LETTERS & REPLIES

A letter from Morris Halle

*Comments on Luigi Burzio's
The rise of optimality theory (Glot **1**, 6)*

I write to comment on a number of issues raised in the recent paper by Luigi Burzio "The Rise of Optimality Theory" (*Glot International* **6**).

Burzio begins his paper by recalling that in his classes of ca. 1976 Chomsky "would argue that writing a rule does not constitute a solution to a problem, but merely a statement of it." He finds this position incompatible with Chomsky's more recent statement that phonology is rule-based and that "the rules deriving the alternants *decide-decisive-decision* (..) are straightforward and natural at each step." In fact, there is no incompatibility between the two statements. Chomsky's point has always been that rules differ from mere statements of fact in that, unlike the latter, rules are subject to specific independently motivated constraints as to their form and to their interaction with one another. Thus, the validity of a rule is not established unless and until its manner of interaction with other rules has also been established. Because of this interaction, a rule-based account of a given state of affairs is always more than just the sum of the separate rules, but this can only be seen if more than one rule is involved.

One of the basic properties of phonological rules is that they are ordered. Rule ordering is a formal means for expressing the manner in which rules interact when, for example, a given string satisfies the structural description of more than one rule. Implicit in this proposition is that some rule interactions will be **feeding**, others will be **bleeding**, others still will be **counter-feeding**, and yet still others will be **counter- bleeding**. And there are even more complicated effects that a given rule may have on the application of a later rule in the order, although no one has invented special names for the latter relationships among rules. It is therefore not clear why **counterbleeding** and **counterfeeding** effects have been singled out by Burzio (see p. 5) to be listed among the outstanding empirical issues for OT, especially since the evidence that such rule interactions play a role in phonology is meager.

On the other hand, Burzio fails to mention the one type of rule interaction that is known to play a special role in phonology, namely the interaction ruled out by the Elsewhere Condition of Kiparsky (1973). This omission is unfortunate, since the Elsewhere Condition effects cannot be readily captured in the OT framework. As Kiparsky noted, the Elsewhere Condition was an important convention for the application of the rules already in Pāṇini's grammar. Formally, the Elsewhere Condition is a special proviso on rule interaction that goes beyond the interaction expressed by linear order. The Elsewhere Condition states that a) if two rules resemble each other formally so that the structural description of the more restrictive rule includes (i.e., entails, but is not entailed by) the structural description of the less restrictive rule, and b) if their structural changes are either identical or incompatible (e.g., one inserts a segment S and the other deletes S); then c) the more restrictive rule must be ordered before the less restrictive, and d) the order is disjunctive, where "disjunctive" means that the less restrictive rule may not apply to a string that has the form of the output of the more restrictive rule. <The definition of "disjunctive" here is somewhat more general than the one given in Kiparsky (1973), where "disjunctivity" was limited to strings to which the more "restrictive" rule had applied. Evidence supporting the modified definition is to be found in Halle & Idsardi (1995).>

The Elsewhere Condition was discussed in Prince & Smolensky (1993), and it has been widely assumed that this discussion has shown that much of the Elsewhere Condition dissolves into logic, and that what remains is unimportant or plainly incorrect. I do not believe that this is a justified inference. Prince & Smolensky's discussion focuses on what they call Pāṇini's Theorem on Constraint-Ranking (PTC). PTC concerns the ranking of constraints, and not the ordering of rules. Prince & Smolensky remark that although PTC has obvious affinities with the Elsewhere Condition, "[t]here is an important difference: PTC is merely a point of logic, but the Elsewhere Condition is thought of as a principle specific to UG, responsible for empirical results that could well be otherwise." It follows from this that if the Elsewhere Condition is correct, it is an empirical result of some importance that should not be set aside on the basis of a few putative counter-examples. But that is precisely what Prince & Smolensky do, and their conclusions, as noted above, have been widely accepted. So let us look at Prince & Smolensky's discussion.

