DISENCHANTMENT WITH PROPER INCLUSION RULE APPLICATION PRINCIPLES

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Proponents of intrinsic rule ordering have offered a hypothesis known as Proper Inclusion Precedence as a universal constraint on rule application. Koutsoudas, Sanders, and Noll 1974 state Proper Inclusion Precedence as follows (8-9):

1) Proper Inclusion Precedence
   'For any representation R which meets the structural description of each of two rules A and B, A takes applicational precedence over B if the structural description of A properly includes the structural description of B.'

   'The structural description of a rule B is PROPERLY INCLUDED in the structural description of a rule A if and only if the structural description of B can be placed upon the structural description of A with some part of the structural description of A left' over.''

Koutsoudas, Sanders, and Noll (hereafter KSN) illustrate the predictions of the principle with an interaction involving two Latin American Spanish rules, restated here in terms of feature specifications.

2) Final Depalatalization (FD) Palatal laterals are depalatalized word-finally.

$$\begin{bmatrix} + \text{ lat, } - \text{ cor} \end{bmatrix} \# \qquad \tilde{1} \ \#$$
$$\Downarrow \qquad\qquad\qquad \downarrow$$
$$\begin{bmatrix} + \text{ ant, } + \text{ cor, } - \text{ hi} \end{bmatrix} \qquad 1$$

3) Delateralization (D) Palatal laterals are delateralized everywhere.

$$\begin{bmatrix} + \text{ lat, } - \text{ cor} \end{bmatrix} \qquad\qquad \tilde{1}$$
$$\Downarrow \qquad\qquad\qquad \downarrow$$
$$\begin{bmatrix} - \text{ voc, } - \text{ cons, } - \text{ lat} \end{bmatrix} \qquad j$$

The representation $ak\tilde{e}l$ 'that' meets the structural description of each of the two rules. Since the SD of Final Depalatalization, $[+ \text{ lat, } - \text{ cor}] \#$, properly includes that of Delateralization, $[+ \text{ lat, } - \text{ cor}]$, Proper Inclusion Precedence predicts—correctly—that Final Depalatalization takes applicational precedence over Delateralization, as in 4a). This prevents the incorrect order of application shown in 4b).

4) a) /akel̃/ 'that'   b) /akel̃/

    akel   FD   akej   D

    ----   D (bled)   ----   FD (bled)

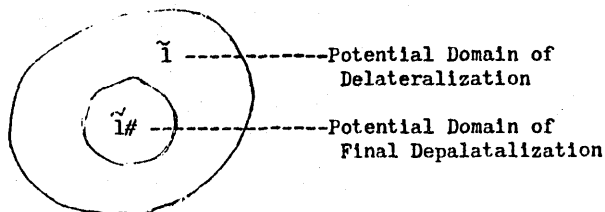   [akel]   *[akej]

The only explanation that has been offered for Proper Inclusion Precedence (hereafter PIP) is the observation that the more general of a pair of rules in a proper inclusion relationship cannot possibly apply so as to block application of the more restricted rule. The structural description of the more restricted rule in a proper inclusion relationship does not qualify the more restricted rule to apply to any representations other than those to which the more general rule is also qualified to apply. Therefore, if the more general rule did apply so as to block application of the more restricted rule, the more restricted rule would fail to apply anywhere and could not consequently be considered a rule of the grammar. Since the more restricted rule in a proper inclusion relationship is indeed a rule of the grammar if it is stated at all, it therefore follows that the application of such a rule must take precedence over a potentially bleeding application of the more general rule in the relationship.

