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RULE INTERACTIONS: ANOTHER GLOSS ON K&K

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0. Introduction

In an earlier note (Zwicky 1985: 'Elementary Phonology from an Advanced point of View') I examined the way Kenstowicz and Kisseberth (1979; hereafter K&K) treat, or rather largely fail to treat, the distinction between morphophonemic and allophonic rules and the distinction between nonautomatic and automatic rules. Here I take up (in the spirit of the previous article) the subject of their Chapter 8, 'Rule Interaction', paying special attention to the automaticity of rules.

K&K consider two proposals for universally determined rule application (UDRA): in their terminology, the Direct Mapping Hypothesis (DMH) and the Free Reapplication Hypothesis (FRH).[1] The former prescribes simultaneous application of all (applicable) rules to underlying representations. The latter prescribes that the full set of rules continues to reapply in this fashion until no more are applicable. In the next part of Chapter 8, K&K advocate the Ordered-Rule Hypothesis (ORH), permitting considerable language-particular freedom in conditions on interaction. The final section of the chapter, on the Multiple Application Problem for individual rules, relates noniteration of a single rule to the DMH, iteration to the FRH.

K&K wisely side-step most of the problems in giving a careful statement of the DMH and FRH, in particular the question of what to do (given either hypothesis) with rules making contradictory changes in some form, and how to keep the FRH from looping. Rather less wisely, in my opinion, they discuss interactional issues in a historical vacuum. I am not recommending that theoretical matters be treated historically; the order in which ideas happen to have presented themselves in time is a poor guide to their logical relationships. (Indeed in K&K's Chapter 7 both the presentation of features and the examination of whether tone is segmental or autosegmental are marred by historical diversions.) But I do think that students need some historical context. In the case of rule interactions, what is missing is any discussion of the phenomena of historical change, dialect differentiation, and acquisition that led Kiparsky and others to examine interactional questions in the first place. Students also need some guide to the literature, both the Great Works and current theory; probably this material should be separated from (and follow) the main exposition.

The absence of a historical setting for the discussion on rule interactions means that the student has no way to figure out why anyone should ever have proposed, much less believed in, the DMH or FRH. As K&K show with great clarity

and in rich detail, each hypothesis is consistent with many rule interactions, but each is also clearly counterexemplified by many others. The fact that both are proposals for UNIVERSALLY determined rule application, and hence are to be preferred on metatheoretical grounds to the ORH (a proposal for PAROCHIALLY determined rule application), is not mentioned by K&K.[2] Nor is the fact that the FRH has been seriously considered as a proposal for UDRA only in combination with auxiliary principles (I will expand on this point below). Even the fact that the DMH, as a thoroughly NONDERIVATIONAL theory of rule interaction, is in some sense the simplest imaginable account of how a bunch of rules could interact with one another is not brought out.

What I will argue is that the riches of the examples in *Generative Phonology* are greater than K&K make out, that their data can be used to examine not only more specific versions of the DMH and FRH than K&K consider, but also a variety of other proposals to predict rule interactions.

One set of proposals asks: What sorts of rules does the DMH or the FRH apply to? The answers include: (a) all rules, whether automatic (AU) or non-automatic (NA); (b) just the AU rules; or (c) just the NA rules. Another set of proposals seeks to elaborate on the FRH so as to achieve UDRA. There are several ways in which the FRH might be elaborated--in the Koutsoudas/Sanders direction, for instance, with principles like Proper Inclusion Precedence (PIP), Morphophonemic-Allophonic Precedence (MAP), and Obligatory-Optional Precedence (OOP), or in the Donegan/Stampe direction, with a major principle that NA rules precede AU rules ('rule'-'process' precedence, or RPP, in Donegan and Stampe's terminology) and a set of subsidiary principles, affecting only AU rules, like Prosodic Process Precedence (PPP) and Fortitions First, Lenitions Last (FFLL). More on these possibilities below.

It is also possible, of course, that the quest for UDRA might have to be abandoned but that an alternative short of the ORH can be maintained. This is the position of Donegan and Stampe 1979, who propose that some AU rules must be marked (in a particular dialect or language) as applying only to underlying representations, while other AU rules apply to representations at any level of derivation. Donegan and Stampe do not concern themselves with NA rules, which seem to exhibit considerably more complex interactions than AU rules do, but an analogous proposal could be entertained for them; see Kenstowicz's (1976, Sec. 2) analysis of Sapir's approach to interactions of NA rules. In what follows, I will use the term Rule-Representation Constraint (RRC) to refer to any constraint on individual rules as to which sorts of representations they can apply to.

(Note that K&K do not examine the question--advanced by at least one student in every phonology class I have ever taught--of whether establishing the interaction between two rules with respect to one form establishes their interaction with respect to all other forms in the language in question. K&K let the student suppose that rule interactions are global within a language--a position that is certainly metatheoretically attractive, and quite generally

held even in the face of arguments by Anderson (1974: Part III) to the contrary--though they might well have taken the opportunity to state the issue and examine it, given that one of their objectives in this book is to encourage theoretical thinking in phonology.)

