

CHAPTER 22

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OPTIMIZATION  
PRINCIPLES IN THE  
TYPOLOGY OF  
NUMBER AND  
ARTICLES

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**22.1 OPTIMALITY THEORY AS A TOOL FOR  
TYPOLOGICAL INVESTIGATIONS**

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THERE are about 6,000 languages spoken worldwide, most of them not mutually intelligible, and many of them displaying rich dialectal variation. Language is a key component of human cognition and highly characteristic of our interactive behavior and it is probably the only general feature that allows such a large amount of diversity across social communities and cultural groups. Why would that be and how can we get a grip on this rich inventory of linguistic variation? These questions have fascinated grammarians, linguists, philosophers of language, psychologists, and cognitive scientists of all times and places. The 20th century saw tremendous

progress in our way of thinking about language and linguistic diversity, mostly because of the advent of more formal models which allowed linguists to focus on linguistic competence rather than language performance. With the creation of large corpora and electronically searchable databases, we witness a return to rich empirical data, fine-tuned observations, and statistical generalizations over actual language use. These findings show conflicting tendencies, such as convergence vs. divergence in morpho-syntactic patterns, economy and simplification vs. doubling and complex agreement phenomena. The patterns often reflect functional considerations that are well known from the typological literature, but they are tendencies, not absolute rules that are always applicable. As such, they haven't been fully integrated within more formal views on language and linguistic diversity that focus on universal grammar. We need a framework that potentially captures typological and dialectal variation, and which is grounded in descriptive adequacy as well as theoretical claims concerning patterns of linguistic form and meaning. In this chapter, we exploit the framework of Optimality Theory (OT), for it lends itself very well as a tool for typological research, and that is the aspect of the theory we focus on here.

Optimality Theory (OT) is a fairly recent development within linguistics. It originates in work on phonology (Prince and Smolensky 1997), was further developed as a framework for syntax (Barbosa et al. 1998; Legendre et al. 2001), and eventually found its way into semantics and pragmatics (de Hoop and de Swart 2000; Hendriks and de Hoop 2001; Blutner 2000; Blutner and Zeevat 2003, etc.). As the name indicates, OT is based on principles of optimization. When we speak, there are in principle infinitely many ways in which we can package our message. We pick the one that best expresses the information that we want to convey to the hearer. But in other circumstances, addressing a different person, speaking another language or another variant of the language, we would have framed our message in a different way. This intuition underlies the idea that there is no perfect form, no perfect (universal) grammar, no perfect language per se, but that we operate with locally optimal patterns of linguistic structure and language use. Variation across languages arises from differences in the "weights" assigned to certain symbolic rules (phonological, morphological, syntactic, semantic ones). These rules represent different, possibly conflicting tendencies in language. In particular, OT exploits the opposition between a drive for economy (favoring "simpler" expressions over more complex ones) and a drive for reflecting differences in meaning in the form. All rules are soft, and can be violated if necessary to satisfy rules that are considered more important in the language, and are ranked higher in the grammar. Languages vary in the balance they strike between economy and meaningful formal distinctions, which is reflected in a range of linguistic patterns.

In this chapter, we will illustrate the essence of such an approach with a typology of plural morphology and article use. Our goal is not to give a complete overview of how these grammatical categories are expressed cross-linguistically but rather to

demonstrate how certain patterns of variation can be understood from the theoretical perspective of Optimality Theory. The core question we address is: what is the best way for the speaker to convey in his or her language information concerning singular/plural distinctions, definiteness, and discourse reference in the nominal form? OT frames this as a relation between input and output, and spells out an optimization process over candidates that are potential forms to convey a certain message. If the speaker wants to convey a certain meaning (input), we determine what is the optimal form (output) he or she should use to do so under the language-specific grammar, which is conceived of as a ranked set of constraints. The meaning carried by the form has to be recoverable, that is, the hearer must be able to construe a meaningful representation based on the form chosen by the speaker. Successful communication arises when this meaning representation corresponds to the message the speaker intended to convey. Our approach is both deductive and partial: starting from a few theoretical premises, we build a simple model and then test how it accounts for part of the cross-linguistic data (section 22.2). Extensions enlarge the empirical coverage and open up a wider perspective (sections 22.3 and 22.4). These sections function as a guide for possible future research.

## 22.2 ARTICLES AND PLURALITY ACROSS LANGUAGES: AN OT TYPOLOGY

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In this section, we demonstrate how a typology is set up in Optimality Theory. We define a single economy constraint, and a range of constraints driving the expression of distinctions in number, definiteness, and discourse reference. Reranking of constraints leads to a range of possible languages, and provides a basic account of how language variation arises.

### 22.2.1 A general markedness constraint: \*FUNCTN

Plural morphology and definite/indefinite articles convey grammatical or “functional” information, as opposed to the lexical information contributed by nouns. In this chapter we ignore proper names and pronominal structures, and focus on expressions with a lexical core, conveyed by a noun (N). East-Asian languages such as Mandarin Chinese, Japanese, Korean make extensive use of classifier and quantifier constructions, but do not systematically establish singular/plural distinctions on nouns, nor do they use definite/indefinite articles like English *a* and *the*.

Accordingly, a sentence like (1) (from Krifka 1995) can be paraphrased by different English sentences:

- (1) Wò kànjiàn xióng le [Mandarin Chinese]  
 I see bear ASP  
 'I see a bear/some bears/the bear(s).'

As illustrated by (1), Mandarin Chinese allows “bare” nominals, i.e., nominals without articles, without plural morphology, without any sort of grammatical marking on the noun. Such bare nominals are preferred under a general economy constraint barring (morphologically and syntactically) complex nominals involving grammatical or functional adornment of N. We label this constraint \*FUNCTN:

- \*FUNCTN: Avoid functional structure in the nominal domain.

The set of functional expressions in the nominal domain is quite rich. Besides plural morphology and definite/indefinite articles, we find demonstratives (*this/that*), classifiers (familiar from East-Asian languages such as Korean, Japanese, Chinese), case marking, etc. We will not formalize the general notion of “functional structure” in a specific linguistic framework in this chapter, but assume that all parts of a nominal constituent accompanying the lexical core are involved. \*FUNCTN is called a *markedness* or *economy* constraint because it favors nominals with the least complex nominal structure. The intuition underlying markedness constraints is that certain forms are preferred to other forms because they are simpler, or shorter, or occur in more languages. In line with the idea that markedness constraints bar complexities, they are often formulated as “avoid” constraints, and we see this with “Avoid functional structure in the nominal domain”. \*FUNCTN is a gradable constraint, as each grammatical marker (plural morphology, article, etc.) adds to the complexity of the form.

The concept of markedness is not always easy to define, and different notions of markedness are found in the literature (cf. Haspelmath 2006 for discussion). However, markedness or economy is broadly conceived as a factor shaping language by many different theoretical frameworks, ranging from functionally motivated approaches to minimalist syntax. In OT, markedness defines a set of output oriented constraints: no matter what message the speaker intends to convey, he or she will prefer a simpler over a more complex form to do so. It is out of the scope of this chapter to address the full inventory of grammatical markers in the nominal domain, so we focus on plural morphology and definite/indefinite articles.