A distinction between the 'potential domain' of a rule and the 'actual domain' of a rule will facilitate discussion of proper inclusion relationships between the structural descriptions of rules. The 'potential domain (of application) of a rule' is the set of objects referred to by the rule's structural description. The 'actual domain (of application) of a rule' is not determined solely by the structural description of the rule, since in a rule ordering framework, there is a possibility of a rule's being bled or counterfed, so that it fails to apply to some representations that match its structural description. The 'actual domain (of application) of a rule' in a rule ordering framework, then, is the set of representations which match the rule's structural description, minus the representations to which its application is prevented by the bleeding or counterfeeding applications of other rules.
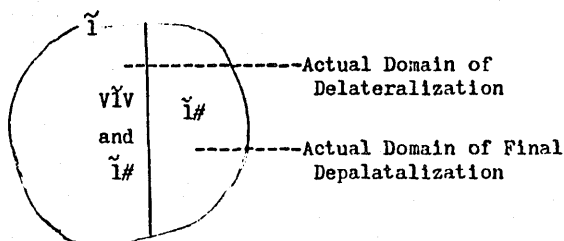
The Latin American Spanish rules can be used to illustrate the distinction between the notions 'potential domain' and 'actual domain'. The potential domains of the two rules are those shown in 5), on the following page. The actual domain of application of Final Depalatalization is [+ lat, + cor] #--identical to its potential domain, since no applications of Final Depalatalization are bled or counterfed by applications of another rule. On the other hand, the actual domain of application of Delateralization is something like 'V [+ lat, - cor] V and

$\#\left[+ \text{lat}, - \text{cor}\right]$,' since this is what is left over after Final
Depalatalization bleeds Delateralization. Although the poten-
tial domains of the two rules are in the inclusion relationship
shown in 5), the actual domains are complementary, as shown in
6).

5) Inclusion Relationship of Potential Domains of Latin
   American Spanish Rules

ĩ ----------------Potential Domain of
                    Delateralization

ĩ# ----------------Potential Domain of
                     Final Depalatalization

6) Complement Relationship of Actual Domains of Latin
   American Spanish Rules

ĩ --------------Actual Domain of
vĩv   ĩ#   Delateralization

and

ĩ#   ----------Actual Domain of Final
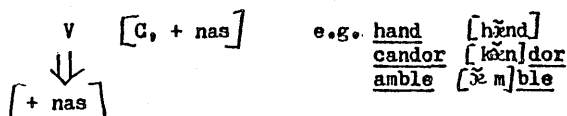   Depalatalization

   Beyond the distinction between the two types of domains,
the Latin American Spanish situation illustrates, more impor-
tantly, how the predictions of Proper Inclusion Precedence fol-
low from the explanation that rules have to apply somewhere.
Since the potential domain of application of Delateralization
includes the potential domain of Final Depalatalization, as shown
in 5), and since application of Delateralization before Final
Depalatalization would bleed application of the latter, as shown
in 4b), it follows that Delateralization applied before Final
Depalatalization would 'absolutely bleed' the application of
Final Depalatalization. That is, prior application of Delater-
alization would effectively remove every object in the poten-
tial domain of Final Depalatalization. There would then be no-
thing left to which Final Depalatalization could apply. But Fi-
nal Depalatalization, being a rule of the grammar of Latin Amer-
ican Spanish, must apply to something. It therefore follows
that, to avoid being absolutely bled, Final Depalatalization
must take applicational precedence over Delateralization, as PIP
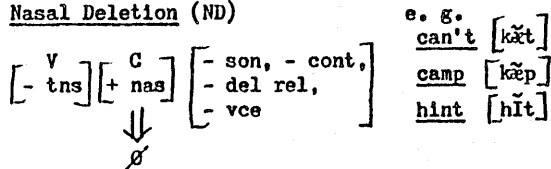correctly predicts.

The explanation that a rule has to apply somewhere would seem to be very satisfactory motivation for the predictions of PIP. However, the formulation and the predictions of Proper Inclusion Precedence are not, in fact, entirely consistent with this explanation. By not allowing for the fact that applicational precedence of the more general rule in a proper inclusion relationship would not necessarily entail bleeding of the more restricted rule in that relationship, PIP overstates a linguistically significant generalization. This generalization is the fact that among the 'more restricted' rules in proper inclusion relationships, it is precisely the rules which are potentially bled by their 'more general' counterparts that must take applicational precedence in order to exist.

The overstatement of PIP can be illustrated with a pair of rules originally presented in Malécot 1960 and discussed later in Chomsky 1964. Some varieties of American English have the rule 7a), which nasalizes a vowel before a nasal consonant, and the rule 7b), which deletes a nasal consonant that is both preceded by a lax vowel and followed by an unvoiced stop.