In what follows I will examine a series of proposals on rule interaction for which K&K provide at least some relevant evidence. In my discussion I will cite rules from K&K's text and from their exercises. These citations are not intended to be complete; rather, they merely suggest the riches to be found in this text. There ARE gaps in the evidence, largely a consequence of the fact the K&K are primarily interested in automatic morphophonemic rules, so that their book is short on cases of nonautomatic rules and also on cases of allophonic rules. But the pedagogical value of the data K&K provide is extraordinary, even if they choose not to exploit it fully themselves.

In my citation of examples I will usually not quarrel with the statement of facts that K&K give, whether these originate with K&K or are adapted from other sources (as is usually the case). There is considerable room for argument about the data, with potentially profound consequences for the theoretical proposals K&K are examining. But I just don't have the space to scrutinize these proposals at every level simultaneously.

1. The Direct Mapping Hypothesis (DMH)

The Direct Mapping Hypothesis (DMH) makes the following prediction about rule interaction:

--rules in a potentially feeding relation interact in a COUNTERFEEDING fashion;

--rules in a potentially bleeding relation interact in a COUNTERBLEEDING fashion;

--two rules, each of which potentially bleeds the other, interact in a MUTUALLY COUNTERBLEEDING fashion, an interaction not describable by any ordering of the rules;

--a rule in a 'feeding-bleeding', or in Churma's (to appear) terminology, TRANSFUSING, relationship with another rule will not transfuse it (if one rule transfuses another, the string to which the second rule applies is different from what it would be if the first rule didn't apply--either because the first rule removes some material to which the second could apply but also supplies new places for the second to apply in, or because the first rule changes one string to which the second is applicable into a different string to which the second rule is applicable; and

--a rule that potentially feeds itself does not iterate.

I will focus here on the first two predictions of the DMH, since K&K themselves provide a good discussion of iteration, and since their text includes few clear cases of potential mutual counterbleeding (the Russian NA rules *l*-drop and dental stop deletion (56-9) provide one such case with respect to underlying representations like //krad + l//; given the phonemic representation /kral/, rather than */kra/, the mutually counterbleeding interaction predicted by the DMH can be seen not to occur) or transfusing (if the Yawelmani 'echo verbs' (92-3) are analyzed as having the underlying shape //CCV:(C)//, then the NA rule inserting an echo vowel between the first two consonants is potentially transfused by the AU rule of vowel lowering with respect to underlying representations like //c'yu:+hin//; given the phonemic representation /c'uyo:hun/, the countertransfusing interaction predicted by the DMH, and also be RPP, can be seen to occur).

1.1. Feeding

All cases of feeding interaction constitute counterexamples to the DMH.

1.1.1 Feeding: NA before AU

I begin by considering interactions between one NA rule and one AU rule. RPP predicts that the NA rule precedes the AU rule, even if a feeding interaction results, and it is the prediction of RPP, not the DMH, that is borne out by the data.

Most of the feeding interactions K&K cite in their discussion of the DMH involve a NA rule feeding a AU rule. One--Tunica stress feeding right destressing (305-7), illustrated in the derivation from //ya+nami// to /yánami/--is a fresh example, not cited in the chapters preceding. Earlier instances in the book include Russian *l*-drop feeding final devoicing (56-7, 305), given the derivation from //greb+l// to /grep/; Tonkawa apocope feeding vocalization (67-71), given the derivation from //yaweya// to /yawei/; Yawelmani reduplicative zeroing feeding vowel epenthesis (87), given //xatxat+iwis// → /xatixtiwis/; Yawelmani vowel drop feeding vowel shortening (98-9), given the derivation from //txa:+k'a// to /taxak'/; Slovak vowel lengthening feeding both the rhythmic law and diphthongization (103-5), given //pi:smen// → pi:sme:n → /pi:smen/ and //žen// → že:n → /žyen/; and Land Dayak word-initial nasalization feeding vowel nasalization (146-7), given the derivation from //pəʔan// to /mə̃ʔã̃n/.

Note that these examples all involve two morphophonemic rules, one NA, one AU. Cases where a NA (morphophonemic) rule feeds an (AU) ALLOPHONIC rule are trivially easy to find. For instance, the English NA rule voicing stem-final /f,θ,s/ in the plural of certain nouns (like *knife, moth,* and *house,* but not *fife, myth,* or *souse*; K&K mention the rule briefly on p. 191) feeds the allophonic rule lengthening vowel nuclei before voiced consonants (formalized by K&K on p. 299); //mɔθ+z// → mɔð+z → [mɔ:ðz].

1.1.2. Feeding: Two NA rules

One might, of course, abandon the DMH as an account of interactions within the full set of rules, of all types, while nevertheless holding to it as an account of interactions within one component of rules. In particular, the DMH might be advanced as a hypothesis about interactions among NA rules.

