

## The question of rule ordering: some counter-fallacies

ROLAND G. NOSKE, JOS SCHINKEL AND  
NORVAL S. H. SMITH

*Instituut voor Algemene Taalwetenschap, Universiteit van Amsterdam*

(Received 1 February 1982)

### 1. INTRODUCTION<sup>1</sup>

In 1980 Koutsoudas published a paper entitled 'The Question of Rule Ordering: Some Common Fallacies'. In this paper he attacks various types of criticism of the theory of intrinsic rule ordering, and gives a set of procedures by which he allows his version of that theory (henceforth the KSN theory<sup>2</sup>) to be falsified. In the present article we utilize the procedures prescribed by Koutsoudas to demonstrate that this theory is not tenable.

In the standard SPE theory the ordering of phonological rules requires to be explicitly stated (extrinsic rule ordering). A number of phonologists have attempted to dispense with extrinsic ordering by formulating principles by which the ordering of rules can be forecast (intrinsic ordering). The KSN proposal is such a theory.

Koutsoudas selects one article (Cathey & Demers (1976)), which he feels contains all the types of fallacy committed by proponents of extrinsic ordering. He gives a list of possible counterexamples to his theory – rule interactions that violate the KSN principles. Next, he describes the major changes the theory has undergone: the introduction of a new principle (the Morphophonemic-Allophonic Principle) and the modification of an old one (Proper Inclusion Precedence/Stifling). Obviously, such changes in the theory will have considerable consequences for the type of rule interaction that can serve to disprove the theory, although Koutsoudas does not provide his readers with a modified list of possible falsifications of his theory. This they will have to work out for themselves.

The cases we present below are based on such a modified list of possible counterexamples to the 1980 version of Koutsoudas' theory of intrinsic rule ordering. We also indicate in this connection a couple of faulty analyses utilized by Koutsoudas.

[1] The authors wish to thank Camiel Hamans and Jacques Hendrickx for their insightful remarks concerning this article.

[2] KSN is an abbreviation of Koutsoudas, Sanders and Noll, who in 1974 originally proposed the theory of which Koutsoudas' 1980 article represents a development.

1.1. In KSN (1974) the general assumption of intrinsic ordering was stated as follows:

The order in which rules apply in derivations is completely determined by universal principles of rule application.

They called this the UDRA (Universally Determined Rule Application) hypothesis; he formulates this as follows:

The UDRA hypothesis can be falsified only by showing that there are two well-motivated grammars of natural languages which must be identical in every respect except in the way their rules interact in derivations.

It seems to us that this requirement is too stringent: there is nothing in the formulation of the UDRA hypothesis itself that calls for the almost absolute identity of grammars in which identical rules must be applied in different orders. We ourselves will assume that it will be sufficient to compare blocks of rules which do not interact with other blocks of rules.

1.2. The Koutsoudas (1980) version of the UDRA theory contains three principles which together must account for the interaction of rules in derivations. These are:

(1) *The Morphophonemic-Allophonic Principle:*

A morphophonemic rule application must always take precedence over an allophonic rule application.

Given a rule  $A \rightarrow B/C \text{ --- } D$  applicable to a form *cad*, the application of this rule is morphophonemic if there are strings of the form *cbd* which could be derived from a source other than *cad*; otherwise the application of the rule is allophonic.

It should be noted that this formulation is imprecise; from the examples he gives to illustrate this principle, it becomes clear that the existence of non-derived (underlying) strings of the form *cbd* also suffices to render a rule application morphophonemic.

(2) *Stifling:*

If a representation R meets the structural descriptions of each of the two rules A and B, and the structural description of A properly includes the structural description of B, then B does not apply to R (but A does).

This is a disjunctive version of the former Proper Inclusion Principle.

(3) *Obligatory precedence:*

An obligatory rule must apply whenever its structural description is met. (Rules will apply simultaneously if possible; otherwise they will apply sequentially.)

The principles must be consulted in the given order. From the formulation of

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the principles and the hierarchy obtaining between them the general format of counter-evidence against this theory automatically follows:

The particular theory proposed by KSN can be falsified by showing that there is a set of two or more relatively straightforward rules for some natural language that are empirically well-motivated independently of any questions of ordering, and that they interact in a manner contrary to that predicted by the KSN principles.

For ease of reference we give here a list of rule interactions which could, following the outline above, falsify Koutsoudas' theory:<sup>3</sup>

- (a) A pair of empirically well-motivated rules not in a stifling relation can potentially apply simultaneously, but must not be allowed to do so.
- (b) A pair of empirically well-motivated rules in a stifling relation can potentially apply simultaneously, and must be allowed to do so.
- (c) A pair of empirically well-motivated rules in a stifling relation must apply conjunctively.
- (d) A pair of empirically well-motivated rules must apply in a bleeding order.
- (e) A pair of empirically well-motivated rules must apply in a counter-feeding order.
- (f) An allophonic rule must take precedence over a morphophonemic one.

Obviously, this list is not exhaustive, but it will serve our purpose. We will classify our counterexamples in terms of this list.

