1 *Inferential–realizational morphology*

1.1 Theories of inflectional morphology

In any language exhibiting inflection, each inflected word in a sentence carries a set of morphosyntactic properties; in English, for instance, the verb form *am* in the sentence *I am sure* carries the properties 'first-person singular (1sg) subject agreement', 'present tense', and 'indicative mood'. In very many cases, an inflected word's morphosyntactic properties are associated with specific aspects of its morphology; for instance, the properties of subject agreement, tense, and mood carried by the verb form *likes* in the sentence *She likes reading* are associated with the presence of the suffix *-s*. In recent years, grammatical theorists have devoted considerable attention to the nature of these associations between an inflected word's morphosyntactic properties and its morphology. Nevertheless, these efforts haven't yet led to anything like a consensus in current theories of inflection.

According to LEXICAL theories of inflection, these associations are listed in the lexicon; the affix *-s*, for example, has a lexical entry which specifies its association with the morphosyntactic properties '3sg subject agreement', 'present tense', and 'indicative mood'. Theories of this sort portray the association between an inflectional marking and the set of morphosyntactic properties which it represents as being very much like the association between a lexeme's[1] root and its grammatical and semantic properties. This conception is rejected by INFERENTIAL[2] theories, in which the systematic formal relations between a lexeme's root and the fully inflected word forms constituting its paradigm are expressed by rules or formulas. In theories of this sort, the associations between a word's morphosyntactic properties and its morphology are expressed by the morphological rules which relate that word to its root: the existence of the word *likes*, for instance, is inferred from that of the root *like* by means of a rule associating the appearance of the suffix *-s* with the presence of the properties '3sg subject agreement', 'present tense', and 'indicative mood'.

Crosscutting this distinction between lexical and inferential theories is a second distinction. According to INCREMENTAL theories, inflectional morphology is information-increasing; that is, words acquire morphosyntactic properties only as a concomitant of acquiring the inflectional exponents of those properties. On this view, *likes* acquires the properties '3sg subject agreement', 'present tense', and 'indicative mood' only through the addition of *-s* (whether this is inserted from the lexicon or is introduced by rule). According to REALIZATIONAL theories, by contrast, a word's association with a particular set of morphosyntactic properties licenses the introduction of those properties' inflectional exponents; on this view, the association of the root *like* with the properties '3sg subject agreement', 'present tense', and 'indicative mood' licenses the attachment of the suffix *-s* (whether this attachment is effected by lexical insertion or by the application of a morphological rule).

One can therefore imagine four types of theories of inflectional morphology: lexical–incremental theories, lexical–realizational theories, inferential–incremental theories, and inferential–realizational theories. At present, each of these four types of theories has its proponents.

Lieber (1992) advocates a lexical–incremental theory. In Lieber's theory, an affix's lexical entry is assumed to supply a subcategorization restriction limiting the kinds of contexts into which that affix might be inserted; for instance, the lexical entry of *-s* might be assumed to supply the restriction '[V_{stem} ____]' (= 'combines with a preceding verb stem'). As an affix joins with a stem, the morphosyntactic properties of the resulting whole are computed from those of its parts by a percolation mechanism; thus, *likes* acquires its syntactic category from its stem *like* and acquires the properties '3sg subject agreement', 'present tense', and 'indicative mood' from the suffix *-s*.

The theory of Distributed Morphology proposed by Halle and Marantz (1993) is of the lexical–realizational type. Halle and Marantz assume that rules of syntax construct hierarchical combinations of abstract 'morphemes' (sets of morphosyntactic properties) into which concrete formatives are inserted from the lexicon; in order for a lexically listed formative X to be inserted into a morpheme Y, the set of morphosyntactic properties associated with X must be a subset of those constituting Y. On this view, the syntax is assumed to supply an abstract structure [V Y] (where Y comprises the properties '3sg subject agreement', 'present tense', and 'indicative mood'); *-s* is then insertable into Y because the morphosyntactic properties specified in its lexical entry aren't distinct from those constituting Y.