Even though K&K present relatively few rules that are clearly NA, there is at least one case in the book where one NA rule feeds another: Slovak epenthesis feeds vowel lengthening (106), as evidenced by the derivation from //ikr// to /ike:r/ (which then becomes /ikyer/ by an AU diphthongization rule). K&K's formulation of the epenthesis rule makes it look automatic--

$$\emptyset \rightarrow e \;/\; C\_\_\_[+\text{sonorant}]\#$$

--but their comment (106) that 'stems terminating in a consonant+sonorant cluster also undergo epenthesis when certain consonant initial derivational suffixes are added' indicates that the rule is NA. Vowel lengthening is certainly NA; K&K state (104) that it 'must be restricted to operate in only certain morphological contexts'.

1.1.3. Feeding: Two AU morphophonemic rules

The DMH might be advanced as a hypothesis only about a component of AU rules. But again there is considerable counterevidence, even if we restrict ourselves only to AU MORPHOPHONEMIC rules.

K&K's discussion of the DMH includes one such case, Tunica syncope feeding right destressing, as evidenced by the derivation //hara+ʔaki// (→ hára+ʔáki) → hár+ʔáki → /hárʔaki/. Further examples appear earlier in the text: Yawelmani truncation feeds vowel shortening (93-4), given the derivation from //ʔil:+al// to /ʔilel/; Lardil apocope feeds both cluster simplification and nonapical deletion (112-5, 300-5), given the derivations from //kantu+kantu// to /kantukan/ and from //putuka// to /putu/; Lardil cluster simplification feeds nonapical deletion (113-4), given the derivation (//muŋku+muŋku// →) muŋkumuŋk → muŋkumuŋ → /muŋkumu/; and French vowel nasalization feeds the shift of /ẽ/ to /ã/, given the derivation from //prend+r// to /prãdr/. At least one further example is available in an exercise: In Maltese Arabic (136-7), a rule deleting unstressed vowels in open syllables feeds a rule inserting prothetic *i* before a word-initial consonant cluster beginning with a sonorant, given the derivation from //laʔat+na// to /ilʔátna/.

1.1.4. Feeding: Two (AU) allophonic rules

K&K's focus on morphophonemic phenomena means that there are not many interactions between allophonic rules to be uncovered in the book. If there are any cases of feeding involving two allophonic rules, I have not found them.

Allophonic rules feeding other allophonic rules are not at all rare, however, Here are three cases, from the Sierra Nahuat dialect of Nahuatl (exercise 13.B in Gleason's workbook (1955)), Chama (exercise 27 in Whitley's workbook (1978)), and Quechua (exercise 28 in Whitley). The Sierra Nahuat phoneme /w/ has a prevelarized allophone after a consonant, and the /n/ phoneme has a velar allophone before a velar or velarized consonant; the derivation from /nota:nwa:n/ to [nota:ŋ^{g}wa:n] shows that the prevelarization rule feeds the nasal assimilation rule. In Chama, word-final unstressed vowels are voiceless, and nasal consonants have voiceless allophones before voiceless vowels; the derivation from /ʔíni/ to [ʔíṇi̥] shows that vowel devoicing feeds nasal devoicing. The Quechua velar nasal has a uvular allophone before uvular consonants, and high vowels have mid allophones in the neighborhood of a uvular consonant; the derivation from /iŋqoy/ to [éɴqoy] shows that the nasal assimilation feeds the vowel lowering.

It is of some historical interest to unearth cases like these, since to my knowledge the only time the DMH has actually been proposed (or, more correctly, assumed) it was as a condition on the application of allophonic rules. Zellig Harris' *(Methods in) Structural Linguistics* (1951:62) required that the environment in which some allophone of a phoneme occurs be stated in terms of surrounding PHONEMES, not phonetic segments; this is equivalent to requiring that the rules distributing allophones apply simultaneously to phonemic representations. But there are counterexamples even to this restricted version of the DMH.

1.1.5. Feeding: One AU morphophonemic rule, one (AU) allophonic rule

Here again, I can find no clear examples in K&K. There are two possible cases, and both occur: an AU morphophonemic rule feeding an allophonic rule (an interaction consistent both with MAP and RPP), and an allophonic rule feeding an AU morphophonemic rule (an interaction consistent with RPP, but not with MAP).

AU morphophonemic rules feeding allophonic rules are easy to find. For instance, many American English speakers have glottalized allophones of voiceless stops in syllable-final position, and English in general has a morphophonemic rule devoicing word-final obstruents after voiceless obstruents; the derivation from //kɪk+d// to [kɪkt'] shows that the devoicing rule feeds the glottalization rule.

The opposite situation, allophonic rules feeding AU morphophonemic rules, is of interest because instances of it support 'Hallean syllogism' arguments against MAP. Donegan and Stampe (1979: fn. 28) cite examples of this interaction from Kabardian, Yana, and English. Here I will outline only the Yana case, which is very similar to the Sierra Nahuat case in the previous section. In women's speech in Yana (Sapir 1929:207), word-final vowels are devoiced; this rule is clearly allophonic. The distinction between voiced and voiceless consonants (which is in general phonemic in both men's and women's speech in Yana) is neutralized before voiceless vowels; this rule is clearly morphophonemic (though AU). Male [imamba] versus female [imampa] 'deer liver' shows that the allophonic rule feeds the morphophonemic rule.

1.2. Bleeding

All cases of bleeding also constitute counterexamples to the DMH.