2. The Morphophonemic-Allophonic Principle was introduced in 1973 (Koutsoudas, 1977). Koutsoudas claimed that introducing this principle into the UDRA theory has two desirable consequences:

- (a) It reduces the class of possible grammars consistent with any set of facts. Koutsoudas illustrates this with a particular analysis of French that is 'excluded' by the new principle. We do not agree with him about this 'exclusion', but it would carry us too far beyond the scope of this article to go into this here.
- (b) It explains certain facts about linguistic variation. He illustrates this with an example from two Catalan dialects; we will discuss this example in some detail, and demonstrate that it does NOT illustrate the Morphophonemic-Allophonic Principle.

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[3] We have adapted this list from Koutsoudas (1980) in accordance with his replacement of the Proper Inclusion Principle with the Principle of Stifling. The most significant difference concerns rule interaction (c) which reads, 'A pair of empirically well-motivated rules in a proper inclusion relation must apply disjunctively', and rule interaction (f) which is added to take account of the Morphophonemic-Allophonic Principle.

2.1. *Catalan*

Koutsoudas states that Western and Central Catalan share two rules, Terminal Devoicing and Spirantization, and claims that the Morpho-phonemic-Allophonic Principle accounts for the different order of application of these rules in the two dialects.

He illustrates the rule of Terminal Devoicing as follows:

- |     |        |              |       |              |
|-----|--------|--------------|-------|--------------|
| (a) | beʒus  | 'kisses'     | bes   | 'kiss'       |
|     | amiɣə  | 'friend (f)' | əmik  | 'friend (m)' |
|     | loβə   | 'she-wolf'   | lop   | 'wolf'       |
|     | muðə   | 'mute (f)'   | mut   | 'mute (m)'   |
| (b) | sekə   | 'dry (f)'    | sek   | 'dry (m)'    |
|     | pətɪtə | 'small (f)'  | pətɪt | 'small (m)'  |
|     | tɪpə   | 'full (f)'   | tɪp   | 'full (m)'   |
|     | pasus  | 'steps'      | pas   | 'step'       |

Terminal Devoicing is formulated as follows:

$$[+obstruent] \rightarrow [-voice] / \text{---} \#$$

Spirantization is illustrated by the following examples (and in the examples (a) above):

- |     |      |         |                  |                      |
|-----|------|---------|------------------|----------------------|
| (a) | gat  | 'cat'   | ləɣatə           | 'the cat'            |
|     | diə  | 'day'   | dəðiə            | 'daytime'            |
|     | blan | 'white' | ləβlanko         | 'whiteness'          |
| (b) | sɛrp | 'snake' | lə sɛrβ ez neɣrə | (W. Catalan only)    |
|     |      |         |                  | 'The snake is black' |

Koutsoudas formulates Spirantization as follows:

$$\left[ \begin{array}{l} +obstruent \\ +voice \end{array} \right] \rightarrow [+continuant] / [+vocalic] (\#) \text{---} (\#) [+vocalic]$$

In the Western dialect of Catalan, whenever both rules could potentially apply simultaneously in a derivation, Spirantization must apply to the exclusion of Terminal Devoicing:

*Western Catalan*

		sɛrb ez
Spirantization		sɛrβ ez
Terminal Devoicing	.....	sɛrβ ez
		*sɛrp ez, *sɛrϕ ez

In the Central dialect the rules have to apply in the opposite order:

*Central Catalan*

		sɛrb ez
Terminal Devoicing		sɛrp ez

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Spirantization                    .....  
   serp ez

Why the difference between these two dialects? In Western Catalan there is a contrast between /b/ and /v/<sup>4</sup> underlyingly. Spirantization neutralizes the distinction between these in final position, so that it is to be counted a morphophonemic rule. In Central Catalan, however, the segments [b] and [v] are allophones of one underlying segment, as a result of a historical merger. In this dialect, then, Spirantization is an allophonic rule. Terminal Devoicing is a morphophonemic rule in both dialects, as we can see from the examples used to illustrate this rule. By the Morphophonemic-Allophonic Principle the Morphophonemic rule – Terminal Devoicing – will have to precede the Allophonic rule – Spirantization – in Central Catalan. In the Western dialect we can make no use of this principle, however. Here we have to look to the other principles in order to make a decision on the order of application of these two rules to forms such as /serb ez/.

The structural descriptions of the two rules as they are applicable here are as follows:

Spirantization:                    [+vocalic]     $\left[ \begin{array}{l} + \text{obstruent} \\ + \text{voice} \end{array} \right] \#$     [+vocalic]  
 Terminal Devoicing:                    [+obstruent] #

Since the Structural Description of Spirantization properly includes that of Terminal Devoicing, the former rule must take precedence by Stifling, which, as this entails disjunctive application, rules out any application of Terminal Devoicing.

In fact, however, the Central dialect of Catalan does not illustrate the operation of the Morphophonemic-Allophonic Principle at all. The rule of Spirantization in this dialect never requires the optional second word-boundary in the Structural Description. It is just the cases that require this second word-boundary in Western Catalan (e.g. /serb ez/ → [serβez]) that do not undergo Spirantization in Central Catalan. In other words, we can simplify the formulation of Spirantization in this dialect to the following:

$\left[ \begin{array}{l} + \text{obstruent} \\ + \text{voice} \end{array} \right] \rightarrow [+ \text{continuant}] / [+ \text{vocalic}] (\#) \text{ — } [+ \text{vocalic}]$

Koutsoudas himself remarks that in the Central dialect Spirantization does not appear to apply in final position, which is equivalent to saying that the rule in this dialect is different from the corresponding rule in Western Catalan. It is difficult to understand why Koutsoudas then assumes for Central Catalan a formulation for Spirantization by which it is possible for this rule to work in final position. If we remove this possibility from the rule, the application of

[4] We presume that by *v* Koutsoudas means *β*.