\*FUNCTN is a powerful markedness constraint, but economy is not the only force driving natural language. The tendency toward simplification is often in conflict with devices that elaborate form and multiply markings. Such opposing tendencies are difficult to manage in models of linguistic theory that are built on hard rules that always need to be satisfied. One of the innovative ingredients of an optimization approach to grammar is the assumption that grammatical rules are not absolute but can be violated if necessary. The Mandarin Chinese example in (1) above indicates

that \*FUNCTN occupies a high position in the ranked set of constraints that constitutes the grammar of the language. In the remainder of this section, we consider cases in which the economy constraint \*FUNCTN is overruled by constraints that favor the encoding of distinctions in meaning in the functional structure of the nominal. If other constraints outrank \*FUNCTN, we obtain a richer set of possible nominal structures in the language, with concomitant meanings. In sections 22.2.2 through 22.2.4, we outline a set of so-called faithfulness constraints which enforce the expression of number distinctions and definite/indefinite discourse reference in the form of the nominal.

### 22.2.2 Plural morphology driven by FPL

Unlike Mandarin Chinese, many languages mark singular/plural distinctions on the noun by means of special number morphology. (2) provides an example from Polish (D. Klimek, p.c.).

- (2) a. Piłka toczy się.  
       ball roll-3sg refl.  
       ‘A/The ball is rolling.’  
       b. Piłki toczą się.  
       balls roll-3pl refl.  
       ‘Balls/The balls are rolling.’

Polish does not use articles to distinguish definite from indefinite noun phrases but it does establish a singular/plural distinction in the morphology of the noun. From the typological literature, the generalization emerges that plural will be marked first, if there is a number distinction at all (Greenberg 1966; Corbett 2000).<sup>1</sup> The unmarked form is then used for singular reference (and possibly number neutrality, cf. Farkas and de Swart 2003). The form marked with a plural morpheme refers to a group of individuals (Farkas and de Swart 2003, 2007). We formulate this as a constraint between the input (the information the speaker wants to convey) and the output (the shape of the nominal constituent):

- FPL: reference to a group of individuals must be reflected in a special plural form of the nominal.

The special plural form of the nominal usually involves plural morphology on the noun, but other realizations of plural are possible (cf. Rijkhoff 2002; Corbett 2000). In OT terms, FPL is a *faithfulness* constraint. Faithfulness constraints link a particular input (in this case reference to a group of individuals) to a certain output (in this case, a special plural form of the nominal). The special plural marking signals to the hearer that the speaker is talking about a group of individuals.

<sup>1</sup> We will come back to the asymmetry between singular and plural marking in section 22.3 below.

Tableau 22.1. No plural marking in Mandarin Chinese

Meaning $\exists x_{pl} \text{ Bear}(x) \ \& \ \text{See}(l, x)$	Form	*FUNCTN	FPL
	Wò kànjàn xióng le I see bear ASP		*
	Wò kànjàn xióng <sub>pl</sub> le I see bear ASP	*	

Tableau 22.2. Plural marking in Polish

Meaning $\exists x_{pl} \text{ Ball}(x) \ \& \ \text{Roll}(x)$	Form	FPL	*FUNCTN
	Piłka toczy się. Ball roll-3sg refl.	*	
	Piłki toczą się. Balls roll-3pl refl.		*

Faithfulness constraints often favor more complex output candidates. Given that it promotes the use of special grammatical structure in the nominal domain, the faithfulness constraint FPL is in conflict with the markedness constraint \*FUNCTN, which bars such functional markers, and favors simpler forms. Given that OT constraints are violable, we can resolve the conflict by differentiating the weight of opposing constraints. In the interaction of two constraints (call them  $C_1$  and  $C_2$ ), there are two possible rankings: either  $C_1$  is more important, and outranks  $C_2$  (written as  $C_1 \gg C_2$ ), or  $C_2$  outranks  $C_1$  (written as  $C_2 \gg C_1$ ). A grammar that ranks \*FUNCTN above FPL ( $*\text{FUNCTN} \gg \text{FPL}$ ) captures East-Asian languages such as Mandarin Chinese, which produce the same form for singular and plural (example 1).<sup>2</sup> The description of Polish involves a grammar that ranks FPL above \*FUNCTN ( $\text{FPL} \gg * \text{FUNCTN}$ ). Such languages produce a special form for plural nominals (example 2). The optimization process is spelled out in the OT Tableaux 22.1 and 22.2.

As the input to the optimization process, the first column of the tableau gives a representation of the intended meaning in terms of a first-order logical formula, enriched with information concerning group-level reference of the object. There is a long, possibly infinite set of forms that could convey indefinite reference to a group of balls, a selection of which are listed as candidate forms in the second column. In the Tableaux 22.1 and 22.2, we focus on the two candidates that differ in the presence vs. absence of special plural morphology on the noun. The remaining columns list the constraints in order of strength. Constraints more to the left are

<sup>2</sup> Mandarin Chinese has an optional plural classifier, but this expression is not grammaticized as a general plural marker, obligatorily used for plural reference; cf. Cheng and Sybesma (1999) for discussion.

stronger than constraints more to the right. The ideal candidate does not violate any constraints, but in Tableaux 22.1 and 22.2, each candidate violates a different constraint (marked with an asterisk \*). The conflict between economy of form and faithfulness to number distinctions is resolved by the ranking of the constraints. Under an optimization approach, violations of a lower-ranked constraint are tolerated if such a pattern allows satisfaction of a higher-ranked constraint. The optimal candidate under a particular constraint ranking is indicated by the pointing hand (☞). Mandarin Chinese and Polish crucially differ in the ranking of \*FUNCTN and FPL. As a result, the optimal form in Mandarin Chinese is a nominal not marked for plural reference (Tableau 22.1), whereas in Polish, the optimal candidate reflects group reference in a special plural form of the nominal (Tableau 22.2). Note that there are more violations of \*FUNCTN than indicated in Tableau 22.3 (in particular for case marking), but we only indicate those relevant to the distinction in number.

The markedness constraint \*FUNCTN reflects speaker economy (it is “easier” to produce an unmarked form), whereas the faithfulness constraint FPL reflects the hearer’s perspective (it is “easier” to understand that group reference is intended when a specially marked form conveys this information). The contrast between the two languages shows that typological variation is the result of conflicting tendencies in natural language, which allow more than one solution. Along similar lines, the speaker can convey information concerning referential status of the individuals talked about by means of definite and indefinite articles. In the next section, we will be concerned with discourse referential status, and uniqueness/familiarity of the referent. The relevant distinctions made in natural language are captured by the two faithfulness constraints FDEF and FDR introduced in section 22.2.3.

### 22.2.3 Article use driven by FDEF and FDR

Many languages have a definite article conveying uniqueness (“the queen of the Netherlands” refers to the one and only queen of the Netherlands), maximality of groups of individuals (“the stars” refers to all the stars) or familiarity (in “I saw a dog in the park. The dog wagged its tail”, *the dog* refers to the dog I just saw). We abstract away from the question whether the definite article involves a condition on uniqueness/maximality (as proposed by Strawson 1950, Hawkins 1991), or should be framed in terms of the discourse old/new distinction (Heim 1982), and use the term “discourse uniqueness” to generalize over both uses.<sup>3</sup>

- FDEF: Reference to discourse unique individuals (unique/maximal or familiar ones) requires the use of an expression of definiteness.