1.2.1. Bleeding: One NA rule, one AU rule

I begin by examining cases where RPP predicts bleeding, while the DMH incorrectly requires counterbleeding.

The NA-before-AU bleeding interactions that Donegan and Stampe (1979:156) supply are from English; the NA rule of auxiliary reduction, for instance, bleeds the AU rule of flapping in cases like [ɪɾɪz], rather than *[ɪɾz], from //ɪt + ɪz//. K&K's examples of bleeding interactions in Chapter 8 (309-13) involve AU rules, but in earlier chapters they do provide several instances where a NA rule bleeds an AU rule.

In Yawelmani, vowels are shortened 'before word-final suffixes consisting of a glottal stop' (95); this NA shortening bleeds AU vowel lowering, as can be seen in the derivation from //c'yu:+ʔ// to /c'uyuʔ/. In the same language, vowels are shortened in nouns zero-derived from verbs; this NA shortening, too, bleeds AU vowel lowering, as can be seen in the derivation from //ʔu:t'// to /ʔut'/.

A final case can be extracted from English phenomena already mentioned, the voicing of noun-final fricatives in plurals and the devoicing of word-final obstruents after voiceless obstruents. The NA voicing rule bleeds the AU devoicing rule, as can be seen in the derivation from //nayf+z// to //nayvz/.

1.1.2. Bleeding: Two NA rules

K&K (311-3) observe that dental stop deletion bleeds *l*-drop in both Russian and Ukrainian. The crucial examples are those like Russian /kral/, derived from //krad+l//.

An example of bleeding between two NA rules presented earlier in the book is in Tonkawa (65-8), where a rule of apocope bleeds an elision rule. The apocope rule is formalized by K&K as if it were AU, but their observation that its purpose is to 'delete the stem final vowels in nominal forms' (67) indicates that it is indeed NA. Elision is certainly NA; 'the second vowel of the word elides as long as it is not the final vowel of the STEM' (68). The bleeding interaction between the two rules is established by underlying representations like //picena//, phonemically /picen/.

1.2.3. Bleeding: Two AU morphophonemic rules

Like their feeding examples, K&K's bleeding examples are largely concentrated in the AU morphophonemic category.

In their own discussion of the DMH (309-11), K&K treat Yawelmani vowel epenthesis bleeding vowel shortening (85-9), as seen in the derivation from //so:nl+hin// to /so:nilhin/; and Modern Hebrew *e*-epenthesis bleeding voicing assimilation in obstruents, as seen in the derivation from //yaraḍ+ti// to /yaraḍeti/.

Their earlier examples include several in which one AU morphophonemic rule bleeds another: English schwa epenthesis bleeding obstruent devoicing (27), given the derivation from //rɪč+z// to /rɪčəz/; Yawelmani vowel epenthesis bleeding contraction (99), given the derivation from //wagc+iws// to /wagciwis/; Slovak vowel truncation bleeding both the rhythmic law and diphthongization (108-9), given the derivation from //nes+e:+u:// to /nesu:/; Lardil *w*-insertion bleeding vowel truncation (111), given the derivation from //papi+ur// to /papiwur/; and Land Dayak vowel nasalization bleeding prestopping (147-8), given the derivation from //pəʔan// to /məʔan/ to /mə̃ʔã̃n/.

A few additional examples turn up in K&K's exercises. For instance, in Lamba (71-2) a rule lowering /i/ to /e/ in a syllable following one with a mid vowel bleeds a rule palatalizing /s/ and /k/ (yielding /š/ and /č/, respectively) before /i/, given the derivation from //čes+il+a// to /česela/. In Tagalog (72) a rule assimilating *n* to the point of articulation of a following obstruent bleeds a rule metathesizing a sequence of a dental and a bilabial consonant, given the derivation (//ganap+in// →) /ganpin/ → /gampin/. And in Catalan (328) a rule inserting /o/ in a word-final consonant cluster composed of a sibilant and /s/ bleeds a rule devoicing

obstruents before voiceless obstruents, given the derivation from //griz+s// to /grizos/.

1.2.4. Bleeding: Two (AU) allophonic rules

For this category K&K's discussions and exercises provide only one sort of example, typified by a bleeding interaction in Chatino (40-1).

In Chatino the position of stress is not phonemic; the final syllable of a word is stressed. The language also has an allophonic rule devoicing unstressed vowels flanked by voiceless consonants. The stress rule bleeds the devoicing rule, given the derivation from /ki?/ to [kí?].

Similar examples can be found in virtually any language with phonologically predictable accent: any allophonic rule applying in unaccented syllables will be bled by the accent rule (and any allophonic rule applying in accented syllables will be fed be the accent rule).

These bleeding (and feeding) interactions are incompatible with the DMH, but are in fact just those required by PPP, which has certain prosodic PROCESSES (that is, AU rules) applying before all other processes.[3]

Donegan and Stampe (1979:155) point out a second source of bleeding interactions between allophonic rules, namely FFLL, which requires that all FORTITIONS--AU rules that are strengthening, paradigmatic, dissimilatory, favored in 'strong' positions, or especially applicable in emphatic, formal, attentive, or slow speech--apply before all LENITIONS--AU rules that are weakening, syntagmatic, assimilatory, favored in 'weak' positions, or especially applicable in casual, inattentive, or fast speech. As Donegan and Stampe observe, FFLL predicts that allophonic rules of epenthesis, which are fortitions, will bleed allophonic rules of assimilation, which are lenitions.

