On the Validity of Morpheme Structure Constraints

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1. Ill-Formedness in the Dictionary and Morpheme Structure Constraints

Morpheme structure constraints (MSCs or, equivalently, morphemic constraints), i.e., constraints on undervied items, pose a logical problem to any theory claiming that the first-います list to the lexicon, i.e., the dictionary (DICT), may contain material which is considered ill-formed by the MSCs of the language. This problem is related to Scobbie's (1991:1) “interaction problem”, i.e., the need to make explicit the way in which constraints, rules and representations interact. In the case of MSCs, the interaction problem can be stated as follows: how can ill-formed material be present in the DICT if the DICT contains constraints, i.e., MSCs, against ill-formed material? The Theory of Constraints and Repair Strategies (TCRS) proposed by Paradis (1988a, 1988b, 1990, 1993, this volume), along with Optimality Theory (e.g., Itô and Mester, this volume, and McCarthy, this volume) but in contrast with Descriptive Phonology (e.g., Scobbie, this volume), claims explicitly that the DICT can contain material which is identified as ill-formed by post-morphemic constraints (see Paradis and Prunet 1989a:331; Bagemihl 1991:641; Paradis and El Penne 1991, 1992, 1993; and Ulrich 1991 for other

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1We are indebted to Darlene LaCharité and Emmanuel Nikiema for their illuminating comments. We are also grateful to Janet Pierrehumbert and Wendy Sandler for discussions. Of course, we are solely responsible for potential mistakes. Paradis acknowledges SSHRC grant 410-90-0575 and a FCAR grant 90-NC-0383, and has also benefited from the financial support of the Faculté des lettres at Université Laval. Prunet is grateful to the Projet de linguistique africaine at UQAM, headed by Jean Lowenstamm and Mohamed Guerss, for its financial help (SSHRC grant 410-91-0716) and intellectual environment.
instances of underlying ill-formedness). To solve this interaction problem, Paradis (1993, this volume) suggests that phonological constraints are active in the lexicon (the component where words are morphologically derived) and the post-lexical level alone, not in the DICT. Structures of the DICT may be identified as ill-formed only when going through the lexicon. The theory of phonology which emerges from this position clearly contradicts the commonly-held view that DICT entries are constrained by MSCs.

In this paper, we will claim that MSCs are unnecessary because their role, that of capturing morpheme regularities, can be fulfilled by post-morphemic constraints, be they diachronic or synchronic. As discussed in Paradis (this volume), lexical derivations are bidirectional. Speakers build their grammar from surface forms. When a speaker perceives a phonological, morphological and semantic relation between two surface forms, x and y, s/he "deconstructs" x and y from the constraints and material available in the phonological and morphological components of his/her grammar in order to identify the base form, i.e., the stem, which is then stored in the DICT. This operation saves memory space and accounts for the fact that stems generally conform to the phonological constraints of the language to which they belong. However, it does not follow that, at the end of a deconstruction operation, a speaker cannot store a stem in a form contrary to the phonological post-morphemic constraints of his/her language, provided this storage is recoverable, economical and makes predictions superior to

\[\begin{align*}
\text{2 The TCRS claims that phonological constraint violations have three sources:} \\
\text{1) morphological operations, 2) constraint conflicts, and 3) ill-formedness in the DICT. Constraint violations, in terms of ill-formed combinations, are impossible in a monostratal framework such as Declarative Phonology, since well-formedness can be achieved only by redundancy rules, as opposed to generative changing rules or repairs. As in functionalism, DICT entries in Declarative Phonology consist only in unspecified forms, i.e., forms free of redundant information. They cannot contain ill-formed combinations since "repairs" and "derivations" are vacuous notions in this framework. As for Optimality Theory, although it does not explicitly address the issue of MSCs, it clearly allows ill-formed combinations in the DICT, which can surface when the constraint violated is not highly ranked in the optimality scale "if certain infelicitious combinations of features should appear in an input feature set, the grammar may simply leave some of them unpaired" (Prince and Smolensky 1993:180-181), but which are ruled out when more important constraints are involved: "But in the face of a battery of high-rank structural constraints which the input is not suited to meet, an entire Null Parse can be optimal. In this case, there is no interpretable output from the input form, and we have what amounts to absolute ill-formedness" (p. 50). Note that, like TCGR, Optimality Theory states that the DICT does not contain ill-formedness per se. Some combinations in the DICT are simply identified as ill-formed by post-morphemic constraints (see Paradis and Prunet 1992 on this particular point).
\end{align*}\]