<sup>3</sup> The notion of discourse uniqueness is inspired by Farkas (2002), who develops a formal implementation of such a unified view in Discourse Representation theory.

Tableau 22.3. Bare definite plurals in Hindi

Meaning $\exists!x_{pl}$ Child(x) & Play(x)	Form	FPL	*FUNCTN	FDEF
	bacca khel rahaa hai child play PROG PRES	*		*
बच्चें	bacce khel rahe haiN children play PROG PRES		*	*
	DEF-bacce khel rahe haiN the children play PROG PRES		**	

Tableau 22.4. Definite article in Hebrew

Meaning $\exists!x$ Tiger(x) & Disappear(x)	Form	FDEF	FPL	*FUNCTN
	namer ne'elam tiger disappeared	*		
הנמר	ha-namer ne'elam the-tiger disappeared			*

In this chapter, we will limit ourselves to languages using definite articles, which constitute the typical expression of definiteness, but the constraint FDEF does not exclude other means of conveying definiteness (compare analyses of case-marking in Turkish and Persian in terms of specificity by Enç 1991 and Karimi 2003). In the grammar of Mandarin Chinese, Polish, or Hindi, \*FUNCTN outranks the faithfulness constraint FDEF, so we do not find definite articles. In such languages, bare nominals display ambiguities between definite and indefinite readings, as illustrated by the Hindi bare plural in (3) (from Dayal 1999):<sup>4</sup>

- (3) bacce khel rahe haiN [Hindi]  
children play PROG PRES  
'The children/some children are playing.'

With the ranking FDEF  $\gg$  \*FUNCTN, we obtain a system in which definite articles alternate with bare nominals, as we see in Bulgarian and Hebrew. The Hebrew example in (4a) is from Doron (2003), who ascribes it a regular definite or a generic interpretation. It contrasts with (4b) in which the bare singular is ascribed an indefinite (non-generic) interpretation:

- (4) a. ha-namer ne'elam me ezor-enu. [Hebrew]  
the-tiger disappeared from area-our  
'The tiger disappeared from our area.'  
b. namer ne'elam me ezor-enu.  
tiger disappeared from area-our

<sup>4</sup> The situation of Hindi bare singulars is more complex, for the choice between a definite and an indefinite interpretation is affected by other syntactic and semantic particularities; cf. Dayal (1999; 2004) for discussion.



‘A tiger disappeared from our area.’

Tableaux 22.3 and 22.4 spell out the optimization patterns in Hindi and Hebrew respectively.

Hindi establishes a distinction between singular and plural nominals, just like Polish, so it has the ranking  $F_{PL} \gg *FUNCTN$  (cf. Tableau 22.2). There is no definite article, so we posit a grammar for Hindi in which  $*FUNCTN$  is ranked above  $F_{DEF}$ . Under this ranking, economy is more important than faithfulness to the discourse referential distinction between discourse unique or discourse non-unique individuals. Although the input in Tableau 22.3 is a unique maximal group of individuals (marked as  $\exists!x_{pl}$ ), the optimal form is a bare nominal.

Just like Polish and Hindi, Hebrew establishes a singular/plural distinction between nouns, so its grammar shows the ranking  $F_{PL} \gg *FUNCTN$ . Unlike these other languages, Hebrew contrasts definite and bare nominals, so the faithfulness constraint  $F_{DEF}$  is ranked above the markedness constraint  $*FUNCTN$  in Tableau 22.4. The speaker wants to convey information about a unique individual, so the input semantic representation marks the individual referred to as  $\exists!x$ . Faithfulness to uniqueness/discourse familiarity requires marking of the input meaning by means of a definite article in the form. The optimal nominal structure conveying the meaning intended by the speaker under the ranking posited in Tableau 22.4 is the definite description *ha-namer*. Note that the respective order of  $F_{PL}$  and  $F_{DEF}$  does not matter, for the two faithfulness constraints do not interact. In the tableau, this is reflected by the dotted line between the two columns.

The introduction of faithfulness constraints concerning the referential status of the discourse referent should be viewed in the broader perspective of how discourse referents are set up by linguistic expressions. It is generally acknowledged that articles, quantifiers, and numerals (broadly construed as a category of determiners) are used to ground the individuals described by the noun in the conversational context. Nominals in regular subject/object/indirect object position are assumed to have full discourse referential status (cf. Higginbotham 1985; Kamp and van Eijck 1996; Chierchia 1998). In the absence of further information concerning definiteness, number or quantificational status, such nominals take an indefinite article. Bare (singular) nominals are blocked in regular argument position in languages like English, Dutch, German, etc. (5a). However, nominals in incorporation constructions, predicative contexts, and a range of other constructions are non-discourse referential, and we observe that bare nominals are allowed in such environments, albeit in a restricted way (5b).<sup>5</sup>

- (5) a. Susan ate \*apple/an apple.  
b. Susan is head of the department of linguistics.

<sup>5</sup> The reader is referred to Farkas and de Swart (2003) and literature cited there for claims concerning the lack of discourse referentiality for incorporated nominals, to de Swart et al. (2005, 2007) for similar claims concerning predicative nominals, and to de Swart and Zwarts (2009) for a more general discussion of non-referentiality.

The correlation between determiners and discourse referential status is captured by the constraint FDR:

- FDR (preliminary version): The presence of a discourse referent in the semantics corresponds with the presence of a determiner in the nominal form.

Note that FDR is independent of the constraint FDEF, in that it does not convey information concerning discourse uniqueness. The contrast between definite and indefinite articles in English makes this a bit hard to see, but the Salish languages provide a nice illustration. Matthewson (1998) discusses the following examples from St'át'imcets:

- (6) a. *tecwp-mín-lhkan ti púkw-a lhkúnsa.* [St'át'imcets]  
 buy.APPL-1SG.SUB DET book-DET today  
 'I bought a/the book today.'
- b. *Léxlex I smelhmúlhats-a.*  
 Intelligent DET.PL woman.PL-DET  
 'Women/the women are intelligent.'

According to Matthewson, the St'át'imcets (circumfixed) determiners do not encode either definiteness or specificity but merely assert existence. She models this notion in Discourse Representation Theory (Kamp and Reyle 1993). For our purposes, "assertion of existence" can be identified with the introduction of a discourse referent. The ranking of FDR above \*FUNCTN forces the introduction of a determiner when the nominal is in regular argument position. Further evidence that FDR is at stake in the grammar of St'át'imcets comes from the observation that the determiner does not appear in predicative contexts, compare (7a) and (b).

- (7) a. *kúkwpi7 kw s-Rose.*  
 Chief DET nom-Rose  
 'Rose is a chief.'
- b. *\*ti kúkwpi7-a kw s-Rose.*  
 DET chief-DET DET nom-Rose

Under the assumption that predicate nominals do not have discourse referential force (cf. de Swart et al. 2005, 2007), the semantic input in (7) does not contain a discourse referent, so the use of the determiner is not enforced. Given that the language does not establish a definite/indefinite contrast, we posit a low position for FDEF in the grammar. The ranking {FPL, FDR}  $\gg$  \*FUNCTN  $\gg$  FDEF derives the obligatory use of a definite-neutral article for all nominals in regular argument position (Tableau 22.5). Predicate nominals occur bare, as illustrated in Tableau 22.6.