7) a) <u>Vowel Nasalization</u> (VN)

$$V \quad [C, + nas]$$
$$\Downarrow$$
$$[+ nas]$$

e.g. <u>hand</u> $[h\tilde{æ}nd]$
<u>candor</u> $[k\tilde{æ}n]dor$
<u>amble</u> $[\tilde{æ}m]\underline{ble}$

b) <u>Nasal Deletion</u> (ND)

$$\left[\begin{array}{c} V \\ - tns \end{array}\right] \left[\begin{array}{c} C \\ + nas \end{array}\right] \left[\begin{array}{c} - son, - cont, \\ - del rel, \\ - vce \end{array}\right]$$
$$\Downarrow$$
$$\emptyset$$

e. g.
<u>can't</u> $[k\tilde{æ}t]$
<u>camp</u> $[k\tilde{æ}p]$
<u>hint</u> $[h\tilde{I}t]$

(Chomsky: 96; Malécot: 22-9)

Since the potential domain of Vowel Nasalization, $V[C, + nas]$, properly includes that of Nasal Deletion, $[V, - tns][C, + nas][- son, - cont, - del rel, - vce]$, it follows that if Vowel Nasalization took applicational precedence such that it bled Nasal Deletion, it would then bleed all possible applications of Nasal Deletion. There is no danger of this, however, since Vowel Nasalization is <u>not</u> potentially bleeding with respect to Nasal Deletion. That is, prior application of Vowel Nasalization could not possibly diminish the input to Nasal Deletion. For example, both /kæmp/, underlying form for <u>camp</u>, and kǣmp, the result of applying Vowel Nasalization to the underlying form, match the structural description of Nasal Deletion. Therefore, Nasal Deletion would not have to apply before Vowel

Nasalization to preserve its existence. It could still be a rule
of the grammar if it were to apply after Vowel Nasalization--
which it in fact does, contrary to the prediction of Proper In-
clusion Precedence.

Since the structural description of Nasal Deletion properly
includes that of Vowel Nasalization and since both SD's are met
by a representation such as /kæmp/, Proper Inclusion Precedence
incorrectly predicts that Nasal Deletion takes precedence over
Vowel Nasalization in applying to such forms. This incorrect
prediction is shown in 8a), with the correct prediction in 8b).

8) a) /kæmp/   camp   b) /kæmp/

         kæp   ND   kæ̃mp   VN

         ----   VN   kæ̃p   ND

        *[kæp]   [kæ̃p]

By overstating the generalization appropriate to the interaction
of rules in a proper inclusion relationship, PIP incorporates the
false prediction of 8a). Another example of a false prediction
stemming from the overstatement follows.

Kenstowicz and Kisseberth (1979: 193-6) consider two rules
of Klamath, borrowing data from Barker 1963. A rule of vowel
harmony changes the vowel of the causative prefix sne- to the
vowel of the following verb stem. And a rule of vowel elision
deletes the first vowel of the verb stem to which the prefix is
attached, if the vowel is short.[1]

9) a) Vowel Harmony (VH)

         s n V]$_{CAUSATIVE}$ + C$_0$ V]$_{VERB STEM}$

         1 2 3   4 5 6

    $\Rightarrow$1 2 6   4 5 6

    e. g. ge:ʝ́ig-a 'is tired'
              sne-ge:ʝ́ig-a 'makes tired'
          qdo:č-a 'it rains'
              sno-qdo:č-a 'makes it rain'
          m'a:s?-a 'is sick'
              sna-m'a:s?-a 'makes it sick'

9) b) <u>Elision</u> (E)

$$\text{s n v}]_{\text{CAUSATIVE}} + C_0 \begin{bmatrix} V \\ -\text{long} \end{bmatrix}]_{\text{VERB STEM}}$$

1 2 3   4 5   6

1 2 3   4 5 $\emptyset$

e. g. <u>wet-a</u> 'laughs'   <u>sne-wt-a</u> 'makes laugh'

Since the structural descriptions of both Vowel Harmony and Eli-
sion are met by the underlying form /sne + nqot'-a/ 'scorches
something' (cf. nqot'-a 'scorches'), and since the structural
description of Elision properly includes that of Vowel Harmony,
Proper Inclusion Precedence makes the counter-to-fact prediction
shown in 10a), by which Elision takes applicational precedence
over Vowel Harmony. The correct application of the rules is
shown in 10b).