Steele (1995) advocates an inferential–incremental theory ('Articulated

Morphology'), according to which morphological rules effect changes in both the form and the content of the expressions to which they apply. For instance, *likes* arises by means of a rule applying to verb stems which are unspecified for subject agreement, tense, and mood; the application of this rule to a verb stem X results in (a) the addition of the suffix *-s* to X and (b) the addition of the morphosyntactic properties '3sg subject agreement', 'present tense', and 'indicative mood' to X's property set.

Finally, Word-and-Paradigm theories of inflection (e.g. those proposed by Matthews (1972), Zwicky (1985a), and Anderson (1992)) are of the inferential–realizational type. In inferential–realizational theories, an inflected word's association with a particular set of morphosyntactic properties licenses the application of rules determining the word's inflectional form; *likes*, for example, arises by means of a rule appending *-s* to any verb stem associated with the properties '3sg subject agreement', 'present tense', and 'indicative mood'.

A careful evaluation of morphological evidence suggests that the most adequate theory of inflectional morphology must be inferential rather than lexical, and must be realizational rather than incremental. Numerous independent lines of reasoning converge on this conclusion. In section 1.2, I present two reasons for preferring realizational theories over incremental theories; in section 1.3, I discuss three poorly motivated theoretical distinctions none of which is entailed by inferential–realizational theories of inflection but which are, to varying degrees, inevitably resorted to by lexical theories and incremental theories. In section 1.4, I discuss the very limited interface between morphology and syntax implied by the assumptions of inferential–realizational theories of inflection; although this conception of the morphology–syntax interface is incompatible with the widely held conviction that inflectional affixes sometimes function as independent syntactic objects, it is nevertheless reconcilable with the phenomena that have been taken to justify this conviction, as I show in section 1.5. My conclusions are summarized in section 1.6, where, in anticipation of the next chapter, I outline the distinctive characteristics of the inferential–realizational theory that is the focus of this book: the theory of Paradigm Function Morphology.

1.2 Evidence favouring realizational theories over incremental theories

Two fundamental facts about inflectional morphology favour realizational theories over incremental theories. The first of these is (1):

(1) The morphosyntactic properties associated with an inflected word may exhibit EXTENDED EXPONENCE in that word's morphology.

That is, a given property may be expressed by more than one morphological marking in the same word. Examples are legion: in Breton, the productive pattern of pluralization for diminutive nouns involves double marking (*bagig* 'little boat', pl *bagoùigoù*); in Swahili negative past-tense verb forms, negation is expressed both by the use of the negative past-tense prefix *ku-* and by the negative prefix *ha-* (*tu-li-taka* 'we wanted', but *ha-tu-ku-taka* 'we did not want'); in French, the verb *aller* 'go' has a special suppletive stem *i-* appearing only in the future indicative and the present conditional – yet, *i-* doesn't resist the attachment of *-r(a)*, the suffixal exponent of the future indicative and the present conditional; German *gesprochen* is distinguished as a past participle both by its stem vocalism and by its affixes; and so on.

Realizational theories are fully compatible with the widespread incidence of extended exponence: in realizational theories, there is no expectation that a given morphosyntactic property will be realized by at most one marking per word; on the contrary, the possibility is left open that the same property may induce (or may participate in inducing) the introduction of a number of distinct markings.[3] In incremental theories, by contrast, it is customarily assumed that a given morphosyntactic property has at most one affixal exponent: in the lexical–incremental frameworks of Lieber (1992:77ff.) and Selkirk (1982:74ff.), the percolation mechanism is defined in such a way that an inflected word's morphosyntactic properties are each traceable to at most one affixal exponent; similarly, Steele (1995:280) states that '[b]ecause operations are informationally additive, multiple additions of identical information are precluded' in Articulated Morphology. Thus, incremental theories deny that instances of extended exponence actually arise, and must therefore resort to extraordinary means to accommodate those that do.

Consider, for example, the phenomenon of adjectival preprefixation in Nyanja, a Bantu language of Malawi. In Nyanja, as elsewhere in Bantu, nouns inflect for gender and number by means of noun-class prefixes. Generally, a given gender is associated with a pair <*x*,*y*> of noun classes, such that members of that gender exhibit the class *x* prefix in the singular and the class *y* prefix in the plural. The inventory of these nominal prefixes is given in row A of table 1.1.