The bare nominal violates the highly ranked constraint FDR, so under the ranking FDR  $\gg$  \*FUNCTN in St'át'imcets, the nominal in direct object position is obligatorily

Tableau 22.5. Discourse reference in St'át'imcets

Meaning ∃!x Book(x) & Buy(l, x)	Form	FDR	FPL	*FUNCTN	FDEF
	tecwp-min-lhkan púkw buy.APPL-1 SG.SUB book	*			*
	tecwp-min-lhkan ti púkw-a buy.APPL-1 SG.SUB DET book-DET			*	*

Tableau 22.6. Bare nominals in predicative contexts in St'át'imcets

Meaning Chief(rose)	Form	FDR	FPL	*FUNCTN	FDEF
	kúkwpí7 kw s-Rose chief DET nom-Rose				
	ti kúkwpí7-a kw s-Rose DET chief-DET DET nom-Rose			*	

marked with a determiner indicating discourse referential force. As Tableau 22.5 illustrates, non-definite and definite meanings are expressed by the same determiner form. In predicative contexts, no discourse referent is present in the semantic input, so in Tableau 22.6, the bare nominal does not violate FDR. Even though the markedness constraint \*FUNCTN is ranked fairly low in St'át'imcets, it comes into play in this configuration, and favors the use of a bare nominal over a nominal marked with a determiner (cf. 7a versus 7b). In OT, the phenomenon according to which a low-ranked constraint can be influential in situations in which higher-ranked constraints do not decide between candidates is known as “the emergence of the unmarked”. It implies that unmarkedness is pervasive, even in languages in which high-ranked faithfulness constraints frequently block the simplest form.

St'át'imcets obligatorily marks both singular and plural nominals with a determiner indicating discourse referential status in environments such as (6). Languages like English display a contrast between singulars and plurals. Singular bare nominals do not occur in argument position (5a repeated as 8a), but bare plurals are perfectly felicitous there (8b):

- (8) a. Susan ate \*apple/an apple.  
b. Susan ate apples.

According to Farkas and de Swart (2003), plural reference can only be predicated of full-fledged discourse referents. Plural morphology then presupposes discourse referential status of the nominal expression. In languages like English, this allows plural morphology to introduce discourse referents through the backdoor of presupposition accommodation. When the speaker uses a presupposition triggering expression, the hearer can accommodate this presupposition in certain contexts, as illustrated by the example in (9):

- (9) (teacher, upon entering the classroom late): Sorry I am late. My bike had a flat tire.

The students may be quite unaware of the fact that the teacher bikes to class, but will not dispute the existential presupposition introduced by *my bike*. The statement that the teacher owns a bike is tacitly added to the background knowledge shared by teacher and student. If this process of presupposition accommodation is operative with plural morphology, it will allow the hearer to tacitly add a discourse referent to the list of individuals talked about during the conversation, even in the absence of a determiner (cf. 8b).

In the following, we will use the term “strong” plural morphology to describe languages like English, in which bare plurals can be used with full discourse referential status, and “weak” plural morphology to describe languages in which plural inflection has to agree with a plural determiner (St’át’imcets, 6b). The correlation between strong plural morphology, determiners and discourse referential status is captured by the revised version of the constraint FDR:

- FDR (final): The presence of a discourse referent in the semantics corresponds with an expression that carries discourse referential force (“strong” plural morphology, an article, or another determiner).

A high ranking of FDR in the grammar implies that nominals in regular argument position are never fully bare (i.e., consisting solely of a lexical core).

Languages that rank FPL, FDEF and FDR above \*FUNCTN display a full contrast between singular and plural, definite and indefinite nominals. In the singular, we find a definite and an indefinite article (10a, 11a). Depending on whether the language has strong plural morphology (e.g., English) or weak plural morphology (e.g., French, cf. Delfitto and Schroten 1991), we find a contrast between definite and bare plurals (10b) or a contrast between definite and indefinite plurals (11b):

- (10) a. I bought a book/the book today.  
 b. I bought books/the books today.
- (11) a. J’ai acheté un/le livre aujourd’hui. [French]  
 I-have bought INDEF.SG/DEF.SG book today  
 ‘I have bought a/the book today.’  
 b. J’ai acheté des/les livres aujourd’hui.  
 I-have bought INDEF.PL/DEF.PL books today  
 ‘I have bought books/the books today.’

The constraint ranking for the two languages is the same, namely {FPL, FDEF, FDR}  $\gg$  \*FUNCTN, where the mutual ranking of the constraints conjoined by bracketing is irrelevant. As the contrast between Tableaux 22.7 and 22.8 shows, the weak plural morphology we find in French implies a lack of satisfaction of FDR by bare plurals. Accordingly, an indefinite plural article must be inserted here.

Tableau 22.7. Indefinite singulars and indefinite plurals in French

Meaning $\exists x \text{ book}(x) \ \& \ \text{Buy}(l, x)$	Form	FDEF	FDR	FPL	*FUNCTN
	J'ai acheté livre		*		
	J'ai acheté un livre				*
Meaning $\exists x_{\text{pl}} \text{ book}(x) \ \& \ \text{Buy}(l, x)$	Form				
	J'ai acheté livres		*		*
	J'ai acheté des livres				**

The strong plural morphology we find in English ensures that FDR is satisfied by the plural nominal. Insertion of a plural indefinite article is thus redundant, and penalized by the markedness constraint \*FUNCTN. Since there is no plural indefinite article in English, we have represented this option here with the abstract marker *indef\_pl*.

The use of a bare, rather than a full indefinite plural in English illustrates the relevance of economy, even in languages in which \*Funct is ranked fairly low. Just like in St'át'imcets bare predicative nominals, we see the emergence of the unmarked at work here.

#### 22.2.4 Summing up: An OT typology of plural morphology and article use

The introduction of a core markedness constraint \*FUNCTN and the faithfulness constraints FPL, FDEF, and FDR complete the set of constraints we discuss for our typology in this section. What emerges is a typology of languages based on all the possible rankings of these four constraints. Table 22.1 sums up the rankings exemplified so far.

Tableau 22.8. Indefinite singulars and bare plurals in English

Meaning $\exists x \text{ book}(x) \ \& \ \text{Buy}(l, x)$	Form	FDEF	FDR	FPL	*FUNCTN
	I bought book		*		
	I bought a book				*
Meaning $\exists x_{\text{pl}} \text{ book}(x) \ \& \ \text{Buy}(l, x)$	Form				
	I bought books				*
	I bought <i>indef_pl</i> books				**

Table 22.1. OT typology of plural morphology and article use

Ranking	Characteristics	Example language
*FUNCTN $\gg$ {FPL, FDEF, FDR}	no number morphology, no articles	Mandarin Chinese
FPL $\gg$ *FUNCTN $\gg$ {FDEF, FDR}	sg/pl distinction, no articles	Hindi, Polish
{FPL, FDEF} $\gg$ *FUNCTN $\gg$ FDR	sg/pl distinction; definite/bare contrast in sg and pl	Hebrew, Bulgarian
{FPL, FDR} $\gg$ *FUNCTN $\gg$ FDEF	no def/indef; no bare nominals (weak plural)	St'át'imcets
{FPL, FDR, FDEF} $\gg$ *FUNCTN	def/indef in sg; definite/bare in plural (strong plural)	English, German
{FPL, FDR, FDEF} $\gg$ *FUNCTN	def/indef in sg and plural; no bare nominals (weak plural)	French