Prince & Smolensky consider only two examples: Kiparsky's stress examples and the choice among the plural allomorphs in English. The latter is clearly irrelevant to the Elsewhere Condition: it is a problem in morphology rather than in phonology, for it has been known since Aronoff's (1976) discussion of Blocking effects in the morphology that these are fundamentally different from the Elsewhere effects in phonology. Kiparsky's stress examples are indeed problems in phonology, but they have a solution that requires no reliance on the Elsewhere constraint, as Prince & Smolensky point out. Thus, neither of these examples provides support for the Elsewhere Condition.

From the irrelevance of these two examples, however, one cannot conclude that the Elsewhere Condition is invalid, for there are many examples that support the Condition. A complex and valid example of the Elsewhere Condition is provided by the interaction of the Lengthening and Shortening rules of English, as discussed in interesting detail by Myers (1987) (see also Halle & Vergnaud (1987)). The phenomena captured by these rules are central to the phonology of English, perhaps the most intensively studied language we have. Since the current literature rarely does them full justice, I mention a few of their most salient characteristics below.

On the one hand, in words such as *divinity*, *natur-al* and *ton-ic*, *athlet-ic*, as well as in *Palestin-ian* the stem vowel is shortened, but there is no shortening in *ton-al* or *atone-ment*. On the other hand, there is lengthening in *Caucas-ian*, *remedi-al*, but not in *remedy-ing*, *buri-al*, or *Casp-ian*. These two length alternations share the important property that the alternating stem vowel is stressed in all cases. In current metrical theories, stress is assigned exclusively to heads of feet. The alternations of interest affect therefore heads of feet. As pointed out by Myers, Shortening takes place only if **the foot** in question is polysyllabic.

Particularly instructive here is the comparison of the adjectival suffixes *-ic* and *-al*. The stress placement in forms such as *original*, *parent-al*, *suicid-al* shows that *-al* is extrametrical; we express this formally by placing a Right parenthesis before *-al*. <I utilize here the formalism of the metrical theory of Idsardi (1992), because it allows me to bring out the points with maximum clarity.> In addition, English is also subject to binary foot construction proceeding from Right to Left, and to a rule accenting heavy syllables, which is formally implemented by inserting a Left parenthesis to the Left of such syllables. These rules assign to *o(rigin-)al pa(rent-)al, (sui(cid-)al* the foot structure shown. By contrast, *-ic* always places the stress on the pre-suffixal syllable, and this fact is reflected formally by representing *-ic* without parentheses of any kind. The binary foot construction rule will therefore assign stress always to the penultimate syllable by placing a Left Parenthesis before it; e.g., *(ton-ic, ath(let-ic.*

Following Myers (1987) we state the main Shortening Rule of English (the counterpart of SPE's Trisyllabic Laxing rule) as follows: "Shorten the head vowel of a branching foot". Shortening therefore applies in *(natur)-al* and *di(vin-i)ty* as well as in *(ton-ic* and *ath(let-ic*, but not in *(ton-)al* or *(chromo(som-)al*, because — as pointed out by Myers — in the latter two forms the stressed syllable is the head of a non-branching foot.

Like Shortening, the Lengthening rule also affects the head of a branching foot; but here **a host of additional conditions must be satisfied**. As was noted in SPE the head vowel must be [-high] and must moreover be followed by an open syllable ending in /i/, which in turn must be followed by a vowel in hiatus. Lengthening therefore applies in *re(medi-al* and *co(loni-)al*, but it does not apply in *(trivi-)al*, *(parti(cipi-)al*, *(natu)r-al*.