10) a) /sne + nqot'-a/   b) /sne + nqot'-a/

        sne + nqt'-a   E   sno + nqot'-a   VH

        ------------   VH   sno + nqt'-a   E

        *$\begin{bmatrix} \text{snenqt'a} \end{bmatrix}$ $\begin{bmatrix} \text{snonqt'a} \end{bmatrix}$

The counterexamples might be discredited by arguing that
the rules involved have not been stated correctly. What this ap-
proach involves is finding different formulations of the rules,
for which Proper Inclusion Precedence is not applicable, and as-
serting that since the new formulations, rather than the counter-
exemplifying statements, are the only correct statements of the
rules, the alleged counterexamples really do not falsify PIP at
all. For example, the 'more restricted' rule in the falsifying
English example could be restated as in 11), adding the specifi-
cation [+ nas] to the initial position of the SD.

11) Nasal Deletion, restated

$$\begin{bmatrix} V, & -\text{tns}, & +\text{nas} \end{bmatrix} \begin{bmatrix} C, & +\text{nas} \end{bmatrix} \begin{bmatrix} -\text{son}, & -\text{cont}, & -\text{del rel} \\ -\text{vce} \end{bmatrix}$$
$$\Downarrow$$
$$\emptyset$$

Since a vowel is, after all, nasalized before a nasal stop by
the other American English rule, this restatement of Nasal Dele-
tion is as observationally adequate as the earlier statement of
Nasal Deletion. The structural description of Nasal Deletion,
restated, still properly includes that of Vowel Nasalization,

but it is no longer the case that the SD's of both rules are
matched by underlying representations such as /kæmp/. Since
now only the SD of Vowel Nasalization is met by this form, PIP
no longer incorrectly predicts that Nasal Deletion must pre-
cede Vowel Nasalization in applying to the forms. By the same
policy of restatement, the Klamath counterexample could also be
dismissed.

    Thus, a rule-writing policy which required these counter-
examples to be stated in a form to which PIP is inapplicable,
would save the hypothesis. However, any such policy would ex-
clude every conceivable counterexample to PIP, as the following
considerations will show. In any pair of rules, the rules must
be related in one or more of the ways shown in 12).

            12) Possible Relationships of Rules

                a) Feeding
                b) Counterfeeding
                c) Mutually non-affecting
                d) Bleeding
                e) Counterbleeding

    Consider the possibilities of any of these relationships
coinciding with a proper inclusion relationship in a way that
is relevant to the predictions of PIP.

            13) Observations
                a) No rules in a feeding relationship with res-
                   pect to some representation R are in a proper
                   inclusion relationship with respect to the re-
                   presentation R, since by the definition of
                   'feeding,' the structural description of one of
                   the two rules in such a feeding relationship is
                   not matched by R.
                b) Similarly, no rules in a counterfeeding rela-
                   tionship with respect to some representation R
                   are in a proper inclusion relationship with
                   respect to that representation, since by the
                   definition of 'counterfeeding,' the structural
                   description of one of the rules in such a rela-
                   tionship is not matched by R.
                c) No rules in a mutually non-affecting relation-
                   ship with respect to some representation R are
                   relevant to PIP, since in such cases, applica-
                   tional precedence of one rule is empirically
                   indistinguishable from applicational precedence
                   of the other.
                d) 1) The more general rule in a proper inclusion
                      relationship with respect to some represen-
                      tation R could not possibly bleed the more

> restricted rule so as to falsify PIP, since
> that would exclude the more restricted rule
> from the grammar, contrary to the fact of
> its existence.
>
>   ii) It is conceivable (and demonstrable, as with
>   the Latin American Spanish example) that the
>   more restricted rule in a proper inclusion
>   relationship with respect to some represen-
>   tation R, could bleed the more general rule
>   --which would corroborate PIP.
>
> e)   i) It is conceivable (and demonstrable, as with
>   the Latin American Spanish example) that the
>   more general rule in a proper inclusion rela-
>   tionship with respect to some representation
>   R, could counterbleed the more restricted
>   rule, which would also corroborate PIP.
>
>   ii) Finally, it is conceivable (and demonstrable,
>   as with the American English example) that
>   the more restricted rule in a proper inclu-
>   sion relationship with respect to some re-
>   presentation R, could counterbleed the more
>   general rule, which would <u>falsify</u> PIP.