those made by a diacritic or suppletion-based analysis (see Paradis 1988b, 1993, this volume, for arguments to this effect in Fula and Gere). Once one admits the availability of restrictions enforced even in early strata but not holding in the DICT, it becomes possible to say that lexical regularities are due not to MSCs but to the leveling influence of diachronic or synchronic post-morphemic constraints. Similar reasoning is defended by Fula (1985:489), who argues that all things being equal, DICT entries are assigned to words so as to conform to true surface regularities of the language, and by Goldsmith (1979:164, 1990:311) and Odden (1988:474), to account for the tendency of DICT entries to reflect the Obligatory Contour Principle effects observed at later derivational stages.

This paper is organized as follows. In Section 2, we review a case in which there exists a reasonable consensus that MSCs must be at work: the Semitic restrictives on homorganic consonants. We argue against this consensus and show that the observed lexical regularities are historical vestiges of post-morphemic constraints, that were last active in pre-Proto-Semitic times. We further claim that there is no reason to believe that these constraints were ever active in the DICT at any historical stage. In Section 3, we consider a consequence of this hypothesis for the view, based on MSCs, that Semitic provides evidence for the presence of a Corononal articulator in DICT entries. In keeping with the position maintained earlier that MSCs can be dispensed with, we conclude that the lexical regularities in Semitic or in other language families do not provide evidence for the specification of coronals in the DICT.

This article is an expanded and thoroughly revised version of a section of Paradis and Prunet (1992:222-224). In the last two years, several researchers have independently, and for different reasons, questioned the existence of active MSCs in Arabic and Hebrew, e.g., Sandler (1991), Elmadouni (1992a, 1992b) and Pierrehumbert (1993). We agree with a number of the arguments put forth in these articles, as will be discussed below, and with Kiparsky (1982:58-84) and Stemberger (1991:105), who question the existence of MSCs altogether.

2. Arguments against MSCs

2.1. Previous literature

Chomsky and Halle (1968:380-380), basing themselves partly on Halle (1959:56), invoke MSCs to express restrictions on, or regularities about, the phonological shape of morphemes as they appear in the DICT. For instance, MSCs are supposed to explain the ability of English speakers to distinguish between a possible but non-existent word like *blick* and an impossible word like *bnik*. As shown in Paradis and Nikiemi (1993), this argument is cogently dismissed by adherents to Natural Generative Phonology and other phonologists, as we now briefly summarize.
2.1.1. MSCs as effects of post-morphemic syllabic constraints:

As pointed out by Sommerstein (1974:73), although the ability of native speakers to distinguish between non-occurring *blik/*bnik forms *makes it necessary, in order to account fully for native speakers' linguistic competence, to have rules stating the possible combinations of phonological elements at some level, this argument says nothing about which level these rules must be stated at* (see also Harms 1968:88). In fact, as Hooper (1975:538) maintains, there is every reason to believe that speakers are unable to form judgments on underlying forms. Thus, Spanish speakers would identify as ill-formed syllable-final or initial consonant clusters in both /abl/- and /ndo/, even though they both surface in forms such as habl-a-ndo *speaking*, i.e., when occurring in different syllabic positions. As in the case of the Spanish clusters, Hooper argues, the rejection of the ill-formed *bnik example is due to syllabic reasons, i.e., its forming an ill-formed onset: the bn sequence can occur heterosyllabically, as in the name Abner, but not tautosyllabically, as in *bnik or *ambnik.