From this table, Mandarin Chinese emerges as the most economical language, but that is of course influenced by the fact that we did not work out in this section faithfulness constraints licensing classifiers and other grammatical markers that occur in East Asian languages. Once we develop such constraints, they will be posited above \*FUNCTN, thus permitting more complex nominals, even in languages that do not use articles, and do not use number morphology on the noun. The rankings in the first column show that the faithfulness constraints FPL, FDEF, and FDR do not interact with each other. In principle, a factorial typology based on four constraints would lead to 24 possible languages, but the lack of interaction between the three faithfulness constraints reduces this number to eight equivalence classes, five of which are distinguished in Table 22.1. Furthermore, the distinction between strong and weak plural morphology creates two options for all languages in which both FDR and FPL are ranked above \*FUNCTN. This accounts for the contrast between English and French, in the last two rows of Table 22.1. So far, we haven't found a language that behaves like St'át'imcets, but has a strong plural, although the case of Sinhala (section 22.3.2 below) comes very close. What is most striking about Table 22.1 is that we are missing languages in which referential faithfulness constraints are rising above \*FUNCTN, while FPL remains below that markedness constraint. We are not aware of languages that establish definite/indefinite and/or discourse referential distinctions in the absence of a singular/plural distinction. This might suggest that somehow number distinctions are more "basic", and are established prior to discourse referential distinctions, but further empirical research is needed to confirm this.

As we already indicated above, number and article systems across languages are more complex than what has been discussed so far. We provide more in-depth discussion of singular/plural marking in section 22.3, and an elaboration of the article system in section 22.4.

## 22.3 MARKEDNESS REVERSAL IN OT

In this section, we discuss two instances of markedness reversal, and a possible strategy to deal with such patterns in Optimality Theory. The first case involves unexpected patterns of number marking (section 22.3.1), the second a Sinhala article marking indefiniteness in the absence of a definite article (section 22.3.2).

### 22.3.1 Unexpected patterns of number marking

In the preceding section we have seen two types of languages with respect to number marking, defined by the two possible rankings of the markedness constraint \*FUNCTN and the faithfulness-to-plural constraint FPL:

- (12) a. languages without number marking: \*FUNCTN  $\gg$  FPL  
 b. languages with plural marking: FPL  $\gg$  \*FUNCTN

In the first type of language, there is no opposition between singular and plural. This is the situation in Mandarin Chinese (cf. example 1, Tableau 22.1). In the second type of language, the plural is marked in opposition to a bare form, used for singular reference. This is what typically happens in English, as shown in the following two tableaux (which ignore the referential faithfulness constraints). The ending *-sg* in Tableau 22.9 represents the non-existent singular marker in English. That it does not exist follows from the absence of a highly ranked faithfulness constraint for singular.

However, in English we actually find Chinese patterns, too, nouns that do not contrast singular and plural. This happens for isolated cases like *sheep*, but also more regularly with certain classes of nouns, e.g., those for exotic people groups, animals that are hunted or fished on, and deadjectival human terms. Notice how the subjects in the following examples behave as plurals (triggering plural agreement on the verb), without being morphologically marked as such:

- (13) a. The Carib were noted for their ferocity.  
 b. Carp breed from May to July.  
 c. The Chinese are subsidizing the American way of life.

This is a serious problem for the standard view on markedness in which there is a rigid asymmetry between singular and plural, with singular unmarked and plural marked. We find a general markedness pattern in English (and across languages), but the pattern has local exceptions, where the markedness is neutralized or reversed. This phenomenon was discussed in Tiersma (1982), who observed many more cases of *local markedness*, as he called it, arguing that in the domain of number it concerns “nouns whose referents naturally occur in groups or pairs”

Tableau 22.9. Singular as unmarked form in English

Meaning $\exists x \text{ book}(x)$	Form	FPL	*FUNCTN
☞	book		
	book-sg		*

Tableau 22.10. Plural as marked form in English

Meaning $\exists x_{\text{pl}} \text{ book}(x)$	Form	FPL	*FUNCTN
	book	*	
☞	books		*

(Tiersma 1982: 832). In a recent critical discussion of the notion of markedness, Haspelmath (2006) uses the phenomenon of local markedness as an argument for a frequency-based approach to such patterns. The plurals in (13) remain unmarked because they are used more frequently than their singular counterparts.

How exactly frequency influences marking patterns is still an open question, but the important thing is that Optimality Theory provides a framework in which local markedness can be modeled through the interaction of general and local constraints. The architecture of the OT system allows for “exceptions” and reversals in an elegant way. We illustrate that here for a few examples in the number domain, but we believe that the OT tool lends itself to application to a much wider range of typological phenomena involving markedness reversals.

Until now we have worked with one faithfulness constraint for plurality (FPL) and one markedness constraint for functional structure that gives us the results in Tableaux 22.9 and 22.10. When we encounter a situation where the plural gets no marking, as illustrated by *carp* in (13b), there is a simple way to accomplish this in the current setup: by introducing a higher-ranked markedness constraint that blocks plural marking. We would like to suggest that this constraint has a general part (\*PL, “don’t use plural marking”), but that it is restricted to applying to a particular class of nouns only, namely names for fish (\*PL<sub>FISH</sub>). Now, assuming that *carp* is a member of this semantically defined FISH class, we get the result in Tableau 22.11:

Tableau 22.11. Unmarked plural in English

Meaning $\exists x_{\text{pl}} \text{ carp}(x)$	Form	*PL <sub>FISH</sub>	FPL	*FUNCTN
☞	carp		*	
	carps	*		*



Since the constraint \*P<sub>L</sub>FISH is ranked over the faithfulness constraint F<sub>PL</sub> it forces the selection of the unmarked form *carp*. The *general* markedness constraint \*F<sub>UNCTN</sub> is ranked below F<sub>PL</sub>, the *local* markedness constraint \*P<sub>L</sub>FISH is ranked above it, allowing for certain nouns to systematically escape plural marking. \*P<sub>L</sub>FISH can be seen as a very specific instance of the general markedness constraint \*F<sub>UNCTN</sub>, which in English has moved upward in the constraint ranking, but in other languages has remained included in \*F<sub>UNCTN</sub>.

Let us now consider a slightly more complicated language in which not only plural nouns can remain unmarked but singular nouns can also be marked. The singular marking is often called *singulative*. This is especially common in Eastern Africa, in both Nilo-Saharan and Afro-Asiatic languages (Dimmendaal 2000). Here are some examples from Endo (Nilotic, Nilo-Saharan, Zwarts 2007):<sup>6</sup>

- (14) a. chumpa ‘Europeans’–chümpiin ‘European’  
 b. taraak ‘cedars’–täääkwä ‘cedar’  
 c. taalim ‘grasshoppers’–taalimwa ‘grasshopper’  
 d. pëël ‘elephants’–pëëlyoon ‘elephant’  
 e. mur ‘rats’–muryaan ‘rat’

In this pattern the plural form is unmarked, the singular form has a special singular suffix. This language does not mark all nouns in this way, but, on the other hand, these are no rare exceptions, for they involve a sizable proportion of the nouns and systematic patterns can be distinguished. Most of the people groups, trees, and insects are treated like this, but there are also isolated cases, as for example the elephant (which is unlike the other bigger mammals, which are unmarked in the singular, marked in the plural). The general idea in the literature (e.g., Dimmendaal 2000) is that these patterns are based on the fact that for these nouns the plural is more frequent than the singular. Phrased differently: Europeans, cedars, grasshoppers, elephants, and rats occur more often in groups than as individuals.

