissen (chap. 3), Sells (chap. 12), and Woolford (chap. 16) in the present volume.

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), 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. In 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 MINPROJ in German cannot be fully determined on the basis of the present competitions. The only evidence we have is that MINPROJ outranks SUBJECT in tableau T1.4 (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 tableaux T1.3–T1.5 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, forthcoming a, b, for analyses of clitic patterns and Legendre et al. 1995 as well as Legendre, Smolensky, and Wilson 1998 for analyses of *wh*-extraction that exploit local conjunctions. See also the contributions by Aissen (chap. 3), Choi (chap. 6), and Grimshaw (chap. 8) in the present volume. While the existence of local conjunctions is amply motivated, their status is still being debated. Smolensky (1997) argues that OT relies on two mechanisms working together: (1) ranking (universal) and (2) 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. MINIMALPROJECTION 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 OT explanation for it is.

24. The Minimalist Program (MP) 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, Smolensky, and Wilson (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 (chap. 13, this volume) for an alternative conception of the input. See also Wilson (chap. 15, this volume) for an interesting take on inputs and candidate sets in the context of bidirectional optimization.
28. The assumption that the set of possible inputs to grammar is universal and not subject to any language-particular restrictions is known as the *Richness of the Base Principle* (Prince and Smolensky 1993: chap. 9).

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