THE REPEATED MORPH CONSTRAINT: TOWARD AN EXPLANATION

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Many languages use haplology, suppletion, and the blocking of derivations to achieve avoidance of 'accidental' repetition of surface morphs. At the same time, many languages permit accidental repetition and even encourage 'deliberate' repetition through redupli-cation. Strong universal constraints against morph repetition therefore fail. This fur-thermore implies the inadequacy of accounts of morphological processes in terms of matching templates or schemas. We present a psycholinguistic processing model built on evidence from language acquisition, and drawing on activation theory, which affords a unification of the linguistic data while allowing for their variety.

INTRODUCTION

1. The existence of a general, yet violable, constraint against 'accidental' repetition of a morph has received extensive discussion in recent work on morphology (Dressler 1977, George 1980, Linell 1976, Radford 1977, Stem-berger 1981, Zwicky 1969, 1982, Zwicky & Pullum 1983).[1] The languages of the world frequently show evidence of conspiracies to avoid the 'accidental' repetition of phoneme strings across morphs. These conspiracies are intriguing, since many languages also use the contrary strategy of reduplication—which deliberately repeats material within morphs (Moravcsik 1977, Wilbur 1973) in order to mark certain grammatical contrasts, achieve emphasis, and express relations iconically. Thus we see languages formally sanctioning the 'deliberate' repetition of all or part of a morph, even while going out of their way to prohibit 'accidental' repetition.

We will argue that a proper account of the prohibition against accidental repetition follows from three claims: (a) that accidental morph repetition creates some inconvenience for language processing; (b) that the set of logically pos-sible responses to this inconvenience can be ordered with respect to the amount of information that each requires the production mechanism to consider; and (c) that each language's choice of a response to this inconvenience is part of the grammar of that language. The resulting account of the prohibition of ac-cidental repetition displays the roles both of psycholinguistic constructs (pro-cessing mechanisms) and of purely linguistic constructs (grammatical rules).

Our model is derived from MacWhinney's 1978 work on the acquisition of morphophonology. A central aspect of his model is the claim that, when a message requires an inflected or derived form, it is sometimes retrieved from the lexicon as an unmarked base form, but at other times is retrieved with the needed morphological markers already present. (By 'lexicon', we mean the 'mental lexicon', the collection of stored phonological information upon which the speaker draws in the production of a word; this should not be identified with the lexicon proposed by any particular theory of phonology or syntax.)

This dual system for production of inflections requires a process which checks for the presence of inflectional markers in the output to the early levels of the articulatory mechanism. In MacWhinney's model, this process is called 'affix-checking'. The psychological justification for the assumption that morphological markers are sometimes added during production is primarily based on 'slip of the tongue' and aphasic errors (Fromkin 1971, Garrett 1982, Menn et al. 1982), in which inflectional morphemes appear to be part of the grammatical framework of the sentence, whereas lexical items are retrieved separately and then fitted into that framework. The claim that morphologically marked forms may also be retrieved 'whole', and that affix-checking is required, is justified by the fact that these statements, taken together, can account for a variety of over-marking and under-marking phenomena in child language acquisition. These include the fact that irregular forms which 'sound as if they carry a regular inflection' tend to be acquired earlier than irregular forms which do not end in the same sounds as the regular inflectional morpheme in question. These acquisition phenomena, when interpreted according to our model, yield the adult pattern as an eventual developmental endpoint. We offer the whole enterprise as an example of how psycholinguistic considerations can strengthen the bridge between developmental and adult linguistics.

1.1. OVERVIEW OF THE MORPHOLOGICAL DATA. As noted by Zwicky 1969, a grammar can use three morphological strategies to eliminate accidental repetition of a morph or part of a morph: deletion or non-addition (haplology), avoidance (blocking of derivation), and suppletion. The operation of purely phonological rules may also 'fortuitously' preclude the appearance of certain potential sequences of identical (or near-identical) morphs. Finally, the language may simply allow some such sequences to occur. This indicates that the processing difficulty which we have postulated as a explanation for these grammatical irregularities is not insurmountable.

1.2. PREVIOUS ACCOUNTS. Linell (21) proposes an account of haplology which is based on the assumption that adult speakers are using templates or schemas rather than morphological rules:

> 'there is plenty of evidence that languages strive for matching certain canonical [surface] patterns for the various morphological categories rather than deriving the forms by simply adding some invariant material to the input forms of the corresponding morphological operations.'

The usefulness of such schemas in accounting for patterns of acquisition of English vowel-changing past tenses has been demonstrated by Bybee & Slobin

1982; however, we will show that a schema-based model can account only for part of the observed affixation behavior of children and adults.

Our analysis is somewhat closer in spirit to that of Stemberger 1982; we propose a specific process model for the operation of what he calls 'ambi-morphemicness', but with a different explanatory basis.[2] The notions of schema, template, and ambimorphemic representation can all be expressed in a model that also explicitly represents rules and item-specific learning.

It might be argued that all the phenomena here can be unified linguistically, since the rules are motivated by the output constraint, even though not determined by it. We argue, on the contrary, that to talk of the motivation of rules is to talk psycholinguistics in disguise. Rules cannot be motivated; only speakers can. Motivation of a rule, to the extent that we allow ourselves the metaphor, makes sense only as a diachronic notion. It does so in two ways: in the history of the language, and in the history of the individual's mastery of the language.

In the history of a language, the repeated morph constraint might have played a role at the time an allomorphy was being created: individuals must then have had choices between the forms to use, and the constraint could have motivated the choice made. Again, in the history of the individual, haplologized and suppletive forms (like other irregularities) must be learned; but it is easier to resist the tendency to over-regularize them where the repeated morph constraint applies, as will be seen below.

We note at the outset that MacWhinney's psycholinguistic model is not economical in the sense required by most linguistic theorists, since it assumes that many morphologically marked forms are entered in the lexicon and ALSO derived in real time. But a psycholinguistically coherent account of linguistically incoherent data can be given by allowing this redundant formulation, and this justifies our extra-grammatical explanation for this weak grammatical universal.

THE ADULT PATTERN

2. Let us look in detail at the ways that languages avoid accidental repetition. In the data below, published sources are indicated in parentheses; the names of colleagues who provided references or first-hand data are given in brackets.

2.1. OMISSION has two sub-cases: (a) non-addition or deletion of a morph that 'accidentally' repeats the end of the preceding stem (stem-end haplology), and (b) merger of two sequential homophonous affixes into a single morph (affix haplology). Examples of the first of these strategies are given below.

  (1) Stem boundary plus inflectional affix.
      a. Spanish: pl. -es is omitted with nouns ending in unstressed vowel + s, e.g. lunes 'Monday(s)'; obligatory (Linell, Stemberger,) [Pizzini, Rojas, Bybee].
      b. Swedish: non-neuter def. -en is omitted; obligatory after certain derived /Vn/ noun endings, optional in some instances, does not operate in still others (Linell, Stemberger).