Since the Lengthening rule must meet several conditions in addition to those also met by Shortening, the structural description of Lengthening includes the structural description of Shortening. It is by virtue of this fact that the two rules stand in the Elsewhere

relation; i.e. they constitute a disjunctive block, where the more restrictive Lengthening rule is ordered first and the less restrictive Shortening rule second. Now, as noted above, strings having the same form as the output of the more restrictive <Lengthening> rule are prohibited from undergoing the less restrictive <Shortening> rule. As a consequence, neither *Shakespear-ian* nor *jov-ial* are subject to Shortening, even though Lengthening was not responsible for the long vowel in their stems. On the other hand, *Palestin-ian* or *Christ-ian* are not subject to Lengthening nor do these strings have the form of an output of the Lengthening rule; therefore, Shortening applies to these words. This intricate interaction pattern, for which — as we have just seen — there is a rule-based account available, is passed over in silence by Burzio, nor has proper attention been paid to it in the OT literature and it is far from obvious that OT has the means to express these interaction patterns correctly.

In addition to disregarding the effects of the Elsewhere Condition, Burzio seems also to overlook the well-established distinction between the Readjustment rules, which are part of the morphology, and phonological rules, which are in a totally different module of the grammar. A typical instance of Readjustment rules is the stem ablaut in verbs; e.g., *buy - bough-t*; *tell - tol-d*. As these examples show, stems may change phonologically in morphological contexts and such changes have traditionally been treated as part of the morphology, and not part of the phonology. On this traditional view, examples such as Burzio's *blaspheme – blasphem-ous* are not to be analyzed as effects of the phonology, but rather as effects of Readjustment in the morphology. Once this assumption is made, the problem Burzio points out about stress placement in *blasphem-ous* disappears: Readjustment being part of the morphology is ordered before phonology, and the stress rules, which are in the phonology, see a short antepenultimate vowel in *blasphemous.*

Burzio's discussion of Lexical Phonology ignores the corrections to the theory proposed in Halle-Vergnaud (1987). We cited evidence there showing that it is incorrect to interleave affixation and phonology, as proposed by Kiparsky and others. Instead, affixation is part of the Morphology module, which also contains the Readjustment rules. Once the Morphology has done its work the terminal string is operated on by the rules of the phonology. It is suggested further in Halle-Vergnaud that the rules of the phonology are assigned to four strata or blocks: I. word-internal (cyclic); II. word-internal (noncyclic); III. word sequence (cyclic); IV. word sequence (noncylic). As explained in Halle–Mohanan (1985) the rules of the cyclic stratum apply to each cyclic constituent of the word/phrase in turn beginning with the innermost constituent and proceding outward. The rules of the noncyclic stratum II apply only once to the entire word. Whether a constituent is or is not cyclic is an idiosyncratic property of its components. Thus, English words formed with the verb suffix *-ing* and the noun-forming *-al* (as in *exacerbat-ing*, *monophthongiz-ing*; *withdraw-al*, *buri-al*) are non-cyclic constituents, whereas stems formed with *-ous*, *-ic*, *-ion*, etc. are cyclic.

Since the English stress rules are part of the cyclic stratum I and do not figure in stratum II, noncyclic suffixes such as *-ing* and the noun-forming *-al* are stress-neutral. Since the Lengthening and Shortening rules are also in the cyclic stratum I, these rules are not triggered by suffixes such as *-ing* or *-al*, because, as noted, these suffixes form non-cyclic constituents. Once again, there is a lot of structure in words to which the rules are sensitive, and this structure accounts for all kinds of subtle phonological effects. It is not obvious how these effects can be captured in an OT account, and Burzio is silent on this matter.

These effects also have special bearing on the OT Faithfulness constraints. As illustrated in the discussion above, in the rule-based account there is no global Faithfulness requirement — however that is to be expresssed formally. Instead, certain underlying representations trigger derivations that violate Faithfulness in part, or entirely, whereas other underlying representations trigger derivations with a bottom line that satisfies Faithfulness. It is to be noted that Faithfulness is a formal condition on the relation between input and output is a claim put forward only by OT, and support for this claim has been largely theory-internal.

The independent evidence for Faithfulness understood as the claim that underlying and surface representations should be as nearly alike as possible is not compelling. The fact that the analysis of every language that has been seriously studied has invariably revealed crucial differences between underlying and surface representations suggests that Faithfulness is of no more than marginal importance. Since there is nothing for phonology to do where Faithfulness successfully suppresses differences between underlying and surface representations, the existence of phonology in every language shows that Faithfulness is at best an ineffective principle that might well be done without.