The qualifying and concordial prefixes in rows B and C serve to express gender/number agreement. Verbs, for example, inflect for subject agreement by means of the concordial prefixes:

Table 1.1 *Class, qualifying, and concordial prefixes in Nyanja (Price 1958:52f.)*

Class:	1	2	3	4	5	6	7	8	9	10	12	13	14	16	17	18
A. Class prefixes:	*mu*[a]	*a*	*mu*[a]	*mi*	*li*[b]	*ma*	*ci*	*zi*	*n*	*n*	*ka*	*ti*	*u*	*pa*	*ku*	*mu*
B. Qualifying prefixes:	*wa*	*a*	*wa*	*ya*	*la*	*a*	*ca*	*za*	*ya*	*za*	*ka*	*ta*	*wa*	*pa*	*kwa*	*mwa*
C. Concordial prefixes:	*a*	*a*	*u*	*i*	*li*	*a*	*ci*	*zi*	*i*	*zi*	*ka*	*ti*	*u*	*pa*	*ku*	*mu*

Notes:

[a] *mu-* appears as *m-* before polysyllabic, consonant-initial stems.

[b] Many nouns belonging to gender 5/6 lack *li-* in their singular form.

(2) *ci-lombo* *ci-kula*.
CLASS:7-weed CONCORDIAL:7-grow
A weed grows.

Two types of adjectives can be distinguished according to the pattern of agreement marking they exhibit. In adjectives of the first type (*-bwino* 'good', *-cabe* 'no good, useless, bad', *-kale* 'ancient, former, old', *-makono* 'modern, present-day', *-mbili* 'many, much', *-pang'ono* 'few', *-tsopano* 'new'; Price 1958:53), the qualifying prefixes are used to express agreement with a modified noun:

(3) *ci-manga* *ca-bwino*
CLASS:7-maize QUALIFYING:7-good
good maize

In adjectives of the other type (*-fupi* 'short, low', *-kulu* 'large, great, important', *-ng'ono* 'small, young, insignificant', *-tali* 'long, tall, high', *-wisi* 'fresh, sappy, green'; Price 1958:54), agreement with a modified noun is instead encoded by means of two prefixes. The outer prefix is the appropriate qualifying prefix; the inner prefix is the appropriate concordial prefix unless the modified noun belongs to class 1, in which case the inner prefix is the class 1 nominal prefix. The examples in (4) illustrate this doubly prefixed pattern of agreement.

(4) Examples of preprefixation in Nyanja (Bandawe et al. 1965:251f.)

a. *mw-ana* *wa-m-kulu*
CLASS:1-child QUALIFYING:1-CLASS:1-large
a large child

b. *a-ana* *a-a-kulu* (→ *ana akulu*)
CLASS:2-child QUALIFYING:2-CONCORDIAL:2-large
large children

c. *m-sika* *wa-u-kulu*
CLASS:3-market QUALIFYING:3-CONCORDIAL:3-large
a large market

d. *mi-sika* *ya-i-kulu*
CLASS:4-market QUALIFYING:4-CONCORDIAL:4-large
large markets

e. *ci-pewa* *ca-ci-kulu*
CLASS:7-hat QUALIFYING:7-CONCORDIAL:7-large
a large hat