1.2.5. Bleeding: One AU morphophonemic rule, one (AU) allophonic rule

Again, the DMH is incompatible with bleeding interactions, and MAP prohibits allophonic rules from bleeding AU morphophonemic rules, but PPP and FFLL would allow certain cases of bleeding.

In Chamorro (62-5) the position of stress is not phonemic; the penultimate syllable of a word is stressed. The language also has a rule providing centralized variants [ɪ,ɔ,ʊ] for unstressed vowels; this rule neutralizes phonemic distinctions (/i/ and /e/ merge, as do the pairs /u/ and /o/, /æ/ and /a/), and so is morphophonemic (on at least some definitions; if the rule is treated as allophonic, then this Chamorro case belongs with Chatino in the preceding section). The (allophonic) stress rule bleeds the (morphophonemic)

vowel shift rule, given the derivation from /dagu/ to [dágu]. This interaction is predicted by PPP but is incompatible with the DMH and MAP.

K&K's exercises include at least one case of an allophonic rule bleeding an AU morphophonemic rule. In Maltese Arabic (136) the position of stress is not phonemic; the second syllable of a word is stressed if it is heavy, and otherwise the first syllable is stressed. The language also has an AU rule deleting unstressed vowels in open syllables, and as the PPP predicts, the (allophonic) stress rule bleeds the (morphophonemic) elision rule, contrary to the DMH even as amended by MAP. The crucial forms are those like //talab+et//, to which elision is applicable in two places (either the first or the second vowel). The application of the stress rule, which places stress on the first syllable, bleeds elision by making it inapplicable to the first vowel; the output is [tálbet], not the *[tlbet] predicted by the DMH.

1.2.6. Excursus: Sommerstein on Latin

Sommerstein (1977:122-3), using Latin data from Peter Matthews, has advanced an apparent case of an AU, indeed allophonic, rule bleeding a NA rule. If accurate, such a case would strike down the DMH, the FRH, MAP, and RPP, all at one blow. The facts are as follows. The Latin lateral phoneme was dark, with light allophones in geminates and before front vowels. The verb root //wel// 'wish' had back-vowel, /o/ or /u/, alternates; compare /welle/ 'to wish' and /welim/ 'I would like' with /wolo:/ 'I wish' and /wult/ 'he wishes'. Sommerstein maintains that the alternation between /e/ and either /o/ or /u/, which is certainly morphophonemic, is predictable on the basis of the velarization of the following /l/. The derivation from //wel+im// to [welim] would then seem to indicate that the (allophonic) rule of lightening bleeds the (morphophonemic) rule backing /e/ to /o/.

What is really at issue here is whether there is any PHONOLOGICAL backing rule at all, or whether allomorphs like /wel/, /wol/, and /wul/ are simply distributed as wholes, in morphological (rather than phonological) contexts. The fact that only this one root exhibits the crucial alternations, and only a handful of other roots exhibit some parts of the system of alternations, suggests strongly that there is no phonological rule here at all, at least in the particular stage of Latin Sommerstein is considering. If there is no backing rule, then there is no bleeding of a NA rule.

Additional data pointed out to me by Rex Wallace indicate that a back-vowel alternant of //wel// occurs in some contexts where the /l/ was light (/wole:bam/ 'I wished', /wole:s/ 'you will wish', /wole:ns/ 'wishing'), so that even if it can be argued that Latin had a phonological rule affecting certain stems, the conditioning for the rule was not phonetic, or even phonological, but morphological. If the lightness of /l/ is not the conditioning factor, then again there is no bleeding of a NA rule.

2. The FRH

The Free Reapplication Hypothesis is the core of most proposals for UDRA. A survey of the types of counterexamples to the FRH thus serves to outline the sorts of amendments to the FRH that will be needed if the UDRA program is to be achieved--or to indicate the areas in which UDRA cannot be attained and rule interactions must be to some degree parochially determined.

The FRH makes the following predictions about rule interaction (again, relative to a particular input form):

--rules in a potentially feeding relation do interact in a feeding fashion;

--rules in a potentially bleeding relation interact in a counterbleeding fashion;

--two rules, each of which potentially bleeds the other, interact in a mutally counterbleeding fashion;

--a rule in a transfusing relationship with another rule might or might not transfuse it; and

--a rule that potentially feeds itself iterates.

The prediction of mutual counterbleeding is the same as that made by the DMH. The prediction of iteration is just the opposite, and K&K's discussion of iteration (318-27) makes it clear that some way must be found to mark particular rules as iterating or not; this appears to be an area of irreducible parochiality.

The FRH's prediction on transfusion depends on the details of the individual rules and forms. I will not examine the matter here.

My discussion will concern the remaining predictions of the FRH: feeding (as against the counterfeeding predicted by the DMH) and counterbleeding (also predicted by the DMH).