Terminal Devoicing in Central Catalan to the exclusion of Spirantization is then dictated simply by the structural descriptions of these two rules as they have to be formulated for this dialect:

Terminal Devoicing:                    [+ obstruent] #  
 Spirantization:            [+ vocalic] (#)  $\left[ \begin{array}{l} + \text{obstruent} \\ + \text{voice} \end{array} \right]$  [+ vocalic]

It is clearly impossible for the two rules corresponding to these Structural Descriptions to be applicable to one and the same string. Invocation of a 'universal principle' becomes then both unnecessary and undesirable.

It strikes us as rather odd that Koutsoudas' account of these dialect phenomena is very similar to what we might have expected from early proponents of the extrinsic ordering theory working in the field of dialects, in that identical rules are assumed for similar processes even when this did not give the simplest explanation of the facts.

Note that this example, had it been correct, still would have been in accord with the theory of universally determined rule application because, although the PHONOLOGICAL RULES of the two dialects would have been identical, the GRAMMARS would not have been. There would have been a difference in terms of the morpheme-structure component, because the one dialect, Western Catalan, has a contrast between underlying /b/ and /v/, whereas the other, Central Catalan, does not have this contrast, possessing only /b/.

3. In this section we will give some counterexamples to the theory of universally determined rule application, involving different orders of identical phonological rules in otherwise identical (portions of) grammars.

### 3.1. *Scottish English*

We find, for instance, a case in Scottish English that would seem to satisfy Koutsoudas' requirements for counterexamples to this theory. In (Standard Middle-Class) Western Scottish English we normally find the following equivalents of Southern English /ai/ in monosyllables:

[æ] before voiced fricatives, liquids and zero<sup>5</sup>  
 [aɪ] elsewhere

- |      |         |       |
|------|---------|-------|
| (i)  | 'time'  | tʌɪm  |
|      | 'tight' | tʌɪt  |
|      | 'tide'  | tʌɪd  |
|      | 'nine'  | nʌɪn  |
|      | 'life'  | lʌɪf  |
| (ii) | 'hive'  | hɑ:ev |
|      | 'rise'  | rɑ:ez |

[5] Also before *θ*.

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	'pile'	pael
	'fire'	fa:er
	'tie'	ta:e
(iii)	'strife'	strʌif
	'strive'	stra:ev
	'advice'	ədvaɪs
	'advise'	ədva:ez

There are two types of Western Scottish English with respect to distribution of these two sounds. One (dialect A) follows the above distribution, the other (dialect B) displays the same distribution virtually everywhere, except for the case of nouns showing an interchange of voiced and voiceless fricatives in the singular and plural. Consider the following data:

		<i>A</i>	<i>B</i>
(i)	'wife'	wʌɪf	wʌɪf
	'wives'	wa:evz	wʌ:ivz
	'knife'	nʌɪf	nʌɪf
	'knives'	na:evz	nʌ:ivz
	'life'	lʌɪf	lʌɪf
	'lives'	la:evz	lʌ:ivz

In other words, in dialect B [ʌi] also occurs in voiced-fricative-final plurals of nouns with voiceless-fricative-final singulars. Let us try to formulate the phonological rules involved in the derivation of the noun-forms:

*Noun Plural Fricative Voicing (NPFV) (Minor Rule)*

$$\left[ \begin{array}{l} - \text{son} \\ + \text{cont} \end{array} \right] \rightarrow [+ \text{voice}] / \text{---}\#z]_N^6$$

*AYE-Distribution*

$$\lambda i \rightarrow ae / \text{---}\left( \left[ \begin{array}{l} + \text{cont} \\ + \text{voice} \end{array} \right] \right)^+ ^7$$

The distribution of the feature of length is automatic, and irrelevant to the point at issue here.

[6] This is clearly a different process from that involved in the derivation of nouns from verbs, which seems rather to be a devoicing process:

	<i>V</i>		<i>N</i>	
	strae:v	'strive'	strʌɪf	'strife'
	ju:z	'use'	jus	'use'
	ədvae:z	'advise'	ədvaɪs	'advice'
	ɛkskjuz	'excuse'	ɛkskjus	'excuse'

The fact that these forms are identical in dialects A and B supports our analysis whereby forms with [ae/ʌi] in the final syllable have the same diphthong underlyingly.

[7] Words such as *scythe*, *blithe*, etc. will require to be marked as positive exceptions to this rule. This could be done by a redundancy rule.

Clearly the difference between dialects A and B can be explained in terms of the order of application of these two rules:

	<i>Dialect A</i>				
	wɹif	wɹif#z	strɹiv	hɹiv	hɹiv#z
NPFV	....	v	.....	.....	.....
AYE	....	ae	ae	ae	ae
	wɹif	wævz	stræv	hæv	hævz
	<i>Dialect B</i>				
	wɹif	wɹif#z	strɹiv	hɹiv	hɹiv#z
AYE	....	.....	ae	ae	ae
NPFV	....	v	.....	....	.....
	wɹif	wɹivz	stræv	hæv	hævz

At this point we may ask if the rule of AYE-Distribution does not have a different status in the two dialects, analogous to the situation in Catalan. In other words, could this rule be allophonic in dialect A, but morphophonemic in dialect B? We must answer this question in the negative, however, because of the existence of forms like the following.