f. *zi-pewa* *za-zi-kulu*
CLASS:8-hat QUALIFYING:8-CONCORDIAL:8-large
large hats

The preprefixal pattern of adjectival inflection in (4) is easily accommodated by realizational theories: in an inferential–realizational theory, for example, one need only assume that a *-kulu*-type adjective's properties of gender and number induce the application of two successive prefixation rules;[4] in Distributed Morphology, one need only assume that a *-kulu*-type adjective's properties of gender and number are shared by two prefixal morphemes. Incremental theories, by contrast, furnish no ready account of the preprefixal pattern in (4). In lexical–incremental theories, for example, it is not obvious how one might rig the lexical entries of the qualifying prefix *ca-* and the concordial prefix *ci-* so as to guarantee the appearance of both prefixes in *ca-ci-kulu* 'large' (cf. (4e)): given that the two prefixes encode exactly the same morphosyntactic properties, the presence of *ca-* cannot be motivated by the need to specify some morphosyntactic feature or other; and given that *ci-* appears independently of *ca-* in some contexts (e.g. (2)), one cannot account for the presence of *ca-* by assuming that *ci*-prefixed forms are by stipulation bound. For analogous reasons, it is equally unclear how the appearance of both prefixes in *ca-ci-kulu* might be credibly guaranteed in inferential–incremental theories.[5]

A second fundamental fact about inflectional morphology which favours realizational theories over incremental theories is (5):

(5) The morphosyntactic properties associated with an inflected word's individual inflectional markings may underdetermine the properties associated with the word as a whole.

Realizational theories are inherently compatible with this fact. In a theory of this sort, it is a word's association with a particular set of morphosyntactic properties that determines the manner in which that word is inflected (whether this inflection is effected by morphological rules or by lexical insertion); nothing excludes the possibility that the inflectional markings determined by a word's set of morphosyntactic properties may simply fail to realize some of the properties in that set. Incremental theories, by contrast, rest on the presumption that as an inflected word's form arises from that of its root (whether through the insertion of lexically listed affixes or through the application of morphological rules), the word's morphosyntactic properties are, in a parallel fashion, assembled from those associated with its individual inflectional markings (whether this association is encoded lexically or in rules). On this assumption, an inflected word's morphosyntactic properties are necessarily deducible from the properties

Table 1.2 *Imperfect and aorist forms of the Bulgarian verb* KRAD *'steal'*

	IMPERFECT	AORIST
1SG	*krad-'á-x*	*krád-o-x*
2SG	*krad-é-š-e*	*krád-e*
3SG	*krad-é-š-e*	*krád-e*
1PL	*krad-'á-x-me*	*krád-o-x-me*
2PL	*krad-'á-x-te*	*krád-o-x-te*
3PL	*krad-'á-x-a*	*krád-o-x-a*

associated with its individual inflectional markings. Thus, incremental theories deny that a word's form might underdetermine its morphosyntactic properties, and must therefore resort to extraordinary means to cope with observed instances of underdetermination.

Consider, for example, the imperfect and aorist paradigms of the Bulgarian verb *krad-* 'steal' in table 1.2.

In the inflection of Bulgarian verbs, the preterite suffix *-x* appears by default in imperfect and aorist forms such as those in table 1.2. (Before a front vowel, *-x* is palatalized to *-š*, as in the 2sg and 3sg imperfect forms; the appearance of a front vowel in the following syllable likewise causes the imperfect suffix *-'á* to be realized as *-é* in these two forms.)[6] In the 3sg aorist form, however, both the preterite suffix and the aorist suffix *-o* fail to appear; and since the 2sg forms in these paradigms are regularly syncretized with the corresponding 3sg forms, the preterite and aorist suffixes likewise fail to appear in the 2sg aorist form. The question here is: what guarantees the association between imperfect *krad'áx* or aorist *krádox* and the morphosyntactic property '1sg subject agreement', given that neither form has any overt exponent of 1sg subject agreement? Proponents of incremental theories might argue that first-person singular is the default person/number combination in Bulgarian, hence that *krad'áx* and *krádox* are associated with the property '1sg subject agreement' because there is nothing overriding that association; but this ad hoc assumption would not be obviously reconcilable with the unsurprising fact that the third person singular (neuter) functions as the default person/number(/gender) combination with respect to a range of syntactic phenomena (Scatton 1984:343ff.). The only way out of this dilemma for proponents of incremental theories is to assume that *krad'áx* and *krádox* acquire the property '1sg subject agreement' from a zero suffix (or, in inferential terms, from a rule effecting no

change in form). Realizational theories, by contrast, require nothing so exotic to account for these facts; one need only assume that the inflectional markings determined by the morphosyntactic properties of *krad'áx* and *krádox* happen not to include any realization of the property '1sg subject agreement'.