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[2] References to MacWhinney 1974, 1978 include references to the review of the literature found in those reports.

    c. Swedish: pl. *-er*, *-ar* are omitted with stems ending in *er*, *are*; optional (Stemberger).

    d. Swedish: verb pres. stem marker *-r* is omitted with verb stems ending in *r*; optional (Linell, Stemberger).

    e. Swedish: poss. *-s* is omitted with noun stems ending in *s*; obligatory (Linell, Stemberger).

    f. Swedish: collective *-s* is omitted after a noun (personal family name) ending in *s* (Stemberger).

    g. Manchu: past participle marker /-hV/ is omitted with stems ending in /hV/; optional in some cases, obligatory in others (Stemberger).

    h. Old Provençal: lsg. *-i* is omitted after 2nd conj. perf. indic. stems with stem vowel *-i-* (Platt 1981).

    i. English: Latin Ø-marked plural is preserved in *species*; various treatments of other *s*-final Latin or Greek loanwords, e.g. *series*; *parenthesis, analysis*; *cyclops, biceps* (Stemberger).

    j. Mono (may be an isolated instance); 'with my left hand' is /i-tiohinawa/ from /i/ 'my' + /tiohi/ 'left' + /nawa/ 'side' + /wa/ 'with' [Stemberger].

(2) Stem boundary plus clitic.

    English: poss. /s, z, əz/ is omitted after certain sibilant-final names (see also 7b, below); optional.

(3) Stem boundary plus derivational affix.

    a. Russian: stems (proper names?) ending in fossilized gen. pl. *-ov* + verb-deriving *-ovat'* yield *-ovat'* instead of expected *-ovovat'*; obligatory (Aronoff 1974).

    b. German: in noun stem-end *er* + agentive *-er*, omission occurs only when another derivational morpheme, e.g. the feminine, follows the agentive; native speakers disagree about particular instances (Dressler,) [Hock].

    c. German: noun denoting physical substance with noun stem in *-en* + adjective-forming *-en*, denoting composition by that substance, drop the stem *-en*, e.g. *Leinen* 'linen', *leinen* 'made of linen'. This also happens to *-en* under partial identity with the *-ern* variant of the affix, e.g. *Eisen* 'iron', *eisern* 'made of iron' (Dressler).

    d. Albanian: in number names, stem-end *të* + ordinal-forming *-të* is reduced (Stemberger).

    e. Avestan: /amr̥ta/ 'immortal' + /-tat-/ nominalizer drops the duplicated segments, giving /amr̥tat/ 'immortality' [Hock] (cf. Grammont 1895).

The merger of two essentially identical affixes or clitic morphs into one ambimorphemic form is probably an even more widespread linguistic phenomenon, operating regularly even in languages where there are no stem-end haplologies in the adult grammar. Data include the following:

(4) Two inflectional prefixes.

    a. Swahili: *ku-* 'past' neg. + *ku-*, infinitive marker for monosyllabic stems; obligatory [Mould].

    b. Classical Greek: verb prefix ('augment') past *e-* + *e-* 'perfect' on stems beginning with certain consonant clusters, the combination marking pluperfect for those verbs; obligatory (Stemberger).

(5) Two inflectional suffixes.

    a. English (real and nonce forms, experiments by Stemberger): nouns with apparent frozen prog. *-ing*, used as Ø-derived verbs, + progressive *-ing*; obligatory.

    b. English: pl. *-s* repeated, e.g. *Beatles* + pl.; also lexicalized possessive followed by plural, e.g. *McDonald's*; optional (Stemberger 1981:794–5).

    c. English (nonce forms, experiments by Stemberger): lexicalized nouns containing poss. /s, z/, used as Ø-derived verbs, + 3sg. pres. /-s, -z, -əz/, e.g. *John McDonald's it at two McDonald's every night*; obligatory.

    d. Turkish: noun pl. /-lVr/ + pl. poss. /-lVr/; obligatory (Lewis 1975), [Boyce].

    e. Turkish: /-sV/ 'possessed' is not repeated in nested possessive constructions; obligatory (Lewis,) [Boyce].

    f. Northern Paiute: /-ki/ 'causative' + /-ki/ 'benefactive'; obligatory [Stemberger].

(6) Prefixal inflection after clitic.
   Luganda: preposition *mu* 'in' + noun class prefix *mu-* [Mould].
(7) Suffixal inflection before clitic.
   a. Mandarin Chinese: perfective *-le* + particle *le* marking 'new situation'; obligatory
      (Radford, citing Chao 1968).
   b. English: regular pl. /-s, -z, -əz/ + possessive clitic of the same shape; obligatory.
(8) Inflectional plus derivational suffix.
   a. Swedish: agentive *-er, -are* + *-er, -ar* pl. (Stemberger).
   b. Mandarin: adjective nominalizer *-de* + poss. *-de* (Stemberger, from Chao).
   c. Sanskrit: 'morpheme of the shape *-ya*' + instr. *-ya* (Stemberger, from Cardona 1968).
(9) Two clitics.
   a. Navajo: the locative clitic *di* (and others) repeated on complementizer, first with func-
      tion in underlying lower clause, then with function in upper clause (Kaufman, see
      below), [Hale].
   b. French: definite article *le* in its usual function + *le* as marker of superlative, when
      superlative stands before noun (Radford).
   c. Polish: reflexive clitic *sie* required by verb of, e.g., mental state + *sie* required by
      embedded verb (Radford).
   d. French: *de* partitive + *de* preposition 'of'; obligatory (Stemberger, Radford).
   e. Japanese: *to* 'with' when iterated in nested constructions (but the sequence *to to ga*
      'is reinterpreted as *to toga* and comes to be regarded as a sequence of two different
      particles' (Kuno 1973).
(10) Free grammatical morpheme plus clitic.
   Japanese: pronoun *no* 'one' + enclitic *no* possessive marker (Radford, Kuno).
(11) Two free grammatical morphemes.
   a. Spanish: repetition of complementizer *que*; some exceptions? [Pizzini].
   b. Swedish: repetition of *som* 'like, as, that' (Radford).
   c. French: sequence of *que* comparative + *que* complementizer (Radford).
(12) Two derivational affixes.
   a. English: adjective-forming *-ly* + adverb-forming *-ly* with nouns denoting periods of
      time (Zwicky & Pullum).
   b. Russian: adjective-forming *-sk*, fixed in place names, + *-sk-* denoting inhabitant of
      geographical area (Aronoff).

To expand on some of the above data, note that English (7b, above) can mark both genitive and plural with identical sibilant morphs, so we have this distributional paradigm:

(13) | SG. | GEN. SG. | PL. | GEN. PL. |
|---|---|---|---|
| girl | girl/z/ | girl/z/ | girl/z/ (*girl/zəz/) |
| woman | woman/z/ | women | women/z/ |

Here the gen. pl. of *girl* bears only a single case/number marker, while that of *woman* bears two.

Two parallel examples of affix haplology may be taken from Turkish, in which a suffix occurs on the word denoting a thing possessed. Thus *kitab* is 'book'; 'his book' is *kitab+i*. If an object is possessed by more than one owner, pl. *-lar, -ler* is inserted: 'their book' is *kitab+lar+i*.