These forms occur equally in dialects A and B:

[ae]		[ɹi]	
baebəl	‘bible’	stɹifəl	‘stifle’
aefəl	‘Eiffel’	trɹifəl	‘trifle’
vaetəl	‘vital’	tɹitəl	‘title’
sækəl	‘cycle’	mɹikəl	‘Michael’
maetər	‘mitre’	lɹitər	‘lighter (boat)’

In other words, the rule of AYE-Distribution is only ‘pseudo-allophonic’ in dialect A, applying only in terms with [ae/ɹi] in the final syllable (here only monosyllables have been utilized). The impossibility of forecasting the distribution of the two diphthongs in certain polysyllables means that, somehow or another, we will have to distinguish between the forms in the above diagram at the level of underlying representations.

Note, however, that the morpheme-structure rules of dialects A and B are identical, SINCE THE DISTRIBUTION OF [ae] AND [ɹi] IN UNDERLYING MORPHEMES IS IDENTICAL. It is only as a result of the combination of monosyllabic noun-stems with the plural morpheme /z/ that the differences arise. These can best be explained in terms of the application of rules in different orders. The Morphophonemic-Allophonic Principle cannot provide a solution in this case, unless allophony is defined with respect to grammatical boundaries and word categories, which would represent a completely new understanding of what is normally meant by ‘allophony’ and be quite undesirable in our opinion.



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Stifling is inapplicable here – the two structural descriptions are:

$$\left[ \begin{array}{l} - \text{son} \\ + \text{cont} \end{array} \right] \#z \Big]_{\text{N}} \quad \text{and} \quad \lambda i \left[ \begin{array}{l} + \text{cont} \\ + \text{voice} \end{array} \right] +$$

Clearly neither of these can properly include the other. Obligatory precedence can apply – it would forecast the order *NPFV-AYE*.

This order is correct only for dialect A; it is wrong for dialect B. We assume then that this is a valid counterexample to the whole notion of intrinsic ordering. Among the speakers of Standard Middle-Class Western Scottish English, dialects A and B are intermingled without any clear geographical or social implications. One of the authors is a speaker of dialect A, and his brother is a speaker of dialect B. We will return to this example in Section 4.2.3.

3.2 *Canadian English*

Another counterexample concerns the well-known case of *rider* and *writer* in Canadian English (Joos, 1942; Halle, 1964). There are two groups of speakers involved. Both voice intervocalic *t*'s. One has raised diphthongs [ɪɪ] and [ʌʊ] instead of normal [aɪ] and [aʊ] before fortis consonants, the other has raised diphthongs also in inflected forms where *d* alternates with *t* such as *writer*, *clouting*, etc. To return to the words *rider* and *writer*, for one group of speakers these are pronounced as [raɪdɔ̃] and [rɛɪdɔ̃] respectively; for the other group both words receive the same pronunciation [raɪdɔ̃]. The relationship of these words to the verbs *ride* [raɪd] and *write* [rɛɪt], and the regular nature of this relationship in general, means that we can ascribe the intermediate representations /rajd + əɾ/ and /rajt + əɾ/ to these words. The underlying forms are in fact irrelevant to this example. Such intermediate forms necessitate the following two rules in order to reach the phonetic representations for these two words:

*Diphthong Raising*

$$V \rightarrow [-\text{low}] / \text{---} \left[ \begin{array}{l} - \text{cons} \\ - \text{syll} \end{array} \right] \left[ \begin{array}{l} + \text{cons} \\ + \text{tense} \end{array} \right]$$

*Intervocalic Laxing*

$$\left[ \begin{array}{l} - \text{son} \\ - \text{cont} \\ + \text{cor} \\ + \text{ant} \end{array} \right] \rightarrow [-\text{tense}] / V \text{---} \left[ \begin{array}{l} V \\ - \text{str} \end{array} \right]$$

These two rules will have to apply in different orders in the dialects represented by the two groups of speakers. Let us call the dialect where the two words have different phonetic outputs *C*, and that where these are identical *D*.

<i>C</i>	/rajd+ər/	/rajt+ər/	<i>D</i>	/rajd+ər/	/rajt+ər/
D.R.	.....	ɐ	I.L.	.....	d
I.L.	.....	d	D.R.	.....	.....
	[raidə]	[rɛɪdə]		[raidə]	[raidə]

What is the nature of these two rules in the two dialects? Intervocalic laxing is clearly a morphophonemic rule, since two underlying contrasting segments – /t/ and /d/ – are merged. Diphthong Raising does not fall under the definition of a morphophonemic rule given by Koutsoudas, therefore it is in his terms allophonic. The grammars of both dialects are presumably identical in all other relevant aspects, since their speakers are co-extensive. So the requirements for the falsification of UDRA are again fulfilled.

#### 4. FALSIFICATION OF KOUTSOUDAS' THEORY

Below, we will present seven cases of 'a set of two or more relatively straightforward rules for some natural language that are empirically well-motivated independently of any questions of ordering, and that interact in a manner contrary to that predicted by the KSN principles'. As we have seen, the only way of falsifying his theory that Koutsoudas recognizes as valid is by showing that there is such a set of rules. Our cases constitute counterexamples of types (a), (e), and (f), according to the classification given in Section 1.2.