The possibilities a-e, though not mutually exclusive, are exhaustive. Only the last case, 13e ii)--which includes my counterexamples--permits falsification of PIP. Feeding and counterfeeding relationships never coincide with proper inclusion relationships, mutually non-affecting relationships are ir-relevant to PIP, bleeding relationships can only corroborate rather than falsify PIP (cf. 13d), and counterbleeding rela-tionships in which the more general rule of a proper inclusion relationship counterbleeds can only corroborate PIP. Therefore, any conceivable counterexample to PIP must have the same form as my counterexamples: there must be two rules in a proper inclu-sion relationship with respect to some representation R such that the more general rule is counterbled by the more restricted rule. It follows that any rule-writing policy which excludes my counterexamples will exclude any conceivable counterexamples to Proper Inclusion Precedence.

Given the above conclusion, the status of Koutsoudas, San-ders, and Noll's hypothesis is contingent on the rule-writing po-licy which they adopt. One of the situations described in 14) must obtain.

> 14) a) Koutsoudas, Sanders, and Noll have no consis-
>   tent rule-writing policy.
>
>   b) The rule-writing policy which KSN assume ex-
>   cludes counterexamples to PIP.
>
>   c) The rule-writing policy which KSN assume per-
>   mits counterexamples to PIP.

If 14a) is the case, KSN's claim is mystical, rather than
scientific. If 14a) is the case, then it is not clear, in prin-
ciple, how PIP could be falsified or even whether it could be
falsified. Any conceivable counterexamples to PIP may be writ-
ten in a form to which PIP is inapplicable by adding informa-
tion to the structural description of the more restricted rule
of the counterexample, as was demonstrated with the American
English example. (Compare 7b) with 11).) Since a theory with no
consistent rule-writing policy does not make it clear whether
such information is to be added for any particular pair of po-
tentially falsifying rules, it is impossible to tell whether or
not the theory allows counterexamples to PIP. Given such a
theory, then, PIP can only be regarded as a mystical, rather
than a scientific hypothesis.

If 14b) is the case--if KSN assume a rule-writing policy
which excludes counterexamples--then PIP is true, but is not an
empirical hypothesis. If the rule-writing policy adopted per-
mits no counterexamples, then PIP is a necessary truth trivially
deducible from the rule-writing policy. It makes little sense,
in this case, to speak of 'falsifying' PIP, since the rule-writ-
ing policy guarantees that PIP is not falsifiable. If KSN in
fact assume a rule-writing policy which excludes counterexamples
to PIP, then this fact should be made public, so that knowledge
of the non-empirical, 'necessary truth' status of PIP will fore-
stall any confused talk of falsification.

Before considering the case 14c), a look, in general, at
rule-writing policies designed to make particular claims true,
may be suggestive about the desirability of 14b). Though an
'exclusive' rule-writing policy has the advantage of making PIP
true, it would seem ultimately to be undesirable. Even absurd,
counterintuitive hypotheses such as 'Only nasalization rules are
bleeding rules.' could be made true by adopting a suitable rule-
writing policy. A policy could be adopted, for example, such
that the potential domain of any rule which might, on some ana-
lysis, be bled by a non-nasalization rule, was restricted to the
rule's actual domain. This would effectively do away with any
non-nasalization bleeding rules, since a rule with a structural
description that describes no more than its actual domain cannot
be bled, given the definitions of 'bleed' and 'actual domain.'

Consider, for example, the rules in 15), which, as written,
must apply in the order shown in 16a), rather than as in 16b), to
achieve observational adequacy.

$$15) \text{ a) } \begin{bmatrix} + \text{ lat, } - \text{ cor} \end{bmatrix} \# \qquad \text{b) } \begin{bmatrix} + \text{ lat, } - \text{ cor} \end{bmatrix}$$
$$\Downarrow \qquad\qquad\qquad \Downarrow$$
$$\begin{bmatrix} + \text{ ant, } + \text{ cor, } - \text{ hi} \end{bmatrix} \qquad \begin{bmatrix} - \text{ voc, } - \text{ cons, } - \text{ lat} \end{bmatrix}$$

16) a) /akeĩl/   b) /akeĩl/

    akel   15a)   akej   15b)

    ----   15b) (bled)   ----   15a) (bled)

    $\left[\text{akel}\right]$ *$\left[\text{akej}\right]$

The potential domain of 15b) is $\left[+\text{ lat}, -\text{cor}\right]$. Since 15b) is bled, on the above observationally adequate analysis, by 15a), the actual domain of 15b) is '$\left[+\text{ lat}, +\text{ cor}\right]$ except $\left[+\text{ lat}, +\text{ cor}\right]\#$.' Because 15a), on the above analysis, is a bleeding non-nasalization rule, the rule writing policy under discussion requires 15b) to be restated as 17), such that the potential domain is identical to the actual domain.