The same *-lar, -ler* (depending on vowel harmony) also indicates a plural number of objects: 'books' is *kitab+lar*, and 'his books' is again *kitablari*. According to this pattern, one would expect that 'their books' would require two plural markers; but *kitablari*, rather than **kitablarlari*, is used for 'their books' as well as for 'his books' and 'their book'. In other words, when two instances of *lar* are called for, they are merged into a single surface morph.

Another Turkish example: if nested possession occurs, the two 'possessed'

markers cannot appear on the same word. That is, one cannot get reduplication of the -si allomorph of the 3sg. 'possessed' suffix:

(14) *Ankara lisesi* 'Ankara lycée-of' (Ankara lycée)
 kɨz lisesi 'girls lycée-of' (girls' lycée)
 Ankara kɨz lisesi 'Ankara (girls lycée-of)-of' (Ankara girls' lycée)

We do not find *Ankara kɨz lisesisi*. In effect, the two occurrences of poss. -si, expected from the paradigm, are merged.

A fourth example of haplology comes from Navajo, where, as Kaufman (1974:522–3) has shown, a clitic-raising rule is involved in the formation of embedded clauses. Consider these sentences:

(15) *Jáan   deeyáhí-góó   adeesbạs   nisin.*
 John   3.go.COMP-to   1.F.drive   1.want
   'I want to drive to where John is going.'
(16) *Dá'ák'eh-góó   adeesbạs.*
 field-to   1.F.drive
   'I will drive to the field.'

In 15, a locative clitic *góó,* which originates in the underlying lower clause 'John is going there', moves up and attaches to a complementizer, yielding the form translated 'where'. However, there is also a source for *góó* in the upper clause, as may be seen in 16; yet only one -*góó* appears on the surface. Functions other than location are also marked by clitics, and many combinations of two clitics, one from the main-clause verb and one from the embedded sentence, are permitted, but when two clitics appear, they must be different. Kaufman formulates the rule explicitly: 'When there are two identical adjacent clitics, delete one.'

Aronoff notes a case (from Isačenko 1972) where Russian neatly distinguishes stem-end repetition, which it allows, from affix repetition, which is not permitted for the affix in question. From the nationality name *bask* 'Basque', the adjective *baskski* is formed regularly; however, the city name *Tomsk* is derived from the river *Tom,* and the adjective meaning 'pertaining to Tomsk' is *tomski,* not **tomskski*. Dressler 1977 cites the attempt of Grammont to deal with this phenomenon in phonological terms, as 'syllabic superposition'—a notion which anticipates Stemberger's ambimorphemic merger, though on a lower level.

2.2. AVOIDANCE is another strategy for elimination of accidental repetition of segment strings. English adverb formation provides a well-known example. The suffix -*ly,* which regularly forms adverbs from adjectives, cannot be used after the -*ly* which forms adjectives from nouns; indeed, it cannot be used even if the adjective in -*ly* has no noun as its base:

(17) *man   manly   *manlily   ugly   *uglily*
 boy   boyish   boyishly   pretty   prettily
      likely   *likelily   probable   probably

For many speakers, the non-existence of forms such as **likelily* forces them to use synonyms, or to avoid sentences in which they might occur. However, many speakers use *likely* as an adverb, as in *She will likely come tomorrow*. These speakers are using haplology, instead of circumlocutions with words such as *probably*; for them, the -*ly* of *likely* is ambimorphemic. Zwicky &

Pullum show that some toleration of double -*ly* exists; they cite *sillily, surlily*, and a few other cases under the heading of 'lily words'.

Full data are as follows:

(18) Stem boundary plus inflectional affix: none found.

(19) Stem boundary plus clitic.

English: poss. clitic /s, z, əz/ is disfavored and replaced by periphrastic poss. *of* with sibilant-final derived nouns, e.g. *mathematics*; optional.

(20) Stem boundary plus derivational affix.

a. English: nouns ending in string *ish* + adjective-forming -*ish*; obligatory.

b. German: nouns ending in string *isch* + adjective-forming -*isch*; obligatory (Dressler).

c. German: nouns ending in string *ig* + adjective-forming -*ig*; obligatory (Dressler).

d. German: same conditions as 3c (Dressler).

(21) Two inflectional affixes.

English: sequence of verbs both ending with the present progressive -*ing*, under complex circumstances; note that these are non-adjacent! (Ross 1972).

(22) Inflectional affix plus clitic: none found.

(23) Inflectional plus derivational affix: none found.

(24) Two clitics.

a. French: repeated non-nominative clitics blocked as part of a more general constraint on clitic sequences (Perlmutter 1970).

b. Spanish: some repeated clitics blocked as part of a more general constraint on clitic sequences (Perlmutter).

c. Pashto: sequences of identical pronominal and/or modal clitics /de/, /me/, /am/, /mo/, /ye/; suppletion and phonological treatments of /am/, /mo/ in various circumstances (Tegey 1975,) [Kisseberth].

(25) Free grammatical morpheme plus clitic.

Turkish (example disputed by our Turkish consultant, Engin Sezer; true at some time?): pronoun *siz* 'you' plus enclitic preposition *siz* 'without' (Lewis).

(26) Two free grammatical morphemes.

a. English: sequences of *who who, which which*, e.g. interrogative + relative (Zwicky & Pullum).

b. English: some sequences of *more more* (Radford).

c. English: sequences of *on on* and other repeated prepositions (Radford).

(27) Two derivational prefixes.

English: *un-* cannot be attached to a word already beginning with that prefix (Aitchison & Bailey 1979).

(28) Two derivational suffixes.

English: adjective-forming -*ly* + adverb-forming -*ly*; derivation is blocked, with few exceptions (Zwicky & Pullum).

(29) Lexical morpheme plus grammatical free morpheme.

French: *aller* 'future tense marker' and *aller* 'to go' are not used just in case the stem allomorphs are the same; this verb has suppletion within its paradigm in both these grammatical functions (Zwicky & Pullum).

2.3. SUPPLETION is still another solution to the accidental duplication problem. This occurs with clitic allomorphy like the Spanish 'spurious *se*' rule (cf. Perlmutter), which is usually described as changing to *se* the first clitic in the sequence **le lo* (and the other possible sequences where a dative 3rd person clitic is followed by an accusative 3rd person clitic). Repetition of the clitic is not complete in these sequences, but all the morphs involved are monosyllables beginning with *l*.

Full data are as follows:

(30) Stem boundary plus inflectional prefix.

Tswana: /ke-/ becomes /ng-/ before stems beginning with /k/ (Cole 1955).