We also present some problems relating to these counterexamples. We have added a case that is only an apparent counterexample of type (a), but which is of relevance here because it confronts us with a wrong analysis made by Koutsoudas in his 1978 article.

##### 4.1 Counterexamples of type (a)

Counterexamples of type (a) meet the following condition: 'A pair of empirically well-motivated rules not in a stifling relation can potentially apply simultaneously, but must not be allowed to do so.'

##### 4.1.1. Karok

Koutsoudas (1980:21) states that Obligatory Precedence correctly predicts the application of two rules in Karok:

- (1) *Palatalization*  
 $s \rightarrow f / \begin{bmatrix} - \text{cons} \\ - \text{back} \\ + \text{high} \end{bmatrix}$  (C) \_\_\_\_\_
- (2) *Vowel Reduction*  
 $V \rightarrow \emptyset / V \text{ \_\_\_\_\_}$

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For an underlying form like *mi + apsu:n* ‘your snake’ this principle requires the following derivation:

	<i>mi + apsu:n</i>
V. Red.	<i>mi + psu:n</i>
Pal.	<i>mi + pʃu:n</i>
output	<i>mipʃu:n</i>

Kenstowicz and Kisseberth (1977: 165), quoting the same source as Koutsoudas – (Bright, 1957) – give the same derivation for *mipʃu:n* but they also give another paradigm for which the same principle would make the wrong prediction:

<i>ʔifva:k</i>	‘chin’	cf.	<i>ʔapsu:n</i>	‘snake’
<i>mifva:k</i>	‘your chin’		<i>mipʃu:n</i>	‘your snake’
<i>musva:k</i>	‘his chin’		<i>mupsu:n</i>	‘his snake’

If we look at the underlying form *mu + isva:k*, we see that it can undergo either rule, but the surface form shows us that it must not be allowed to undergo Palatalization.

Stiffing is not applicable here. The SD of neither rule properly includes that of the other. Therefore we must turn to Obligatory Precedence. This principle instructs us to apply both rules simultaneously, because their structural descriptions are both met.

This would give us:

<i>mu + isva:k</i>
↓↓
Øʃ
 *[ <i>muʃva:k</i> ]

So, while the derivation of *mi + apsu:n* was well-fitted to serve as an illustration of Obligatory Precedence, the derivation of this latter form seems to point out the weakness of that principle. It is rather striking that Koutsoudas mentions only the example that supports his theory, and omits all mention of a paradigm where his principles fail. However, as we said in our introductory remarks to this section, the Karok case is only an apparent counterexample to Koutsoudas’ theory. Nearly all the exceptions to the rule that *s* preceded by *i* (with an optionally intervening consonant) is *ʃ* on the surface are English loanwords, so we can reasonably take Palatalization to be an allophonic rule. The Morphophonemic-Allophonic Principle will then predict the correct derivations for both *mi + apsu:n* and *mu + isva:k*, because in both cases it will require the precedence of the Vowel Reduction rule, thereby rendering Palatalization inapplicable to the latter form. It is odd that Koutsoudas did not in fact utilize these examples to illustrate his Morphophonemic-Allophonic Principle. From his ignoring the paradigm of *ʔifva:k* in

his illustration of Obligatory Precedence we may at least conclude that he had not realized the relevance of the M.-A. Principle in Karok.

4.1.2. *Yawelmani*

Iverson (1976) has demonstrated that the KSN principles fail in their prediction of the order of application of the rules of Shortening and Epenthesis.

$$\begin{array}{l} \text{Shortening } V \rightarrow [-\text{long}] / \text{ \_\_\_\_ } C \left\{ \begin{array}{l} C \\ \# \end{array} \right\} \\ \text{Epenthesis } \emptyset \rightarrow i / C \text{ \_\_\_\_ } C \left\{ \begin{array}{l} C \\ \# \end{array} \right\} \end{array}$$

As both rules must be regarded as morphophonemic, the Morphophonemic-Allophonic Principle cannot, as in the case of Karok, solve the problem.

If we take an underlying form /ʔa:ml-hin/ 'helps', only Epenthesis must be allowed to apply, yielding [ʔa:milhin]. However, as there is no proper inclusion of the SD of the one rule in that of the other, Obligatory Precedence would demand simultaneous application of the rules, giving [\*ʔamilhin].

Trommelen and Zonneveld (1977) suggest amending the Epenthesis rule by adding a V to the left of the SD. This would cause proper inclusion of the structural description of Shortening by that of Epenthesis, so that Stiffing would be triggered. By this principle, only Epenthesis would be allowed to apply, giving – as we saw above – the correct surface form. The question is whether this complication of the rule is well-motivated. Trommelen and Zonneveld claim that this addition ALTHOUGH APPARENTLY IRRELEVANT FOR YAWELMANI (emphasis ours) may be crucial for languages with clusters of four (consonants) or more. If an addition to a rule is irrelevant within a particular language one is justified in asking whether it will be permitted by the evaluation metric. Their claim that this addition 'actually removes an ambiguity from the structural description of the rule' is true. This can be seen by examining the outcome of the application of the Epenthesis rule in its different formulations to an underlying sequence like /VCCCCV/:

$$\begin{array}{l} \text{SD: } VC \text{ \_\_\_\_ } CC \qquad C \text{ \_\_\_\_ } CC \\ \quad \overline{VCCCC}CV \qquad \quad \overline{VCCCC}CV \qquad \text{or} \qquad \overline{VCCCC}CV \\ 1. \quad VC\overline{VCCCC}V \qquad 1. \quad VC\overline{VCCCC}V \qquad [VCCVCCV] \\ 2. \quad [VCV\overline{VCCCC}V] \qquad 2. \quad [VCV\overline{VCCCC}V] \end{array}$$