So, it seems that the same “multitude” factor that plays a role in neutralizing the plural in English is also working in Endo, but note that Endo differs from English in a crucial way. Unlike in English, the singular in Endo is not left unmarked, but marked with a singulative suffix. In fact, there are hardly any nouns in Endo that have the same form for singular and plural. We see that the same functional factors are working in English and Endo, but that they are organized in different ways, leading to typologically different systems.

Let’s see how OT can deal with this, on the basis of the example *taraak* “cedars” vs. *täääkwä* “cedar”. The majority of nouns in Endo marks only plural, so we assume the F<sub>PL</sub> ≫ \*F<sub>UNCTN</sub> order that we also see in English. With this ordering we would expect the plural of *taraak* to be marked, so we need a local markedness constraint. We use a higher-ranked markedness constraint \*P<sub>L</sub>TREE (“leave the plural of trees

<sup>6</sup> The diaeresis expresses advanced tongue root. Tone is left unmarked.

Tableau 22.12. Unmarked plural in Endo

Meaning $\exists x_{pl} \text{ cedar}(x)$	Form	FSG <sub>TREE</sub>	*PL <sub>TREE</sub>	FPL	*FUNCTN
☞	taraak			*	
	taraaktiin		*		*

Tableau 22.13. Marked singular in Endo

Meaning $\exists x \text{ cedar}(x)$	Form	FSG <sub>TREE</sub>	*PL <sub>TREE</sub>	FPL	*FUNCTN
	taraak	*			
☞	tääkwä				*

unmarked”), because that seems to be the subregularity in the number system. For the singular we now need a special faithfulness constraint that guarantees the marking of the singular for the class of trees, FSG<sub>TREE</sub> (“mark the singular of trees”). These two constraints go hand in hand, as two sides of the same coin, making sure that number of trees is always differentiated in Endo. This is illustrated in Tableaux 22.13 where *-tiin* is a plural suffix and *-wä* is the singular suffix.

Tableau 22.12 captures why *taraak* “cedar” does not have the plural form *taraaktiin* when it refers to a plurality (or any of the many other possible plural forms that Endo morphology provides). What makes Endo *taraak* different from English *carp* is that Endo requires number to be differentiated. When the plural is neutralized for a particular class of nouns (through a functionally motivated markedness constraint), then the singular needs to be reflected in the output to avoid the distinction being lost, as shown in Tableau 22.13. This is why in Endo \*PL<sub>X</sub> for a particular lexical class X will pair up with FSG<sub>X</sub> for that class.

Number marking in Endo, and in languages across the world, is much more complex than this, but this first sketch gives us an idea of how constraint interaction could help us understand some of the complexity.

### 22.3.2 An indefinite article in the absence of a definiteness marker

When a language has only one type of article (definite vs. indefinite), then, according to typological generalizations (Dryer 2007), this article is more likely to be definite than indefinite. In the OT system, this is reflected by the presence of a constraint F<sub>DEF</sub>, rather than a constraint FIN<sub>DEF</sub>. Indefinite articles in languages like English are licensed by the constraint F<sub>DR</sub>, and get an indefinite semantics,

because they take the complementary meaning of the definite article. This view of indefiniteness as non-definiteness is challenged by languages that have developed an indefinite article in the absence of a marker of definiteness. Sinhala instantiates this reversed markedness pattern.<sup>7</sup> Sinhala has a high ranking for the constraint F<sub>PL</sub>, and establishes a systematic morphological distinction between singular and plural nouns. It does not have a definite article. Plural nouns are bare, regardless of whether the noun is definite or indefinite. However, in the singular, indefiniteness is marked by the article *-ek* (for animates) or *-ak* (for inanimates). In the absence of an indefinite article, the bare singular noun is interpreted as definite. So for instance *vacanaya* or *vacane* is the bare form, meaning “the word”, *vacana* is the plural form meaning “words” or “the words”, and *vacanayak* is the singular indefinite form, meaning “a word”. Examples in context (from Henderson 2006) are given in (15).

- (15) a. waṅdura kehel malə uḍə-tə pænn-a [Sinhala]  
 monkey banana flower.SG top-DAT jump-PST  
 ‘The monkey jumped on the stalk of bananas.’
- b. mæssa miris karələkə wəhuw-a  
 fly.SG chili.pepper pod.like.thing.SG.IND.LOC land-PST  
 ‘The fly landed on a chili pepper.’
- c. hatu mal narakweela  
 mushroom flower.PL rotten  
 ‘The mushrooms are rotten.’
- d. maṅ laṅgə dehi geḍi tiye-nəwa  
 1SG near lime fruit.PL exist-IMP  
 ‘I have limes.’

The indefinite marker *-ek* is identical to the stem of the numeral “one”, but just like the numerals “two”, “three”, etc., “one” comes in two forms, namely the definite form *ekə* (inanimate) or *ekəna* (animate), and the indefinite form *ekak* (inanimate) or *ekkenek/kenek* (Henderson 2006, with reference to Gair and Paolillo 1997: 22). Thus no reduction of the indefinite article to the numeral “one” is possible. We can account for the reversed markedness strategy adopted by Sinhala along similar lines as the reverse number systems in section 22.3.1.

Suppose Sinhala wants to mark both plural and discourse referentiality (similar to St’át’imcets), but differs from the Salish languages in blocking a general marker of definiteness. This suggests the ranking \*DEF ≫ {F<sub>DR</sub>, F<sub>PL</sub>} ≫ \*FUNCTN ≫ F<sub>DEF</sub>. Strong plural morphology is sufficient to satisfy the faithfulness constraint F<sub>DR</sub> with plural nominals, and the high ranking of \*DEF implies lack of differentiation between definite and indefinite interpretations of the bare plural. Hijacking the numeral “one” as a marker of indefiniteness satisfies F<sub>DR</sub> in the singular domain,

<sup>7</sup> Thanks to Gavin Austin (p.c.) for drawing our attention to the relevance of Sinhala for our analysis. (f. Austin (2008).

Tableau 22.14. Indefinite singular in Sinhala

Meaning $\exists!x$ word(x)	Form	*DEF	FDR	FPL	*FUNCTN	FDEF
■	<i>vacane</i> word		*			*
	<i>vacane.DEF</i> word.DEF	*			*	
Meaning $\exists x$ word(x)	Form					
	<i>vacane</i> word		*			
■	<i>vacanayak</i> word.INDEF				*	

but an overt definite form is blocked by the high ranking of \*DEF. Accordingly, Sinhala reverts to the unmarked bare form to convey definiteness. The paradigm is illustrated in Tableau 22.14.

Summing up, we observe that OT often allows for different choices in setting up constraint systems and in different architectures of the form–meaning correspondence. However, the important thing is that OT is a formal framework in which the different factors that shape grammatical marking can be brought together as sharply formulated constraints on the mapping between meaning and form. More specifically, we have seen how functionally grounded factors in local markedness are not randomly working in a language, but that their influence on the morphosyntax is regulated through the interaction with other constraints, accounting for systematic differences between languages.