(31) Stem boundary plus inflectional suffix.
    a. Hungarian: /-Vs/ becomes /-Vl/ for noun stems ending in /Vs/.
    b. Turkish: passive /-Vl/ is replaced by reflexive /-Vn/ when a verb stem ends in /l/ or a vowel (Lewis).
(32) Stem boundary plus clitic: none found.
(33) Stem boundary plus derivational affix.
    a. Latin: after noun stem containing *l*, the adjective-forming *-alis* is replaced by *-aris*, with some exceptions (*aes* 'bronze', gen. *aeris,* adj. *aeraris*) (Watkins 1970; actually, this is not a 'boundary' example, since the *l* may appear anywhere in the stem).
    b. German: after a noun stem ending in *l*, or containing this segment toward the end of the word, the diminutive affix *-chen* is used instead of *-lein*; some exceptions (Dressler).
(34) Two inflectional prefixes.
    Tswana: 1sg. subject /ke-/ before mood prefix /ka-/ is replaced by /ng-/; cf. ex. 30 (Cole).
(35) Two inflectional suffixes.
    a. Ngarluma: when accusative /-ku/ is repeated (it is attached to all words in a relative clause which modifies an accusative noun), the first acc. /-ku/ or acc. /-yi/ is replaced by /-kapu/ [Hale,] (see below).
    b. Swedish: in neuter pl. *-n* + neuter def. pl. *-en*, the *-en* is replaced by *-a*; obligatory (Stemberger).
(36) Inflectional affix plus clitic.
    Aghem: the associative proclitic, used to mark a possessive relation between two nouns, is essentially the same as the class prefix of the first (possessed) noun. If both nouns are of class 7, /kɨ́/ + /kɨ́-/ is replaced obligatorily by /ká/; if both are of class 4 or 5, /é/ + /é/ becomes /zé/; if both are of class 2 or 6, /á/ + /á/ is replaced by /ghɔ́/ under certain conditions. Similar replacements are found with some other combinations, e.g. /é/ + /á/ becomes /zá/. Cf. ex. 48, below, for tolerance of repetition in this construction (Hyman 1979).
(37) Inflectional plus derivational affix: none found.
(38) Two clitics.
    a. Spanish (spurious *se* rule): a sequence of indirect and direct object 3rd person proclitics, *le lo* etc., becomes *se lo*. Obligatory: reported to have an omission variant (Perlmutter).
    b. Italian: the 2pl. proclitic and the locative proclitic both have alternating forms *ci, vi*; if both morphemes are present, the surface morph sequence is *ci vi* [Miceli].
    c. Serbo-Croatian: the 3rd person fem. acc. proclitic *je*, before the 3sg. form of past tense auxiliary *je*, becomes *ju* (Radford,) [S. Menn].
    d. Italian: the 3rd person dative proclitics *lo, la* become *glie* before accusative clitics beginning with *l* (Radford,) [Miceli].
    e. Tagalog: sequence of proclitics *ko* + *ka* is replaced by suppletive form *kita* (Zwicky 1982, from Schachter 1974).
    f. Rumanian: 3pl. non-reflexive dative proclitic *le* ~ *li* becomes *ii* → *i* when followed by the 3pl. non-reflexive fem. acc. proclitic *li* (Radford).
    g. Albanian: ind. obj. pron. *i* + dir. obj. pron. *i* becomes /jau/ [Morgan].
    h. Pashto (western/literary): sequence of 1sg. clitics */mo mo/ becomes /am mo/ (Tegey 1975).
(39) Free grammatical morpheme plus clitic: none found.
(40) Two free grammatical morphemes.
    German: two comparative morphemes *als* become sequence *denn als* (Radford).
(41) Two derivational affixes.
    a. French (rule more general then needed to prevent repetition): adverb-forming *-ment* is not added to participial adjectives in *-ant*, but to an alternative stem in *-a-* or other alternative stems [S. Menn].
    b. Turkish: the causative suffix has two forms, /-dVr/ and /-t/; in double causative constructions, one of each form is used (Lewis).

(42) Lexical morpheme plus grammatical free morpheme.
      Italian: local superlative construction, as in *il migliore tra N* 'the best among N', be-
        comes *il migliore fra tre* when N is 'three' (*il migliore tra tre*) [Miceli].

The alternations in Italian between clitics *ci* and *vi*, and in Serbo-Croatian between clitics *je* and *ju,* are similar to the Spanish case. These alternations are conditioned by the presence of an identical clitic in the same phonological word, and the suppletive form is used in precisely those instances where morph reduplication would occur.

However, in some cases suppletion applies more generally, blocking morph repetition and also applying to cases where repetition could not occur. An example of such broad-brush suppletion comes from an Australian language described to us by Ken Hale. In Ngarluma, if a relative clause modifies the object of the upper sentence, every word in the relative clause must bear the accusative marker /-ku/. However, if a word in the embedded sentence is already an object, it does not get two /-ku/ markers. Instead, a different allomorph of the accusative marker, /-kapu/, is attached to the word; then the /-ku/ is added to it and to all the other words in the embedded sentence. For example, /mangkurla/ is 'child'. In 'The dog bit the child', 'child' appears as /mangkurla-ku/; but if this sentence is embedded, as in 'I saw the dog that bit the child', then 'child' appears as /mangkurla-kapu-ku/. But only words of at least three syllables take /-ku/ as an accusative marker; shorter words, e.g. /-warlu/ 'snake', take /-yi/. Nevertheless, if 'snake' is embedded, as in 'I saw the dog that bit the snake', it appears with the special /-kapu/ form: /warlu-kapu-ku/, not */warlu-yi-ku/. Finally, note that /-ku/ can be added to other morphemes without changing them. For example, there is a locative agent suffix /-la/, and if /mangkurla-la/ is in a relative clause modifying an object, it will appear as /mangkurla-la-ku/.

Hungarian provides a slightly different illustration of a suppletive alternation that applies to a broader class of cases than would be necessary to avoid morph repetition. The 2sg. pres. indef. indic. suffix *-asz, -esz, -sz* has a set of suppletive allomorphs *-ol, -el, -öl* which are used when a verb stem ends in a sibilant; thus **mász + -asz* is replaced by *mászol* 'you climb'. Again, *-ol-* is used to convert **olvasasz* into *olvasol* 'you read', where the repetition would have been only approximate.

Data from Pashto (which are challenging to clitic theory on several counts; see Tegey 1975, 1977) show a borderline area where the distinction between strategies of avoidance and suppletion turns on the definition of 'allomorph'. Blocked repetitive clitic sequences of two personal pronouns are replaced by locutions which, Tegey states (1975:164), 'utilize the strong pronoun and one clitic rather than two clitics'. For example, we would expect

(43) */wror   me me wahi/ 'My brother is hitting me.'
      brother 2sg. 1sg. hits

But /wror me mA wahi/ is used instead, /mA/ being a strong form of the 1sg. pronoun. This could be called a case of avoidance (followed by circumlocution) if the clitic pro-form /me/ and its corresponding strong form /mA/ are considered separate lexical items, but it is suppletion if the forms are allomorphs.