2.1. Counterfeeding

All cases of counterfeeding interactions are now counterexamples to the FRH. As before, I treat the examples in groups.

2.1.1. Counterfeeding: NA before AU

At least one such case occurs in K&K's exercises. In Okpe (233-4), there are several rules predicting alternations in the form of verb stems with tense vowels in them; the context for these alternations is fairly clearly morphosyntactic. The language also has an AU rule shifting high lax vowels to mid tense ones. The stem alternation rules are counterfed by the vowel lowering/tensing rule, given that stems like /se/ (underlying //sɪ//) are invariant in form even though they have tense vowels in them.

2.1.2. Counterfeeding: Two NA rules

One possible case involves a Ukrainian rule (232-3) palatalizing consonants before /i/, which is counterfed by a rule shifting /i/ to /o/ before one or more consonants at the end of a word, given the derivation from //mir'// to /mor'/ rather than */m'or'/. As K&K point out, the palatalization has surface exceptions (like *bil'* 'ache'), and in any case the vowel shift is suspicious as an AU rule, because it alters several features. Both facts suggest that we have two NA rules here.

2.1.3. Counterfeeding: Two AU morphophonemic rules

K&K's own presentation of counterfeeding gives one example of this type, from Sea Dayak (298), where vowel nasalization is counterfed by (optional) voiced stop deletion, given the derivation from //naŋga// to /nãŋaʔ/ or /nãŋgaʔ/, but not */nãŋãʔ/.

Earlier parts of the book provide further examples from Tonkawa (65-71), where truncation is counterfed by vocalization, given the derivation from //yɑweyɑ// to /yɑwei/; from Yawelmani (99), where vowel lowering is counterfed by contraction, given the derivation from //wɑgc+iws// to /wɑgci:s/ (as predicted by FFLL); and from Land Dayak (148-9), where vowel nasalization is counterfed by voiced stop deletion, given the derivation from //əmbun// to /əmudn/.

Additional examples can be found in the exercises. For instance, in Hindi (175-6) a rule assimilating /n/ to the point of articulation of a following consonant is counterfed by a rule deleting schwa in the context VC__CV, given the derivation from //sənək+o:n// to /sənkõ:/. In Bizcayan (176-7) a rule raising /ɑ/ to /e/ after a syllable with a high vowel is counterfed by a rule raising /ɑ/ to /e/, /e/ to /i/, and /o/ to /u/ when a vowel immediately follows, given the derivation from //seme+ɑ// to /semiɑ/. (K&K inform us that there is another dialect, with /semie/ rather than /semiɑ/; that dialect apparently has the same rules, but with a feeding interaction.)

Neither PPP nor FFLL shows much promise in accounting for this set of counterfeeding interactions, or for the Ukrainian counterfeeding in the previous section (though FFLL might be responsible for the application of Yawelmani vowel lowering before contraction); the rules involved are not prosodic, and nearly all of them are lenitions. The precedence principles that have been advanced by supporters of UDRA do not fare much better. OOP, which requires that an obligatory rule precede, and block the application of, an optional rule (Ringen 1972), is relevant only for the Sea Dayak case; there it correctly predicts that (obligatory) vowel nasalization is counterfed by (optional) voiced stop deletion. PIP, which requires that a more particular rule precede, and block the application of, a more general rule (Koutsoudas et al. 1974), doesn't apply to any of these counterfeeding cases; in each case, the strings to which the two rules apply are overlapping. MAP is of course irrelevant, since we are looking only at morphophonemic rules, and so is RPP, since we are looking only at automatic rules.

There are several responses at this point. One is to abandon hope for UDRA entirely and adopt the ORH. Another is to adopt parochially determined rule interaction in a guarded way, perhaps via a RRC. Another is to search for still further principles that will predict certain counterfeeding interactions. Another possibility, one that is certainly encouraged by K&K's reticence to tell the reader about lexical or morphosyntactic conditioning of the rules they cite, is that at least some of the rules above are NA rather than AU, and that RPP or some other principle will correctly predict the counterfeeding interactions. A final strategy (a popular one with UDRA advocates) is to maintain that the rules have been incorrectly formulated, and that when they are correctly formulated, existing principles, in particular the FRH, will predict the interactions that do in fact occur. However, K&K argue explicitly in Chapter 8 that the strategy of reformulation produces unsatisfactory results in certain cases (which happen to involve feeding and bleeding interactions); the conditioning factors for one rule must be repeated in the statement of the other, which is then decidedly unnatural.

2.1.4. Counterfeeding: Two (AU) allophonic rules

So far as I can determine, K&K give no examples of this sort. Instead, they provide some cases of allophonic rules counterfed by morphophonemic rules, which are the subject of the next section.

2.1.5. Counterfeeding: One AU morphophonemic rule, one (AU) allophonic rule

Two of the three cases of counterfeeding that K&K given in Chapter 8 have allophonic rules counterfed by morphophonemic rules, contrary to the FRH even as amended by MAP.