## 22.4 GENERIC REFERENCE AND NOMINAL STRUCTURE

In this section, we discuss a possible extension of the analysis developed in section 22.2 to plural nominals conveying generic reference. In languages that allow an extensive use of bare nominals, genericity is frequently conveyed by bare nominals (e.g., Mandarin Chinese, Polish, Hindi, etc.). In languages with elaborate plural morphology and a contrast between definites and indefinites, we observe a striking instance of cross-linguistic variation in the expression of plural genericity. In this section, we will be concerned with languages that rank FPL, FDR and FDEF above \*FUNCTN in the grammar, and which have strong plural morphology, so

that definite plurals contrast with bare plurals.<sup>8</sup> When it comes to the expression of genericity, this class of languages gives rise to two subclasses. One group of languages uses definite generic plurals (Italian, Greek, Hungarian), the other uses bare generic plurals (English, Dutch). Both bare and definite plural generics are found in German, which constitutes an intermediate case.

In line with the literature, in particular Krifka et al. (1995), we distinguish between two types of genericity, namely reference to kinds and generic generalizations. The examples in (16a) and (16b) illustrate that English uses the bare plural in both environments:

- (16) a. Dinosaurs are extinct. [reference to kinds]  
 b. Dogs are dangerous when they are hungry. [generic generalization]

(16a) involves direct reference to kinds, for it is the kind that it extinct. (16b) involves a generic generalization over individual dogs instantiating the kind. Dutch is a language that patterns very similarly to English.

Interestingly, Romance languages such as Spanish, Italian, and Portuguese use definites, rather than bare plurals in both generic environments, as discussed by Longobardi (2001) and illustrated with data from Farkas and de Swart (2007):

- (17) a. Dinosaurii au dispărut. [Romanian]  
 Dinosaur.DEF has disappeared.  
 ‘Dinosaurs are extinct.’  
 b. Ciinii sînt intelegenți.  
 Dog.DEF are intelligent.  
 ‘Dogs are intelligent.’

This is not a typically Romance pattern, though, for Greek and Hungarian also use definite rather than bare plurals to convey genericity, as shown by Farkas and de Swart (2007):

- (18) a. A dinosauruszok kihaltak. [Hungarian]  
 the dinosaur.PL die.OUT.PAST.PL  
 ‘Dinosaurs are extinct.’  
 b. A kutyák veszélyesek mikor éhesek.  
 the dog.PL dangerous.PL when hungry.PL  
 ‘Dogs are dangerous when they are hungry.’

In most languages, there is one designated form for plural generics, either the bare plural, or the definite plural. However, some languages allow both, for instance German:

<sup>8</sup> The restriction to languages with strong plural morphology simplifies the discussion because it allows us to concentrate on bare plurals vs. definite plurals. It is not crucial though, for Farkas and de Swart (2007) show that French (which has weak plural morphology) behaves like Italian, Spanish, and Romanian in using definite plurals to convey genericity.

- (19) a. Die Dinosaurier sind vor ungefähr 65 Millionen Jahren  
 the dinosaurs are before about 65 millions years  
 ausgestorben [German]  
 died.out  
 ‘Dinosaurs died out about 65 million years ago.’
- b. Man weiß nicht genau, warum Dinosaurier ausgestorben sind.  
 One knows not exactly why dinosaurs died.out are  
 ‘We do not quite know why dinosaurs died out.’

The OT typology developed in section 22.2 does not account for the contrast between English and Dutch, on the one hand, Italian, Greek, and Hungarian, on the other hand, nor for the optionality of the definite article in German plural generics, because all these languages adopt the grammar  $\{F_{DEF}, F_{DR}, F_{PL}\} \gg *F_{FUNCTN}$ . In particular, we notice that  $F_{DEF}$  is not decisive in generic environments. Farkas and de Swart (2007, 2009) argue that this constraint is independently satisfied by the generic construction in all the languages involved. Accordingly, we need a more fine-grained distinction between the two groups of languages illustrated in (16)–(18). According to Farkas and de Swart (2007), the semantics of genericity involves two ingredients that impose conflicting demands on the nominal expression. On the one hand, the discourse referent involved in generic plurals is not discourse old, because it ranges over individuals across times and possible worlds. On the other hand, the discourse referent involved in generic plurals is always maximal, because it covers the entire kind, or generalizes over all individuals that satisfy a particular description. The observation that the generic plural is not discourse old (represented as a feature  $[-fam]$  on the discourse referent) militates against the use of a definite article, because familiarity is one of the ingredients of definiteness, as we saw in section 22.2.3 above. However, the fact that the generic plural involves maximal reference (represented as a feature  $[+max]$  on the discourse referent) would favor the use of a definite article, because uniqueness or maximality is another ingredient of definiteness. These conflicting tendencies are captured by the following two constraints:

- $*F_{DEF}/[-FAM]$ : Avoid non-familiar definites
- $MAX_{MAX}$ : reflect maximality features of the referent in the nominal structure

“High familiarity” languages like English and Dutch adopt the ranking  $*F_{DEF}/[-FAM] \gg MAX_{MAX}$ , and use bare plurals to convey genericity. “High maximality” languages like the Romance languages, Greek, and Hungarian adopt the ranking  $MAX_{MAX}$  and use definite generic plurals, as Tableaux 22.15 and 22.16 illustrate.

The input meaning is the same in both tableaux. Along the lines of Krifka et al. (1995), it spells out the semantics of a generic generalization in terms of a generic operator ranging over individual dogs instantiating the kind across times and worlds. In addition, the input specifies the values of the discourse referent concerning the features of maximality and familiarity. The tableaux map this input

Tableau 22.15. "High familiarity" languages use bare plurals to convey genericity (e.g., English)

Meaning Gen <sub>x</sub> (Dog(x_pl), Intellig(x_pl)) [+Max] [-Fam]	Form	*DEF/[-FAM]	MAXMAX
	Dogs are intelligent		*
	The dogs are intelligent	*	

Tableau 22.16. "High maximality" languages use definite generic plurals (e.g., Romanian)

Meaning Gen <sub>x</sub> (Dog(x_pl), Intellig(x_pl)) [+Max] [-Fam]	Form	MAXMAX	*DEF/[-FAM]
	Cîini sînt intelegenți Dog.PL are intelligent	*	
	Cîinii sînt intelegenți Dog.PL.DEF are intelligent		*

onto a number of candidates that crucially vary in article use. The choice between a definite or a bare plural is dictated by the ranking of the two constraints MAXMAX and \*DEF/[-FAM] in the two languages. The same meaning can thus be expressed in two ways, and languages differ in the optimal form they associate with the mixed input of familiarity and maximality that is characteristic of plural generics in generic generalizations. Tableaux 22.15 and 22.16 spell out the optimization process for generic generalizations. The case of plural generic subjects of kind level predicates is similar, because they also involve the feature combination [+max] [-fam].