TOLERANCE OF REPEATED MORPHS

3. Tolerance of repetition, of course, is the 'regular' case: each morpheme of an underlying sequence is marked on the surface by a morph, regardless of the phonetic shapes involved. If a grammar valued surface transparency above all else, this would be the norm. Examples follow:

(44) Stem boundary plus inflection
　　a. Swedish: neuter stems ending in *en* occur with def. pl. *-en* (Stemberger).
　　b. English: most nouns ending in /əs/ take plural in /-əz/.
(45) Stem boundary plus clitic: none found.
(46) Stem boundary plus derivational affix.
　　　Shona: stem ending in /er/ allows applied suffix /-er/ (Fortune 1960,) [Kisseberth].
(47) Two inflectional affixes.
　　a. Swahili: 3pl. subject marker and 3pl. object marker *wa-* (Zwicky & Pullum,) [Clements].
　　b. Choctaw: active voice /-li/ + 1sg. /-li/ (Stemberger, from Nicklas 1972).
(48) Inflectional prefix plus clitic.
　　　Aghem: when associative marker occurs with class prefix, as explained in ex. 36, repetition is tolerated for class 3 /ó/ + /ó/, class 9 /tɨ́/ + /tɨ́/, class 10 /fɨ́/ + /fɨ́/, and sometimes for repetition of class 2 or 6 /á/ + /á/ (Hyman).
(49) Inflectional suffix plus clitic.
　　a. Turkish: past tense /-mVs/ + dubitative /mVs/ (Radford,) [Sezer].
　　b. English: lexicalized pl. /-s, -z, -əz/, e.g. *headquarters,* + cliticized copula /-s, -z, -əz/ (Stemberger).
(50) Inflectional plus derivational prefix.
　　　Tswana: reflexive /i-/ repeated; considered as derivational + inflectional because it is reported only for cases where the reflexive form of the verb has a meaning not fully predictable from that of the unmarked form (Cole).
(51) Two clitics.
　　a. French: subject and reflexive 1pl. or 2pl. proclitic sequences *nous nous* and *vous vous.*
　　b. Albanian: comparative *të* + 2sg. *të* [Morgan].
　　c. English: lexicalized possessive /-s, -z, -əz/ + cliticized copula /-s, -z, -əz/ (Stemberger).
(52) Free grammatical morpheme plus clitic.
　　　Turkish (see ex. 25): *siz* 'you' + *siz* 'without' [Sezer].
(53) Two free grammatical morphemes.
　　a. German: fem. def. article *die* is followed by fem. rel. pronoun *die* (Zwicky & Pullum).
　　b. Quiché Mayan: /le:/ demonstrative 'that' is repeated; possibly an intensifying use = 'that there' [Pye].
　　c. Tiv: identical direct and indirect object pronouns may occur in sequence, e.g. /i̠/ + /i̠/, /u̠n/ + /u̠n/ (Abraham 1940).

(54) Two derivational morphemes.
　　　English: exceptions to the *-ly* + *-ly* cases cited, e.g. *sillily* (Zwicky & Pullum).

We may also list here preclusion of repetition because of general phonological rules, as in the following cases:

(55) Phonological conspiracy happens to affect shape of derivational affix.
　　　Japanese: the causative suffix is *-(s)as(a)*, but only three allomorphs exist, since various rules preclude the potential form *-sasa* [Rispoli].
(56) Phonological rule happens to affect shape of clitic morph.
　　　Pashto: the clitic sequence */am am/ is re-syllabified by general rule to /a mam/ (Tegey 1975).

For stem-end duplications, as in exx. 44–46, tolerance of repetition is probably the norm, so much so that it is not even mentioned by grammars; thus a

survey which would satisfy the criteria of Bell 1978 (cf. Comrie 1981) is impossible to carry out. For the two-affix and clitic examples, however (exx. 47–54), we do not even have a guess as to what might be the usual outcome of the conflict between regularity/transparency, on one hand, and the repeated morph constraint on the other. French permits *nous nous* and *vous vous* in reflexives; Swahili permits the 3pl. subject and object agreement markers, both *wa*, to appear in sequence on a verb; and, as noted above, some English speakers see nothing peculiar about *sillily*.

We are willing to make only one hypothesis on the basis of the observed distribution of strategies: Avoidance is probably too expensive a strategy for inflectional morphology, and for most cliticization rules. (Recall that the Pashto case of blocking in cliticization, cited above, is on the borderline of suppletion.) This claim assumes that most languages call on inflection and clitics much more frequently than they call on derivation, so that the actual real-time inconvenience of stumbling into blocked forms is less tolerable for inflectional morphology than for derivational morphology. By this reasoning, if some derivational affixation process should happen to be very active in a particular language, one would not expect avoidance of accidental repetition for that process—but rather haplology, suppletion, or tolerance.

To summarize, strong grounds exist for claiming that there is a general output constraint which tends to prohibit sequences of phonologically identical morphs. Since violations of the constraint certainly exist, the proposed constraint is properly referred to as a weak morphological universal. We will call it the 'repeated morph constraint', which can be expressed formally as follows:

(57) *XY, where X and Y are adjacent surface strings such that both could be interpreted as manifesting the same underlying morpheme through regular phonological rules, and where either
   (a) X and Y are both affixes, or
   (b) either X or Y is an affix, and the other is a (proper subpart of a) stem.

MORPHOLOGICAL PROBLEMS IN LANGUAGE ACQUISITION

4. In this section, we will examine problematic phenomena in the acquisition of morphology. Primarily they involve morphological over-marking and under-marking, and they are set against the extremely strong evidence for an analytic morphology which is provided by children's universal tendency to (over-)regularize morphological markings. Most of these phenomena seem to favor a holistic template-matching view of affixation, but one appears to fit in with the analytic, 'bead-stringing' model. The goal is to reconcile these apparent opposites.

4.1. LATE ACQUISITION OF 'SHWA-INSERT' AFFIXES (in English, and similar phenomena in other languages). The regular syllabic plural and past allomorphs /-əz, -əd/ are commonly omitted in the early stages of acquisition of the plural and past tense morphemes: *kiss* is used for both singular and plural of the noun, *paste* for both present and past of the verb. This is contrary to children's general avoidance of zero morphological marking on semantically marked categories (Slobin 1973, Universal E2). In experimental work, investigators have noted

the late appearance of regular plural marking on such nonsense words as *niz* and *tass* (e.g. Berko 1958, Derwing & Baker 1979, Solomon 1972); and they have suggested that the /-əz/ is omitted because these stems already sound like plurals to children. Bybee & Slobin 1982, Kuczaj 1977, 1978, Maratsos & Kuczaj 1978, and Slobin 1971 all present similar analyses for the late acquisition of the syllabic form of the English past tense.

Further evidence comes from other languages. In German, children tend to omit plural suffixes from words that already 'appear' to end in plural affixes (e.g. *Hammer, Pfeife,* and *Glas* in MacWhinney 1978, and the experimental nonce form *Findin* in Walter 1975). Réger 1975 notes the absence of Hungarian acc. *-et* from words whose stems end in *t*. In French, Guillaume 1927 gives examples of overt self-corrections based on this process (see MacWhinney 1978:75). Furthermore, MacWhinney 1983a shows that this phenomenon can be captured within the context of a miniature linguistic system experiment. Here children learning a small artificial language avoided production of inflected forms like *pugonone* /pəgownown/ (from *pugone* /pəgown/ + *-one* /-own/); they used stem forms, e.g. *pugone* /pəgown/, instead. Evidently, this was because the children detected the apparent presence of the suffix *-one* in the base *pugone*.