The first of these concerns the Mecayapan dialect of Isthmus Nahuat (298-9). Syllable-final /l y w/ in Mecayapan have voiceless allophones, with complex additional conditions on the devoicing rules; it is sufficient here to note that word-final /l/ is obligatorily voiceless. Mecayapan also has an optional AU rule deleting short unstressed vowels at the end of a word if a voiced sonorant precedes. The (allophonic) devoicing rule is counterfed by the (morphophonemic) vowel deletion, given the derivation from //šikakili// to [šikakíli] or [šikakíl], but not *[šikakíl̥].

The second case is a familiar one from English, in which the allophonic rule lengthening vowel nuclei before voiced consonants is counterfed by the rule neutralizing /t/ and /d/ to a voiced flap after a stressed syllable and before an unstressed one. The derivation from //ráyt+ər// to [ráyɾr̥], not *[rá:yɾr̥], shows that the (allophonic) lengthening rule is counterfed by the (morphophonemic) flapping rule. (There may well be other sets of speakers for whom the interaction is feeding rather than counterfeeding; but if there are any speakers at all for whom lengthening is counterfed by flapping, there is a problem for the FRH.)

2.2. Bleeding

Instances of bleeding run counter to the FRH just as they do the DMH. The critical cases are those that have no obvious analysis in terms of MAP, RPP, or PPP. From the discussion in section 1.2 above, then, the cases to be examined are those in 1.2.2 (two NA rules) and in the following sections (two AU rules, of whatever kind). I have nothing to say about the NA examples in 1.2.2, but the remaining cases--two AU morphophonemic rules, two (AU) allophonic rules, and one AU morphophonemic rule plus one (AU) allophonic rule--are of obvious interest.

Consider, for example, English schwa epenthesis bleeding devoicing. This particular interaction could be explained on either of two grounds, PIP or FFLL. On the one hand, schwa epenthesis is genuinely a more particular rule than devoicing, so that PIP correctly predicts bleeding. One the other hand, schwa epenthesis is clearly a fortition, devoicing a lenition, so that FFLL also correctly predicts bleeding.

PIP might also be invoked to explain the fact that the Lamba lowering of /i/ bleeds the palatalization of /s/ and /k/, and FFLL might be invoked to explain the fact that Yawelmani vowel epenthesis bleeds both contraction and vowel shortening and also the fact that the Lardil insertion of /w/ bleeds $V \rightarrow \emptyset$ / V___.

Whether all the apparent bleeding interactions can be accounted for in one way or the other is a deeper question. Neither the UDRA program based on the FRH nor the RRC approach, also based on the FRH, permits two AU rules in a bleeding relationship. As in section 2.1.3 (on counterfeeding), there

are several possible responses to such facts, worth discussing with students of phonology.

3. Counterbleeding

Finally, I must remark that there are indeed cases of the counterbleeding interactions predicted by the FRH and DMH.

3.1 Counterbleeding: NA before AU

K&K give one case of this sort in their discussion of interactions: In Ki-Rundi (294-6) a NA rule lowering a high vowel in a syllable after one with a mid vowel is counterbled by an AU rule converting nonlow vowels to glides before another vowel, given the derivation from //ku+nyó+iiš+a// to /kunywéešа/. The vowel harmony rule is certainly NA; 'the rule is restricted to a certain morphological class of suffixes' (296).

At least one more case is available in Tonkawa (66-8), where elision is counterbled by truncation, given the derivation from //picena+o?// to /picno?/.

3.2. Counterbleeding: Two AU morphophonemic rules

K&K provide two such examples in their chapter on interactions: Yawelmani vowel lowering counterbled by vowel shortening (94-5), as in the derivation from //mi:k'+hin// to /mek'hin/; and Tunica (292-3) vowel assimilation counterbled by syncope, as in the derivation from //hípo+?aki// to /híp?ɔki/.

Among the other cases in K&K are Yawelmani vowel harmony counterbled by vowel lowering, given the derivation from (//wu:?y+hin// →) wu:?iyhin to /wo:?uyhun/; Yawelmani vowel lowering counterbled by vowel shortening, given the derivation from //su:g+hin// to /ṣoghun/; and the Slovak rhythmic law counterbled by diphthongization, given the derivation from //hne:zd+a:// to /hnyezda/.

Another case of this sort of interaction involves the English (189-90) devoicing rule seen in /plænts/, from //plænt+z//, and a rule optionally deleting alveolar stops between a nasal and an alveolar fricative. The fact that the alternative pronunciation of *plants* is /plæns/, not /plænz/, indicates that devoicing is counterbled by stop deletion. Note that this interaction is consistent with OOP.

3.3. Counterbleeding: One AU morphophonemic rule, one (AU) allophonic rule

In know of no clear cases of this sort in K&K. A number of such interactions have been noted in the literature, however; some of them are of significance because they provide further evidence against MAP, though they are consistent with the FRH without a MAP rider attached to it.