Thus the SD C\_\_\_\_CC admits of two different interpretations. On the other hand, it can easily be verified that the addition of a (C) to the SD also makes a disambiguating difference, and has the advantage that it caters for the fact that it is unclear that /..CC+CC../ sequences could never arise in Yawelmani. In Newman (1944) there are three suffixes with initial consonant cluster: *-mliwis* (reciprocal noun for relationship terms), *-lsa:* (causative-repetitive suffix), and *-hne:l* (passive consequent adjunctive). Next there is the

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fact that Kisseberth (1970) gives TWO consonant deletion rules for Yawelmani:

$$C \rightarrow \emptyset / CC + \_\_\_\_ \\ \text{and } C \rightarrow \emptyset / C + \_\_\_\_ C$$

which together suggest that the possible occurrence of four consonant clusters must not be altogether excluded.

In the same article, Kisseberth mentions a rule which deletes short vowels in the context VC\_\_\_\_CV. This would mean that in the derivation of /VCCCCV/ forms (see schema) the first V inserted by the Epenthesis Rule, in the first two formulations, would be deleted again, giving [VCCVCCV].

The same result can be achieved in a more straightforward manner if we take the SD of Epenthesis to be: (C)C\_\_\_\_CC, because then the rule only has to apply once to VCCCCV structures. If we prefer this solution to that proposed by Trommelen & Zonneveld for Yawelmani, we are back exactly where we started: Koutsoudas' principles fail for this language (a type (a) counterexample), and as far as we are aware he has not come up with another analysis of the Yawelmani data since 1976.

4.2. Counterexamples of type (e)

We will present three counterexamples of type (e): 'a pair of well-motivated rules must apply in a counter-feeding order'. They can be found in Javanese, the Bantu language Mwera and Scottish English. The second of these examples will be treated in relation with another question of theoretical relevance, i.e. that of vacuous rule application.

4.2.1. Javanese

According to data given by Hirschbühler (1978), there exists a rule of consonant tensing in Javanese:

*Consonant Tensing*

$$C \rightarrow [+tense] / \_\_\_\_ \left\{ \begin{array}{l} C \\ \# \\ -ipun \\ -ake \end{array} \right\}$$

Examples of the functioning of the rule can be found in the following forms:

- /murid/ murIt 'a student'
- /murid + mu/ murItmu 'your student'
- /godog + ake/ gɔdɔkake (causative form of /godog/, 'boil')

Javanese also has a rule of reduplication, which marks plurality in forms such as the following:

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/murid + murid/ murItmurIt 'students'  
/murid + murid + e/ muridmuride 'the students'  
/murid + murid + mu/ murItmurItmu 'your students'

Both rules are clearly morphophonemic. Consonant Tensing is morphophonemic because Javanese has also underlyingly tense consonants in the environment in which this rule operates. Rules of reduplication are always morphophonemic; in the Javanese case support for this point of view can be found in the existence of a non-reduplicated form like:

/oyoloyol/ oyɔɔɔyɔɔl '(kind of biscuit)'

which means that there is a 'neutralization' between forms of this type and truly reduplicated forms.

Now let us look at the way these two rules interact. Consider the form

muridmuride

The second syllable of this form does not have a tensed final consonant as we would expect. Apparently, Consonant Tensing has not applied. So we must infer that this rule is ordered before Reduplication.

When we consult the three principles proposed by Koutsoudas, we find that they fail to predict the right order of the two rules under consideration. The Morphophonemic-Allophonic principle does not apply because both rules are morphophonemic; neither does Stiffing, because there is no proper inclusion of the structural description of either rule in the structural description of the other; finally, Obligatory Precedence predicts the wrong order. The two rules must therefore apply in a counter-feeding order, which forces us to conclude that this is a counter-example of type (e).

#### 4.2.2. *Mwera*

In Mwera (Kenstowicz & Kisseberth, 1977) the singular and plural of a certain noun class are marked by the prefixes /lu-/ and /N-/ respectively, where /N-/ stands for a nasal homorganic with the root-initial consonant, cf.

lu-juci / ñ-juci 'bee/bees'  
lu-gomo / ŋ-gomo 'lip/lips'

A rule of cluster simplification optionally deletes a voiced stop after /N-/:

ñ-juci ~ ñ-uci 'bees'  
ŋ-gomo ~ ŋ-omo 'lips'

The other rule we are interested in voices voiceless stops following nasals. Its operation can be seen in other plural forms:

lu-kuya / ŋ-guya 'Cape bean/plur.'  
lu-pundo / m-bundo 'piece of string/plur.'

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Since obviously both rules must be considered morphophonemic in Koutsoudas' terms, we cannot consult the Morphophonemic-Allophonic Principle to determine the order in which these rules must be applied.