1.3 Minimizing unmotivated theoretical distinctions in inflectional morphology

A theory of inflectional morphology must be preferred to the extent that it minimizes any dependence on theoretical distinctions which are not empirically motivated. To varying degrees, lexical theories and incremental theories rest upon distinctions which cannot be convincingly motivated. Since inferential–realizational theories do not entail these distinctions, they must to that extent be preferred. Three such distinctions are at issue here.

The first of these is the distinction between concatenative and nonconcatenative inflection. In their theory of Distributed Morphology, Halle and Marantz maintain a strict separation between the means by which affixational markings are introduced (namely lexical insertion) and the means by which nonconcatenative markings are introduced (through the operation of a battery of 'readjustment rules'); but although concatenative and nonconcatenative inflection differ in their phonological expression, there is no convincing basis for assuming that they perform different functions or occupy different positions in the architecture of a language's morphology; there is, in other words, no empirical obstacle to the assumption in (6).[7]

(6) There is no theoretically significant difference between concatenative and nonconcatenative inflection.

Thus, in inferential theories, the morphological rule associated with a given set of morphosyntactic properties may be either affixational or nonconcatenative; the difference between affixational rules and nonconcatenative rules has no theoretical importance. Lieber's lexical–incremental theory is likewise intended to incorporate assumption (6): Lieber's contention is that the principles of autosegmental phonology and prosodic morphology always make it possible to reduce apparently nonconcatenative inflection to affixal inflection (Lieber 1992:165ff.).

According to assumption (6), concatenative and nonconcatenative markings should be able to enter into direct competition. In an inferential–realizational theory, for example, the fact that the default rule of *-ed*

suffixation doesn't apply in past-tense forms such as *sang*, *drank*, and *swam* can be directly attributed to the existence of a rule of *i/a* substitution, which is like the rule of *-ed* suffixation in expressing the property 'past tense': being the more narrowly applicable of the two rules, *i/a* substitution overrides *-ed* suffixation, in accordance with Pāṇini's principle. Because they reject assumption (6), Halle and Marantz (1993) must resort to a very different account of the complementarity of *i/a* substitution and *-ed* suffixation. They assume (pp.126ff.) that *sang* carries an empty past-tense suffix which competes with the default past-tense suffix *-ed* for insertion into the same abstract morpheme and which, in some verbs, triggers a rule of vowel readjustment; on the assumption that this empty suffix subcategorizes for a narrower class of verbs than *-ed*, Pāṇini's principle predicts that the former suffix should prevail in instances in which it competes with *-ed*. By this logic, though, one must likewise assume that *men* carries an empty plural suffix which overrides the default plural suffix *-s* and which, in some nouns, triggers a rule of vowel readjustment; that Breton *mein* 'stones' (sg *maen*) carries an empty plural suffix which overrides the default plural suffix *-où* and which triggers vowel readjustment; that German *darf* 'is permitted' (inf. *dürfen*) carries an empty 3sg present indicative suffix which overrides the default 3sg present indicative suffix *-t* and which triggers vowel readjustment; that Sanskrit *śatrāu* 'enemy (loc sg)' (stem *śatru-*) carries an empty locative singular suffix which overrides the default locative singular suffix *-i* and which triggers vowel readjustment; and so on. What emerges is a grand coincidence: again and again, both within and across languages, a default affix is overridden by an empty affix whose presence triggers a readjustment rule; this recurrent pattern is portrayed not as the consequence of any overarching principle, but as the accidental effect of innumerable piecemeal stipulations in the lexicon of one language after another. If one searched the languages of the world for a class of overt and phonologically identical affixes having the same sort of distribution that Halle and Marantz must logically attribute to their proposed class of empty affixes, one would inevitably come back empty-handed.

A second poorly motivated distinction in inflectional morphology is the distinction which is sometimes drawn between properties of content and properties of context. Lexical theories make it possible to associate an affix with a morphosyntactic property in two different ways: a given property may, on the one hand, serve as part of an affix's content; on the other hand, it may serve as part of an affix's subcategorization restriction, limiting the range of contexts into which that affix may be inserted. A similar distinction