17) $\left[+\text{ lat}, +\text{ cor}\right]\left[+\text{ seg}\right]$

$$\Downarrow$$

$$\left[\begin{array}{l}-\text{ voc}, -\text{ cons}, \\ -\text{ lat}\end{array}\right]$$

The required rule 17) is not bled by 15a): rule 17) interacts correctly with 15a) on either order of application, as shown in 18).

18) a) /akeĩl/   b) /akeĩl/
     ----   17)   akel   15a)
     akel   15a)   ----   17
     $\left[\text{akel}\right]$ $\left[\text{akel}\right]$

Thus, the rule-writing policy guarantees that particular rules will not refute the claim that only nasalization rules are bleeding rules. By stating any conceivable counterexamples in a form to which the claim at issue is inapplicable, a rule-writing policy such as this makes the claim at issue necessarily true.

No rule application principles which have been seriously proposed are as absurd as the one just considered. However, given the multiplicity of rule application hypotheses advanced in recent years, it seems doubtful that the quality of making a particular rule application hypothesis true can be regarded as sufficient justification for a rule-writing policy.

If 14c) is the case, PIP is obviously false, as shown by the English and Klamath examples. There is good reason to believe that 14c) is indeed the case. Clearly, KSN consider PIP to be an empirical hypothesis, since Koutsoudas 1980, for example, suggests how Proper Inclusion Precedence could be falsified (p. 23). If PIP is an empirical hypothesis, then the rule-writing policy which KSN assume permits conceivable counterexam-

ples. Consequently, the policy must permit the rule statements
of 7) and 9). It follows necessarily, then, that PIP is falsi-
fied by the English and Klamath rules in 7) and 9).

To summarize, it was argued that the American English and
Klamath examples presented here must stand as counterexamples to
Proper Inclusion Precedence, since the rule-writing policy of
Koutsoudas, Sanders, and Noll--as nearly as it can be determined
--permits the rules to be stated in their counterexemplifying
forms. It was pointed out that the absence of a consistent rule-
writing policy would make the claim of PIP vague to the point of
mysticism, since in the absence of a consistent rule-writing po-
licy, it would be impossible to determine how or even whether
PIP could be falsified. Further, it was pointed out that PIP
could be made true merely by specifying a suitable rule-writing
policy, though the justification for such a policy might be
questionable.

It is entirely possible that I have misconstrued KSN's in-
tentions, in which case I point to the lack of an explicit rule-
writing policy as the source of my error. If, in fact, contrary
to the impression given by talk of falsifying PIP, KSN assume a
rule-writing policy which guarantees the truth of PIP, they
should make their policy explicit enough to prevent confusion
about the possibility of falsifying PIP.

In conclusion, two of the observations which have been made
here can be generalized to other rule application hypotheses:
i) For those rule application hypotheses, the truth of which is
contingent on the choice of analysis in particular cases, it is
impossible to ascertain how or even whether such hypotheses
could be falsified (or corroborated) without a clearly stated,
consistent rule-writing policy. ii) A rule-writing policy which
excludes counterexamples to a particular hypothesis disqualifies
that hypothesis from status as an empirical hypothesis. Conse-
quently, the policy should be made as explicit as possible to
avoid confusion about the possibility of falsifying the hypothe-
sis.

NOTES

[1] I follow Barker in giving the underlying form of the caus-
ative prefix as /sne-/. Kenstowicz and Kisseberth do not present
the two rules in generative formalisms; the rule formulations 9a)
and 9b) are my own. Transformational format is used to avoid any
confusion as to whether Vowel Harmony and Elision participate in
a proper inclusion relationship. Note that if the structural
description of Vowel Harmony were given as $snV]_{CAUSATIVE} +$

$C_0V_1]_{VERB\ STEM}$, the proper inclusion relationship of the SD's of