Formalization of the rules shows that the structural description of Post-Nasal Stop Voicing properly includes the structural description of Cluster Simplification:

*Cluster Simplification (OPT)*

$$\begin{bmatrix} + \text{ cons} \\ - \text{ cont} \\ + \text{ voi} \end{bmatrix} \rightarrow \emptyset / [+ \text{ nas}] \text{ \_\_\_\_\_\_}$$

*Post-Nasal Stop Voicing (OBL)*

$$\begin{bmatrix} + \text{ cons} \\ - \text{ cont} \end{bmatrix} \rightarrow [+ \text{ voi}] / [+ \text{ nas}] \text{ \_\_\_\_\_\_}$$

What do the Koutsoudas principles predict for this pair of rules? The underlying (or, more accurately perhaps, the intermediate) forms we are concerned with are /ŋ-gomo/ and /ŋ-kuya/. In the case of /ŋ-kuya/, Stifling is irrelevant because /ŋ-kuya/ only meets the structural description of Post-Nasal Stop Voicing. Obligatory Precedence then requires us to apply the rules whenever their structural descriptions are met. This gives us:

	/ŋ-kuya/	
PNSV	ŋ-guya	
CS	ŋ-uya	CS not applied
	*[ŋuya]	[ŋ-guya]

We see that only non-application of the optional rule of Cluster Simplification gives the correct surface forms. Within the framework of an extrinsic ordering theory we could simply say that the rules must be applied in a counter-feeding order; within the KSN theory there is no legitimate way to restrain Cluster Simplification. So we have here a type (e) counter-example.

These data also bear upon the question of vacuous rule application. Consider the following form:

/ŋ-gomo/

The application of PNSV to this form would be vacuous. If we allow this type of rule application, the principle of Stifling will prescribe the application of the rule with the 'longest' SD, i.e. Cluster Simplification, to the exclusion of Post-Nasal Stop Voicing.

	/ŋ-gomo/
CS	ŋ-omo
	[ŋomo]

If we forbid vacuous application of rules – Koutsoudas doesn't seem to take a stand in the matter – then only Cluster Simplification will be able to apply, given Obligatory Precedence. In this case, whether we allow vacuous rule application or not, makes no difference as to the outcome: [ŋomo]. But it seems desirable, to say the least, that the principles predict the application of any set of rules unambiguously.

#### 4.2.3. *Scottish English*

Apart from being a counter-example against UDRA, the example given in Section 3.1 also provides us with a type (e) counter-example. For this, we must look at dialect B and examine the derivation of *wives*, [wʌivz].

	<i>Dialect B</i>			<i>Dialect A</i>	
	wʌif#z	hʌiv#z		wʌif#z	hʌiv#z
AYE	.....	haevz	Fric.Voi.	wʌivz	.....
Fric.Voi.	wʌivz	.....	AYE	waevz	haevz
	[wʌivz]	[haevz]		[waevz]	[haevz]

We see that AYE-Distribution has not applied during the derivation, because it is ordered before Fricative Voicing. As we have seen in Section 3.1, the Morphophonemic-Allophonic Principle and Stiffing are not applicable here, and Obligatory Precedence predicts the wrong order, because we are faced here with a counter-feeding relationship. So this constitutes yet another counterexample of type (e).

#### 4.3. *Three counter-examples of type (f)*

We will now give three counter-examples of type (f): 'an allophonic rule must take precedence over a morphophonemic one'. Our examples are to be found in Javanese, American English and Danish.

##### 4.3.1. *Javanese*

Let us recall from Section 4.2.1 the rule of Reduplication of Javanese, which marked plurality in forms such as the following:

/murid + murid/ murItmurIt 'students'  
 /murid + murid + e/ muridmuride 'the students'  
 /murid + murid + mu/ murItmurItmu 'your students'

As we have seen, this rule is morphophonemic.

Another rule of Javanese is that of Close Laxing, which laxes high vowels in closed syllables. Compare:

/murid/ murIt 'a student'  
 /murid + e/ muride 'the student'



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The forms [murItmurIt] and [murItmurItmu] also display the functioning of this rule. Hirschbühler (1978) formulates this rule as follows:

##### *Close Laxing*

$$\begin{bmatrix} V \\ +hi \end{bmatrix} \rightarrow [-tense] / \text{---} C. (. = \text{syllable boundary})$$

Close laxing is an allophonic rule, because there are no underlyingly lax vowels in Javanese. Now consider the form [muridmuride]. It has a closed second syllable but no lax vowel. To explain this form, we have to assume that the allophonic rule of Close Laxing is ordered before Reduplication – a clearly morphophonemic rule, as we have seen. This is a breach of the Morphophonemic-Allophonic principle and thus a counter-example of type (f).

##### 4.3.2. *American English*

Let us turn to an example provided by Anderson (1975). In certain American dialects there are present the two rules of Vowel Lengthening and Flapping:

##### *Vowel Lengthening*

$$V \rightarrow [+long] / \text{---} \begin{bmatrix} +cons \\ +voi \end{bmatrix}$$

##### *Flapping*

$$\begin{bmatrix} -son \\ -cont \\ +cor \\ +ant \end{bmatrix} \rightarrow D / V \text{---} \begin{bmatrix} V \\ -str \end{bmatrix}$$

Anderson (1975) claims that the former rule is insufficient when one examines the full range of phenomena involved. He quotes House and Fairbanks (1953) for details of the influence on vowel length of following consonants. While voicing of the consonant plays the most influential role, other aspects may also play their part. Taking the shortest length observed as basic – that before [p] and [k] – we find the following additive and subtractive effects:

Basic Length:	160 ms.
/---[+cor]	+ 20 ms.
/---[+cont]	+ 35 ms.
/---[+voice]	+ 80 ms.
/---[+nas]	- 10 ms.