4.2. ACCEPTANCE OF 'PARTIAL REGULARITY'. English-speaking children appear to respond to stem-final /t ~ d/ in verbs as a potential past tense marker; pre-school-age children show less over-regularization of irregular past tenses of verbs whose present or past tense ends in a dental stop (*hitted, feeled, felted*) than of those whose past and present tense forms do not end in dentals (*sanged, camed, ranned*) (Bybee & Slobin 1982, Kuczaj 1977, 1978, Maratsos & Kuczaj 1978, MacWhinney 1978).[3] Note, however, that an exception to this pattern is found by Bybee & Slobin: regularization is common for those irregular forms which change stem-final /d/ to /t/, e.g. *send/sent*.

Although this phenomenon is obviously related to that of §4.1, it is not quite the same: §4.1 concerns the unexpected lateness of a regular rule, but we are now dealing with unexpected (and often temporary) early acquisition of irregular forms. In the case of failure to produce *hitted*, one could argue that the child using *hit* for past had not yet fully acquired the syllabic past allomorph /-əd/, and one could offer a variety of explanations for this delay (frequency, length, destressing etc.) However, in the case of the child's tendency to use *caught* instead of regularized *catched*, the syllabic allomorph is not involved; yet we find an early preference for the irregular correct form.

All the child and adult phenomena which we have discussed so far seem to be straightforward matters of repetition avoidance; they can be modeled by saying that, when morphological marking is added by a rule, affix-checking takes place. This process looks to see if the marker in question was already present when the form was retrieved from the lexicon. If the checking process

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[3] The exact paradigmatic/semantic status of the stem may also be a part of the frame specification (Maratsos & Chalkley 1980).

finds the marker 'already there', then the rule is blocked, and the form is allowed to pass unmodified. Such a process would support the haplology solution in adults, while also encouraging children's erroneous omissions of regular affixes on some words, e.g. *box* (§4.1), and surprising acceptances of partial regularities on others, e.g. *felt*. (We will have to postulate that affix-checking is clumsy and inexact in the very young speaker, since all sibilant-final stems in English, not just /s/ and /z/, are late in acquiring their plurals.)

4.3. INFREQUENCY OF INFLECTIONAL BACK-FORMATIONS. Children apparently seldom (if ever) produce /kɪ/ as the singular of *kiss*, or the like. This requires that the formulation of affix-checking not be modeled as a process of stem extraction. Many of the reported cases of back-formation (cf. Leopold 1949) are like the extraction of *pant* from *pants,* in that they start 'back' from a form which could easily be construed as having a marker on semantic and syntactic grounds. In Hungarian, which has very extensive possibilities for back-formation, MacWhinney (1974:359–60) reports only 13 cases of back-formations in the entire Hungarian diary literature; of these, only six involve inflectional morphology. In English, if past tense verb forms like *hit* or *lent* were being analysed into stem + /t/, we would expect children to use forms like /hɪ/ or /lɛn/ in the present. But such forms have never been reported.

These data create considerable difficulty for a strictly analytic 'bead-stringing' view which equates affix analysis and learning with the process of word production. But they are compatible with MacWhinney's model, in which affix-checking looks for string-final (or string-initial) materials that receive semantic activation—i.e., are required by meaning—without reference to the presence of a morpheme boundary between stem and affix. Thus it can operate on a rote-learned marked form even before that particular form has been analysed into stem + affix.

4.4. OCCASIONAL AFFIX REPETITIONS. Children who have begun to acquire the shwa-insert affixes occasionally produce over-marked forms like *duckses, footses, feetses,* or *runded,* as well as regularizations like *bented* and *fishes* (Ervin 1964, Kuczaj 1978, MacWhinney 1982). MacWhinney 1974 cites 42 such errors from Hungarian. In Spanish, similar errors, e.g. *mamáses* 'mothers', are common; in fact, a number of words with final stressed vowels take *-ses* rather than the standard *-es* plural in the New Mexican Spanish dialect (Espinosa 1946).

Since we have placed so much emphasis on finding a device that automatically prevents affix repetition, these data present a challenge. If a process of semantic checking for redundant expressions of content were a hard and fast constraint, it is hard to imagine how *duckses* could be produced. Therefore the process that looks for affix expression, and attempts to block redundancy, must be a process that can fail and/or be overridden. We suggest that *duckses* and *hitted* are the creations of an intermediate stage in the development of the system within which this process operates—a stage in which the child has learned that some apparently-marked stems (*box, bend*) are in fact not marked, but has not yet straightened out which ones those are.

4.5. MARKING FIRST OVEREXTENDED TO UNMARKED STEMS. In comprehension tests, three- and four-year-olds have a tendency to reject over-marking in forms like *felled,* but to accept regularization errors like *falled*; this was first reported by Kuczaj 1977, 1978. However, five- and six-year-olds do not show this preference for *falled* over *felled* (Kuczaj 1978). At each age, children seem to accept, in reception, errors that are similar to their own errors in production (Butler Platt & MacWhinney 1983).

THE DIALECTIC MODEL FOR THE ACQUISITION OF MORPHOLOGY.

5. The fundamental principle underlying the MacWhinney model is the notion of the dialectic. Children are seen as moving through a cycle which leads in successive approximations toward the adult grammar. They acquire some forms 'whole' by memorization or rote; they learn to produce others by morpheme combination; and they derive still others by analogy when existing rules fail to operate. That children memorize their first inflected forms is well known, since irregular but frequent inflected forms are among the first to be acquired (Cazden 1968); being irregular, these are also lexical entries for the adult.

MacWhinney has further suggested (1978:20) that children prefer rote over combination even when they know the inflection in question, and they prefer combination over analogy: i.e., rote, combination, and analogy were thought to be ordered serially. However, MacWhinney 1983a,b shows how the three processes can operate in parallel, in a network based on the interactive spread of activation in a 'competition system'. Although several technical descriptions of interactive activation have now been formulated, the details and the mathematics of these models need not concern us here. All we need for the current analysis is an intuitive understanding of the process (cf. McClelland & Rumelhart 1981, Thibadeau et al. 1982, Anderson 1983).

The basic assumptions are these:

(a) Resting level: All processing nodes have a resting level of activation that reflects item strength; the stronger items are those which are used more frequently.

(b) Activation: When items receive activation from other items, they become activated.

(c) Threshold: When the activation of an item reaches a certain threshold, it begins to activate other items.

(d) Interaction of levels: Activation may spread top–down or bottom–up.

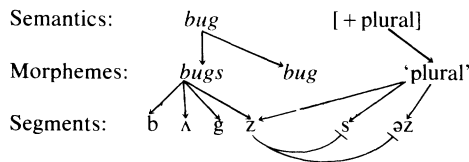Figure 1 illustrates how such a system of parallel competition would work.

FIGURE 1.

Here pointed arrows represent the paths of the first-order spread of activation (Anderson), and blunt ones represent inhibitory impulses. In this example, both the rote form *bugs* and the combination of *bug* with the plural morpheme lead to the activation of the form /bʌgz/. Note, however, that the allomorph /z/ also suppresses /s/ and /əz/ in the second round of the spread of activation. In irregular forms like *feet*, there is competition for the nucleus of the stem: although the morphemes *foot* and 'plural' receive some activation, the rote form *feet* receives more. Because of this, the /ʊ/ of the nucleus receives some activation, but the competing /i/ receives more and wins.