As noted in Bromberger & Halle (1988) the fundamental fact that makes phonology different from syntax is that the words of a language are not part of our innate linguistic knowledge, but rather are learned; i.e., stored in our memory in some form. Since every speech act involves words, every speech act involves accessing the memory. When we speak we take something out of memory and use it to produce an acoustic signal by appropriate gymnastics of our articulators. When spoken to we analyze the acoustic signal in some way that allows us to determine the words that are encoded in the signal. It is obvious that the form that words have in memory is not acoustic or articulatory in nature, but rather neurological. There must therefore be some module in the human language organ that translates the neurological representations of words into representations in articulatory/ acoustic terms and *vice versa.* The phonology is part of this translation module. What is not understood at the moment is why in all languages the module includes substantially more machinery than the minimum required for the translation from one of the two representations into the other.

In papers now in preparation, including one delivered at the recent Colchester workshop, Bromberger and I have argued that a derivational account of the standard kind answers both the question as to why a particular input string (a sequence of morphemes stored in memory) corresponds to specific output (the intention to execute a specific sequence of articulatory actions), and the question of how this input is translated into articulatory actions. Any other theory — and OT, in particular — must also answer these two questions, the why question and the how question. OT clearly has an answer for the why question; i.e., the output is chosen by the constraint hierarchy. But OT has no answer to the question of how speakers go from the neurological representation to the articulatory activity/ acoustics, and it is not obvious that a plausible answer is to be expected soon. The suggestions of Tesar (1995), where this issue is addressed from an OT perspective, seem implausible because they make the most far-fetched assumptions about intermediate representations and the processes generating them.

In sum, as I have attempted to show above, Burzio's positive evaluation of OT is undercut by his failure to note that OT does not provide a correct analysis for rule interaction effects, most especially for the Elsewhere effects. Moreover, OT is forced to rely crucially on Faithfulness, a principle for whose validity there is no compelling independent evidence. OT has no plausible account for the process whereby speakers translate a specific input into a given surface representation. Since rule-based analyses provide convincing solutions for all of these problems, Burzio's conclusion that OT constitutes an advance over rule-based phonology is not properly established.

References

Aronoff, M. (1976). Word formation in generative grammar. Cambridge, MA: MIT Press.

Bromberger, S. & M. Halle (1988). Why phonology is different. *Linguistic Inquiry* **20**, 51–70.

Bromberger, S. & M. Halle (1995). The contents of phonemes: A comparison between Derivational and Optimality Theories. Paper presented at the Conference on Derivations and Constraints in Phonology, University of Essex, September 1–3, 1995.

Burzio, L. (1994). *Principles of English stress*. Cambridge: Cambridge University Press.

Halle, M. & W. Idsardi (1995). The Eastern New England /r/: OT vs. Rule-based phonology. Paper presented at the Conference on Derivations and Constraints in Phonology, University of Essex, September 1–3, 1995.

Halle M. & K.P. Mohanan (1985). Segmental phonology of Modern English. *Linguistic Inquiry* **16**, 57–116.

Halle, M. & J.-R. Vergnaud (1987). *An essay on stress*. Cambridge, Mass.: MIT Press.

Idsardi, W. (1992) The computation of prosody. Ph.D. dissertation MIT, Cambridge, Mass.

Kiparsky, P. (1973). "Elsewhere" in phonology. In *A Festschrift for Morris Halle*, S. Anderson & P. Kiparsky (eds.), 93–106. New York: Holt Rinehart and Winston.

Myers, S. (1987). Vowel shortening in English. *Natural Language and Linguistic Theory* **5**, 485–518.

Prince, A. & P. Smolensky (1993). Optimality Theory. Ms. Department of Linguistics, Rutgers University, New Brunswick, N.J.

Tesar, B. (1995). Computing optimal forms in Optimality Theory: basic syllabification. Ms. Department of Computer Science, University of Colorado, Boulder, Colorado.

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