How this rule should be formulated will remain doubtful as long as phonetic rules receive so little study, but it is clear that the description of the various values of the feature [long] will not be in  $\pm$  terms.

In other words, as Anderson says, what we have here is a phonetic detail

rule – a rule manipulating *n*-ary values of features instead of binary values. Whatever the exact shape of this rule, however, we will continue to accept it as formulated above, the difference being irrelevant to us here.

Now let us look at the prediction which the Koutsoudas principles make about the order of the two rules. First, we must consult the Morphophonemic-Allophonic Principle. As it stands the rule of Flapping is a morphophonemic rule. This rule would change, for example, (a) to (b):

- (a)  $V t \begin{bmatrix} V \\ -str \end{bmatrix}$   
 (b)  $V D \begin{bmatrix} V \\ -str \end{bmatrix}$

But the latter form could equally well be derived from (c):

- (c)  $V d \begin{bmatrix} V \\ -str \end{bmatrix}$

Therefore, the rule is morphophonemic. The rule of Vowel Lengthening however, involves no neutralization, and is, therefore, an allophonic rule. Koutsoudas' Morphophonemic-Allophonic principle would forecast the order to be Flapping first and Vowel Lengthening second. In this dialect words like *writer* end up with a short vowel preceding a flap, in this case [rajDər]. But this is not what would be forecast. We get derivations like the following:

	/rajd + əɾ/	/rajt + əɾ/
V-Lengthening	a:	.....
Flapping	D	D
	[ra:jDər]	[rajDər]

Inasmuch as this is not the order we would expect from the Morphophonemic-Allophonic principle we have here another type (f) counterexample.

#### 4.3.3. Danish

The Danish counter-example is provided by Anderson (1975) and concerns the allophones of /a/. His source is Basbøll (1972). The example as we give it here is based on these two articles as well as on information from native speakers. According to Anderson and our informants, we may distinguish the following allophones:

furthest back	/_____ tautosyllabic r
next most back	/_____ tautosyllabic velars
slightly more front	/_____ tautosyllabic labials
furthest front	/_____ { coronals } (.= syllable boundary)

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Basbøll (1972) doesn't distinguish between the qualities of /a/ before velars and before labials, but that is irrelevant to us here. Here, we only need to occupy ourselves with two types: that before velars, given by Basbøll and Anderson as [a], and that before coronals, which they give as [a]. The rule describing the backness or frontness of /a/ is obviously not one operating in  $\pm$  terms, but is again a numerical rule.

Another rule of Danish is the rule of nasal assimilation, which is optional in compounds; it converts coronal nasals into noncoronal nasals (i.e. assimilates them) before noncoronal obstruents in compounds. A case where both these rules are involved is the following:

sand + krabbe	[sanʔ] + [krabə]	'sand crab'
sang + kreds	[saŋʔ] + [krɛʔs] <sup>8</sup>	'song cycle'

Basbøll and Anderson do not formulate the rules required here, but it is plain enough that the rule specifying the backness or frontness of short /a/ is an allophonic rule in terms of the Morphophonemic-Allophonic Principle, because no neutralization is involved. The rule of Nasal Assimilation, on the other hand, is a morphophonemic rule by the same principle. This rule will change the coronal nasal in *sandkrabbe* into a velar one. However, there is also the possibility of an underlying velar nasal in this position, which we have in *sangkreds* or in the hypothetical *sangkrabbe*. The phonetic forms assumed by the compounds are:

sandkrabbe	[saŋkrabə]
sangkreds	[saŋkrɛʔs]
sangkrabbe	[saŋkrabə]

This means that there too, the allophonic rule (in Koutsoudas' terms) has preceded the morphophonemic one, and that we are once again faced with a counter-example of type (f).

#### 5. CONCLUSION

In this article we have attempted to challenge the hypothesis that no explicit ordering of phonological rules is required in generative phonology. As Koutsoudas (1980) says, this hypothesis is independent of the individual principles which may be posited to forecast the precise order of application of phonological rules. We have therefore addressed ourselves both to the more general hypothesis (UDRA), and to the individual principles utilized by Koutsoudas. Against UDRA we have adduced two counter-examples – from Scottish English and Canadian English. As far as the various kinds of

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[8] Basbøll and Anderson use here the hypothetical *sangkrabbe* 'song crab'.

counter-examples against the individual principles are concerned we have given one Type (a) counter-example (against Obligatory Precedence) from Yawelmani. Also against Obligatory Precedence we have three Type (e) counter-examples – from Javanese, Mwera, and Scottish English. We also have three counter-examples against the Morphophonemic-Allophonic Principle (type f) – from Javanese, North American English and Danish.

We have shown that neither the KSN theory nor the general principle on which it is based can be maintained. Our conclusion is therefore that the explicit statement of rule order is an inherent feature of language.

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