In this way, an activation model expresses the notion of a preference of rote over combination in the competition for the output. In the manner of Slobin 1973, we will express such concepts as 'operating principles'. The five such principles that we will introduce here are rewordings of similar principles in MacWhinney 1978, 1983a,b.

> (A) Speakers give preference to a rote form over production of a combinatorial form.

The next three operating principles spell out the ways in which affixes are activated; each one helps to insure proper affix choice or placement. The process of affix-checking can be stated as follows:

> (B) When speakers are attempting to attach an affix, they check items to see if they are contained in the currently activated output in the correct prosodic position. If so, they are satisfied and do not attempt further activations, but instead strengthen current ones.

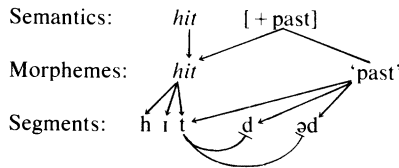Figure 2 shows how affix-checking works in the competition model.

FIGURE 2.

Together, principles A–B provide solutions for the problems of §§4.1–4.3, above. In the activation/inhibition account, the /t/ of *hit* in Fig. 2 is specified as word-final, which matches the specification of past tense /-t/. Although it may be activated primarily by *hit*, it also matches upward to 'past', and this gives it added strength to suppress /d/ and /əd/. (For further discussion, see MacWhinney 1982.) This procedure operates on a candidate for output, and is blind to the underlying associated set of semantic markers; i.e., it works only on segment strings, and can therefore be deceived by strings which, apparently, 'already end' in a morph in question. However, this process operates only on verifying output and does not perform stem extraction (cf. §4.3).

Inter-affix inhibition or competition is closely related to affix-checking, and is motivated by several considerations (see MacWhinney 1983a,b). Here we

mention only one—the need for some kind of traffic regulation when a morpheme has several allomorphs:

    (C)   The more strongly a form is activated, the more strongly it inhibits its direct competitors.

We claim that inhibitions between lexical items are learned slowly, item by item, throughout development. This lexically based knowledge provides the basic back-up to the affix-checking required by the adult system. Thus, in the adult system, *sang* inhibits *-ed* during rote retrieval; Stemberger 1982 notes that *sanged* is less frequent than *singed* in adult errors. If this inhibition fails, over-marking can also be blocked by the affix-checker.

According to the model, over-markings can arise in two ways: from the retrieval of a marked form from the lexicon, followed by a failure of affix-checking, or from a failure in the inhibition of competing forms. Suppose that a plural, say *ducks,* is learned by rote. Then, by Principle A, the child desiring to refer to more than one duck will activate *ducks* (perhaps supported by the concurrent activation of *duck*). Principle A holds that, at the same time, the plural affix is activated. If affix-checking operates successfully, as in Principle B, the child notes that *ducks* already ends in a sibilant, and needs no further marking. If affix-checking fails, the child ends up also activating /-əz/, and produces *duckses.* Eventually, a child who continues to produce *ducks* by rote will acquire a path from *ducks* which directly inhibits the plural. Such learning leads eventually to blockage of forms like *falled* (cf. §4.5).

The second possible source for *duckses* is failure of Principle C (inhibition of competing affix allomorphs), resulting in combinatorial attachment of both /-s/ and /-əz/ to the stem *duck.* Until the child learns to inhibit /-əz/ when producing /-s/, there will be a period of *-ses* over-markings (cf. Ervin). The high frequency of these over-markings during a narrow developmental time frame supports the need for Principle C.

The fourth operating principle is related to the acquisition of new lexical items. As noted earlier, children can end up learning their own productive formations by rote. Having produced *foot* + *s* = *foots* by combination, the child may then pick up his own error, and acquire it as a new plural-marked lexical item. Similar types of acquisition have been observed within phonology by Menn 1979 (/dɔ/ for *ball*) and Macken 1980 (re-analysis of Smith 1973). The basic principle is this:

    (D)   Speakers store their own new combinations in the lexicon.

We suggest that learning of this type is responsible for the four-year-old's acceptance first of *eated* and later of *ated.* For a fuller account of the ways in which monitoring and acquisition operate to acquire lexical items, see MacWhinney 1978, Butler Platt & MacWhinney 1983.

Affix over-marking is also restricted by the principle of positional patterning (MacWhinney 1982), which holds that each affix is specified for a certain positional frame. For example, the suffix *-ed* has the frame [stem ___],[4] which

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[4] This suppression is itself variable: Zwicky 1969 points out that variable order in clitics can occasionally be found.

specifies that it should be placed directly after the stem. If some other affix is competing for this slot, the affix will be directly inhibited.[5] The operating principle here is as follows:

(E) The associated positional frame is used to determine the position and co-occurrence privileges of each affix.

We propose that affix-checking is initially, let us say, myopic: it looks to see if the affix in question is present in the prosodically designated frame or schema, and it pays no attention to the rest of the word. Thus the checker, finding -*ly* in *ugly*, or -*ish* in *fish*, blocks **uglily* or **fishish,* yet never produces the non-existent word /ʌg/ or the impossible word /f/.

THE DEVELOPMENT OF THE AFFIX-CHECKER

6. We now consider changes in affix-checking capabilities as the child develops. Early or 'naïve' affix-checking is not sensitive to morpheme boundaries in the strings it checks; it therefore produces stem-end haplology whenever a suffix matches an immediately preceding string or other affix (for prefixes, the same statement applies, mutatis mutandis). But we have seen that languages of the world are quite capable of other responses to accidental affix or stem-boundary repetition; therefore it must be possible for a naïve affix-checker to become more sophisticated. Let us consider what is needed to model a processor that can discriminate between stem-substrings and affixes, block a derivation, or tolerate affix repetition.

Take the English possessive morpheme as tolerating stem-end repetition (poss. sg. *Katz*/əz/, but not affix repetition (poss. pl. **cats*/əz/); we ignore the 'euphony' problem of long *s*-final words, e.g. *Dionysus's.* Affix-checking for the English possessive clearly can tell the difference between the segment strings /kæts/ and /kæt + s/, so we must endow it with sensitivity to the presence of morphs, i.e. of segments bearing morpheme boundaries. The final /s/ in the stem of *Katz* must not behave like the final /t/ in *hit* (see Fig. 2), so the stem-final segment must be blocked from taking part in the affix-checking and the inter-affix inhibition when the possessive is being formed. This is a morpheme-specific modification in the initial affix-checking process, and must therefore be explicitly learned.

Now consider what is necessary to account for the behavior of English adverb-forming -*ly*. Suppose that one wishes to use a word based on *friendly* to fill in the blank in the sentence *She smiled at me* ___. Since no such English adverb exists, the attempt to retrieve the needed word from the lexicon will find nothing but the adjective. According to MacWhinney's model, combination will then take over, and the speaker will attempt to add -*ly* to *friendly.* If either naïve affix-checking or a simple boundary-sensitive affix-checking were in use, the output would be *friendly* used as an adverb, for these affix-checking pro-

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[5] This is reminiscent of the familiar fact that, in derivational morphology, lexical forms (e.g. *heat*) pre-empt derived forms (*hotness*). When both types of derivative exist, as they do in the cited case, the derived form will have a meaning that does not overlap the meaning of the lexical form.

cesses would be satisfied by the fact that (+)*ly* is present as the terminus of the input, and incorrectly pass it to the output unchanged. In order to block the derivation, affix-checking for -*ly* must be able to tell that the input *friendly* is an adjective; and it must 'know' that (except in a listable set of cases) an adjective cannot become an adverb without adding the adverb-forming -*ly*. To state the case more generally, an affix-checker capable of blocking a derivation must have the power to 'read' category labels on the input, and to 'know' whether the morph in question is already there. This ability is conferred by Principle E.