Several examples are collected in Dinnsen 1983. Citing a series of phonetic studies of word-final devoicing in German, Catalan, Russian, and Polish, Dinnsen casts doubt on the claim that word-final devoicing is ever a neutralization (and then on the claim that there are neutralization rules at all). These studies indicate that in some cases voiceless final obstruents derived from voiced underlying segments are not phonetically identical to underlyingly voiceless final obstruents (in which case, there is no neutralization, in anyone's sense of the term), and that in other cases (German and Russian, at least) the final voiceless obstruents appear to be phonetically identical, but the underlying contrast is carried by the length of the preceding vowel, which is significantly longer before a voiceless obstruent that is underlyingly voiced than before one that is underlyingly voiceless. (Dinnsen labels these latter cases non-neutralizing, presumably because final devoicing does not create homophonous words, but they are certainly neutralizations in the sense that a phonemic contrast is eliminated at some position within words.)

Notice now that the interaction between the allophonic rule lengthening vowels before voiced consonants and the morphophonemic rule of final devoicing, at least for the German and Russian speakers examined in the studies Dinnsen cites, is counterbleeding: Vowel lengthening is counterbled by final devoicing, against MAP. But counterbleeding is exactly what the FRH predicts. Indeed, it is BLEEDING that is problematic for UDRA proposals built on the FRH, as I pointed out in my discussion of bleeding above. The Donegan/Stampe proposals, in particular, have no way to predict a bleeding interaction between two non-prosodic lenitions like the vowel lengthening and final devoicing rules at issue here.

3.4. Excursus: Neutralizations

Despite Dinnsen's observations, I am disinclined to say the there are no neutralization rules.

NA rules are all neutralizing, and given the extent to which RPP is supported by the evidence I have surveyed, I would be astonished to find that ANY NA rule left the sort of contextual allophonic trace that final devoicing apparently leaves in Russian and German.

In addition, AU morphophonemic rules are all neutralizing (on one definition), and I find it hard to believe that EVERY AU morphophonemic rule--

even if we restrict our attention to the rules catalogued in earlier sections of this paper--either fails to neutralize completely at the phonetic level or else leaves an allophonic trace in the surrounding context. Rather, a neutralization rule will leave a trace if the feature it eliminates serves as the context for an allophonic rule, so that the FRH predicts that the allophonic rule is counterbled by the (morphophonemic) neutralization rule.

Neutralization rules can leave traces for other reasons, of course. Dinnsen, notes, in particular, that vowel lengthening is counterfed by flapping for many speakers of English, and that for these speakers allophonic vowel length is a trace of underlying voicing in the following consonant. This interaction can be described by saying that for these speakers vowel lengthening applies only to underlying representations. For other speakers, the feeding interaction predicted by the FRH alone is what occurs, and not only do words like *latter* and *ladder* have phonetically identical flaps in them, but the words are in fact homophones.

4. Conclusion

I have now demonstrated that K&K provide a rich source of data for evaluating proposals about rule interactions.

The DMH is clearly inadequate, given that feeding interactions (which it prohibits) are commonplace.

The unadorned FRH (predicting only feeding and counterbleeding) fares better, but stumbles on cases of counterfeeding and bleeding. It needs amendment. The Koutsoudas/Sanders line of amendment embraces MAP, PIP, and OOP. The Donegan/Stampe approach assumes instead RPP, FFLL, and PPP, and it entertains the possibility of RRCs marking certain rules as applicable only to underlying representations. The examples that K&K provide enable the student to evaluate several of these proposals. In particular, they speak very clearly against MAP while sustaining RPP.

As for the proposals PIP and OOP, FFLL and PPP, which in combination with the FRH and RPP would permit certain instances of counterfeeding and bleeding: K&K's examples appear to be consistent with the whole set. Their examples were not, of course, designed to shed light on these particular proposals, especially as items in a package also containing the FRH and RPP.

Finally, some instances of counterfeeding of AU rules do not appear to submit to an account using free reapplication plus RPP and one or more auxiliary principles. For these, RRCs may be necessary. There is some hope, however, that auxiliary principles will suffice for cases of bleeding involving AU rules. Interactions between NA rules still require an account, perhaps one involving PIP and OOP, or types of RRCs; K&K do not give us enough NA rules for an examination of such proposals.

NOTES

*My thanks to Donald Churma, Patricia Donegan, and David Stampe for their comments on an earlier version of this article.

[1]The terminology originates with Koutsoudas 1976b.

[2]See the discussion in Pullum (1979, sec. 1).

[3]I have seen no clear statement of this principle, although it is hinted at in Donegan and Stampe 1979. For my purposes here, it is sufficient that some principle should predict that AU rules distributing accentual marks precede segmental AU rules.

ABBREVIATIONS

AU = Automatic

DMH = Direct Mapping Hypothesis

FFLL = Fortitions first, lenitions last

FRH = Free Reapplication Hypothesis

K&K = Kenstowicz and Kisseberth (Michael Kenstowicz and Charles Kisseberth. 1979. *Generative Phonology: Description and Practice*. New York: Academic Press.)

MAP = Morphophonemic-allophonic precedence

NA = Non-automatic

OOP = Obligatory-optional precedence

ORH = Ordered-Rule Hypothesis

PIP = Proper inclusion precedence

PPP = Prosodic process precedence

RPP = 'Rule'-'process' precedence

RRC = Rule-representation constraint

UDRA = Universally determined rule application

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