The optional use of definite articles in the German expression of kind reference illustrated in (19) can be approached in different ways. Either the choice for a definite or a bare plural is bound to a particular regional or dialectal version of German, in which case we are dealing with an instance of micro-variation. We can then postulate two varieties of German, call them German\_bare and German\_def, which have the rankings in Tableaux 22.15 and 22.16 respectively. Alternatively, the alternation could be due to a change in progress, the two versions reflecting an "older" and a "newer" pattern, where the ranking is dependent on the generation of the speaker, or the register of use. Finally, it is possible that the choice between the two forms is free, which could be reflected in a grammar that ranks the two constraints at the same level, as indicated by the dotted line between the two columns in Tableau 22.17.

The decision between the three options requires a more extensive dataset of German dialects and registers of use than we can investigate in this chapter.

Tableau 22.17. Optional use of a definite article in plural generics (e.g., German)

Meaning Dinosaur(x <sub>pl</sub> ) & Extinct(x <sub>pl</sub> ) [+Max] [-Fam]	Form	*DEF/[-FAM]	MAXMAX
	☞ Dinosaurier sind ausgestorben Dinosaurs are extinct		*
	☞ Die Dinosaurier sind ausgestorben The dinosaurs are extinct	*	

Given that MAXMAX and \*DEF/[-FAM] target highly specific ingredients of the semantics of plural definiteness, they immediately become inactive when FDEF and FPL are ranked below \*FUNCTN. As a result, such constraints create subclasses of one of the language groups distinguished in Table 22.1 in section 22.2.4, but they do not complicate the entire typology.

What we can learn from the analysis of cross-linguistic variation in the expression of plural genericity is that the course-grained typological classifications defined in section 22.2 can be refined by looking at subclasses of languages. Thus OT tools can be applied in macro-level typological variation, as well as in meso-level variation (within a family of languages), or even micro-variation (across dialects or diachronic stages of a language). Given that typology and language change are mirror images of each other in space and time, we can also use OT to trace diachronic developments in language, as illustrated by Jäger and Rosenbach (2006).

## 22.5 CONCLUSION

As our point of departure in this chapter, we took the optimization approach developed in Optimality Theory, and applied it to the typology of number morphology and article use. The OT approach provides an alternative to the semantic parameter based theory proposed by Chierchia (1998). Chierchia distinguishes three types of languages on the basis of how common nouns behave as arguments or predicates (proper names are different and will be kept apart here, as in most treatments). In one class of languages (of which Mandarin Chinese is the typical example) every noun is an argument, which means that it does not need article or number marking at all. In another class of languages (of which the Romance languages are the typical examples), every noun is a predicate. This means that a noun can never be used as a subject or object without the support of some sort of marking that



turns this noun into an argument. This marking can be an article but it can also be number marking. Then there are languages that have properties of both. They behave like Mandarin Chinese for one class of nouns and like Romance for another class of nouns. English is an example of such a language. Some nouns can occur without any marking (the mass nouns, (20a)), other nouns need marking by an article or plural suffix (in order to be able to occur in argument position, (20b) and (20b')):

- (20) a. I read literature.  
 b. \*I read book.  
 b'. I read a book/I read the book/I read books.

In this class of languages the count nouns are predicates (like Romance, in need of marking), the mass nouns are arguments (like Chinese, not in need of marking).

What we see here then is a rudimentary scale ranging from languages that have no grammatical marking on nouns to languages that have obligatory marking on all nouns. In the middle are languages that mark only part of the nouns, see Table 22.2. Languages that are both [–argument] and [–predicate] are ruled out because with such a combination nouns would not be able to occur at all.

There are two important differences between Chierchia's parameter-based approach and the OT analysis advanced here. From the comparison of Tables 22.1 and 22.2 it becomes clear that the OT analysis permits a richer inventory of languages, so it has an advantage over Chierchia's proposal, which has been criticized for lack of empirical coverage (Schmitt and Munn 1999). Within the [+argument, +predicate] languages in the middle of Table 22.2, Chierchia distinguishes between languages that have articles (like the Germanic languages) and languages that don't have articles (like the Slavic languages). However, languages with articles are not all alike. Hebrew, for instance, differs from the Germanic languages in having only a definite article, and no indefinite article. As a result, bare singular nouns do occur in Hebrew (example 4), but not in English (example 5). This requires a finer-grained typology, that goes beyond a simple distinction between languages that do and do not have articles, respectively. In a sense, Hebrew is in between Slavic on the left and Germanic on the right. Chierchia leaves open how this linguistic variety

Table 22.2. Chierchia's (1998) Nominal Mapping Parameter approach

+argument	+argument	–argument
–predicate	+predicate	+predicate
Chinese	English	French

should be characterized, but it is clear that languages are not arbitrary in what articles they possess. When a language has only one type of article, then this article is more likely to be definite than indefinite (Dryer 2007), as we have seen above. Also, within the [+predicate] languages finer distinctions need to be made. While French does typically not allow bare nouns at all (in argument position), Italian allows bare plurals and mass nouns in certain argument positions (Longobardi 2001; Chierchia 1998). Both Longobardi and Chierchia explain this difference from a special invisible article in Italian lacking in French. The question is of course why Italian and French would differ in this way and why there is no invisible article for singular count nouns. Although more work needs to be done on the OT typology to provide a more complete description of the rich variation we find in number and article systems across the globe, we think the system proposed in this chapter provides a better starting point for an analysis with a better typological coverage. On the one hand, we can add more constraints to the system developed in section 22.2, as already illustrated in sections 22.3 and 22.4, which allows us to fine-tune the analysis. On the other hand, we observe that constraints interact, whereas the parameters in Table 22.2 are in principle independent of each other. The interaction of constraints is particularly relevant in cases where we observe the “emergence of the unmarked”, as pointed out in various places in section 22.2. For example, the account we have developed of obligatory article use with singular (count) nouns in regular argument position (as illustrated in 5a for English, and 6a for St’át’imcets) extends in a natural way to the felicity of bare nominals in non-referential positions (such as 5b for English, and 6b for St’át’imcets) (cf. Tableau 22.6). Such connections are difficult to build into a parameter-based approach.

A second important difference between the approach advanced by Chierchia (1998) and the OT analysis developed in this chapter concerns the locus of cross-linguistic variation. In Chierchia’s approach the variation between languages is located in the lexicon. It is a property of nouns in French, for instance, that they are [+predicate], i.e., that they always require marking (in argument positions). Given that the variation is located in the lexicon (it is a property of lexical items), the grammar can be universal. By contrast, OT locates universal grammar in the set of constraints. The constraints discussed in this chapter are claimed to be present in the grammar of all languages. However, whether a constraint is actually operative, i.e., has a visible effect in the language depends on its position in the ranking. Referential faithfulness constraints are thus part of the grammar of languages like Mandarin Chinese and Hindi, but their effect is not visible because they are ranked below the general markedness constraint \*FUNCTN. Given that cross-linguistic variation is accounted for by reranking of constraints, as outlined in section 22.2, OT has means to locate typological variation in the grammar. What we need in linguistics is a system that can deal with sources of cross-linguistic variation at

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different levels and of different magnitudes that can deal both with the broad typological patterns, but also with the smaller-scale exceptions that we find within languages and within constructions. It should allow us to integrate various factors in one framework so that we can make more precise hypotheses about the way these factors interact. Optimality Theory, as a general framework for formulating hypotheses about constraint satisfaction and interaction, offers new perspectives to achieve this goal.