The subjective discomfort which one feels when fumbling for an illegal 'lily adverb' is nicely modeled by proposing that the blocking action of category-sensitive affix-checking occurs because the process is in a double bind. In the present example, it cannot pass *friendly*, because it is only an adjective; but it cannot activate the adverbial -*ly*, because it senses that the morph /+li/ is already present. It therefore stutters to a halt and produces no output.

Tolerance of accidental morph repetition also requires a category-sensitive affix-checker, but one with yet a little more power. For example, to produce Swahili *wa* + *wa* + *penda* 'they love them', the addition of whichever *wa* comes second must proceed when, and only when, the two *wa* morphs have different category labels. To model this, we propose that this most sophisticated form of affix-checking will allow only a string containing the particular morpheme in question to pass, and that it will do so regardless of the phonemic shape of the string.

Now at last let us consider the suppletion case. If one gives an output device enough power to choose correctly among allomorphs, that device becomes the embodiment of a morphophonemic rule of the 'item and arrangement' type. If one finds 'item and arrangement' models unattractive (as opposed to 'item and process' or generative phonological treatments), even for use in a real-time model, then the choice among allomorphs requires processing devices of an entirely different sort from those which are the topic of this paper.

Might one, however, argue that repetition-avoiding morphophonemic rules like the Spanish 'spurious *se* rule' are at least TRIGGERED by an affix-checking process? Might such rules be called upon only when some form of affix-checking has found that an affix is on the verge of being repeated? This might work in some cases. But the Ngarluma example certainly cannot involve triggering, since the suppletion rule applies in some cases where the accidental reduplication cannot in fact occur.

OUTPUT CONSTRAINTS AND FORMAL MORPHOLOGICAL DEVICES

7. The idea of handling at least the haplology strategy by some kind of holistic template-matching has occurred independently to at least three parties; to us, to Linell, and to Stemberger. Linell writes in terms of templates; Stemberger proposes such formulations as 'Make X end in Z' or 'Make X end in morpheme Z' instead of 'Add Z'; and we initially had the same idea. Indeed, our present description of the naïve initial state of the affix-checking process differs from the schema/template suggestions only in being explicitly embedded in a model of parallel activation and competition. However, the template is limited; it

cannot evolve into anything smarter. As soon as speakers can distinguish strings which are proper subparts of stems from strings which are affix morphs, and can apply haplology more or less exclusively to the latter, then the power of an affix-checking process is needed to model their behavior—because the affixation process must at that point be able to sense the presence or absence of a morpheme boundary, and behave differently in the two cases.

On the formal level, as on the model level, trying to capture the intuitive flavor of 'Change it so it ends in ____' as a description of stem-end haplology seems to be impossible; by the time one has the formal operation well enough defined so that it will actually produce the same output as the speaker, one has re-created an affixation rule. After all, the change must occur through (possibly vacuous) addition, not by deletion—and indeed, by addition of exactly the needed segments. The plural of *closet* is not /klaz/! Thus template-matching, when made sufficiently explicit to be operational, is tantamount to defining the affix.

This study incidentally provides a good example of an important point of linguistic metatheory: the potential for mismatch between simplicity of linguistic notation and what one might term 'developmental' simplicity—a strategy or rule being developmentally simpler than another if it is the one which a child tries on new data first. The simplest-looking affixation rules are those which tack on morphemes sequentially and analytically, statements like 'V + PAST = V + /d/'. But such rules will not account for the child's observed first strategy, viz. stem-end and affix haplology. A formal statement incorporating haplology correctly can be created by means of a convention that the unmarked form of a morphophonemic spelling-out rule operates by splitting off any stem-final string which could be an allomorph of the morpheme in question (stem-initial string, if the morpheme is a prefix), and then adjoining the affix only if the split-off piece is null. But it will be complicated to describe any such formal mechanism, compared to the description of a straightforward spelling-out of affix morphemes; thus the intuitive aesthetic sense of simplicity does not correctly predict what is developmentally simplest for the child.

SPECULATIONS AT THE LEVEL OF PSYCHOLINGUISTIC EXPLANATION

8. We have described the operations of an affixation process—with special attention to one of its features, the affix-checking process; and we have argued that a good many puzzling observations about both adult language and child language can be explained in terms of successively more sophisticated modes of operation of this affix-checking process.

This may be considered the level of psycholinguistic DESCRIPTION: certain linguistic and language acquisition patterns can be accounted for if we assume that humans have some kind of affix-checking process. Our satisfaction with this accomplishment is necessarily limited by our curiosity about the question that immediately follows: Why should we be equipped with (something like) this particular array of psycholinguistic machinery? Is a psycholinguistic EXPLANATION available? Do adults really retrieve marked forms from the lexicon, in preference to creating them by rule?

Perceptual processing offers one interesting and independent motivation for

avoiding accidental reduplication, which should be valid even if the retrieval of affixed forms from the lexicon turns out to be rare in adults. Since the affixation process is a production device, psycholinguistic explanations of its structure which refer to perceptual facts require at least one of two assumptions: (1) perception influences the operation of production devices because at least some of the monitoring of production is carried on through perception devices; or (2) production devices have evolved to be compatible with perception devices, and in particular are designed to produce strings that are not confusing to the latter. Neither assumption can be maintained in a very strong form; but both are plausible as 'design principles' which can be implemented if the cost of doing so is not too great for the production system.

We suggest that decoding 'grammatical' morphemes within the phonological word is carried out by a parallel array of morph-detectors. These detectors search only a specified domain of the incoming word; this enables them to work faster, but requires that the morphs occupy fixed slots in the phonological word. This arrangement is optimal for fast signal processing, but it handles strings of adjacent identical inputs very poorly. Because of this, ambimorphemic merger would represent an effective adaptation to the demands of such a perceptual system: both morpheme detectors may be activated by the single incoming ambiguous morph. In monitoring one's own output through a perceptual channel, the same would be true.

Finally, a conclusion on a cautious note. This paper has set out to deal with morphological duplication; but stem-internal haplology, a traditional area of interest (cf. Grammont) may have a somewhat similar explanation, though it cannot involve affix-checking per se. The same is true of any morpheme-internal haplology or dissimilation.

A psycholinguistic explanation that will unify all cases of repetition avoidance thus still lies in the future. Nevertheless, as Dressler 1982 has said, the goal of 'natural morphology' is to get rid of the word 'natural'—in other words, to replace descriptions of morphological tendencies by psycholinguistic explanations of why such tendencies should exist. This paper attempts to begin the journey toward that goal with respect to the repeated morph constraint.

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