2.1.2. MSCs as redundant mechanisms:

Clayton (1976:307) takes this reasoning further and argues that MSCs must be dispensed with because they are redundant: the generalizations they express can be equally well captured by post-morphemic (phonetic) constraints, though the reverse is not true. There are many instances where the effect of MSCs must be extended beyond the DICT. Thus, cases where identical morphemic and post-morphemic constraints must be posited to account for regularities observed in underived and derived environments in the same language are commonplace. This can be seen with vowel backness harmony in Turkish (Shibatani 1973:99), and with the obligatory homorganicity of Spanish NC sequences (Hooper 1976:182). Other cases can be found in e.g., Stanley (1967:403) on Spanish, and Paradis and Prunet (1990:460–461) on Gere. In such cases, morphemic constraints are simply redundant since post-morphemic constraints fulfil the same function.

2.1.3. Absence of speaker's judgement on DICT entries:

There are cases where native intuitions demonstrably do not reflect the content of DICT entries (see Shibatani 1973:95). Thus, it is universally agreed that German allows morphemes to end in voiced obstruents, an assumption needed to account for alternations such as [bunt]/[bunded] *federation* (neutral/genitive). As a consequence, the constraint against voiced word-final obstruents, which is deemed responsible for the absence of *[bund] *federation* (neutral), is viewed as a post-morphemic constraint, not as an MSC.

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3Her position is the mirror-image of that of Postal (1968), who claims that post-morphemic constraints are redundant and that morphemic constraints alone are necessary.

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That German speakers would nevertheless consider [bund] ill-formed shows that their intuitions do not bear on DICT entries, since this word presents no MSC-violation: their intuitions bear on surface forms. The same must be true of English speakers' judgements that *bnik is not a possible English word: non-occurring forms cannot have a DICT entry (Clayton 1976).

2.1.4. Morphemic regularities inexpressible with MSCs:

Finally, there are instances where lexical regularities on segmental sequences must be captured by means other than MSCs. For instance, Yip (1989:454) argues that Chinese co-occurrence constraints on possible consonant-vowel sequences are inapplicable in the DICT, because that at stage consonants and vowels stand on separate tiers. These constraints on possible sequences must consequently be activated after consonants and vowels have been confined. So even though these cooccurrence constraints cannot apply in the DICT, it is nonetheless possible to account for the fact that there are no Chinese words violating them at the surface.

A general overview of MSCs can be found in Kiparsky (1982:53–54, 58–84). Kiparsky argues that there is no need for MSCs and that the lexical regularities they express can be captured by lexical rules. Kiparsky goes further in disallowing rules *whose domain is defined as the morpheme; minimally they must belong to level 1 and apply also to such derived forms as meet their structural description* (p. 54).

2.2. Semitic MSCs

2.2.1. Their characteristics:

One of the morphemic regularities which cannot be attributed to either syllabic or to low-level phonetic constraints is the distribution of root consonants in Semitic. Semitic morphology, most notably in its verbal part, is based on mostly consonantal roots which express a lexical field and usually contain three consonants, noted C1C2C3, e.g., kth *to write*. Words are built by inserting vowels and consonants in front of, between and following the root consonants. It has long been known that there are constraints on the articulations of the root consonants (see the references to Arabic and Hebrew grammarians in Cantineau 1946:133 and Greenberg 1950:163, n.2). In an extensive study of mostly Arabic roots, Greenberg (1950:178) points out that a well-formed root may not contain two consonants from any one of the following sets: i) labials, ii) coronal obstruents, iii) coronal sonorants, iv) velar and uvular stops, v) uvular fricatives, pharyngeals and glottals. Similar results are reported in Cantineau (1946:133–136) and McCarthy (1988, 1993). Because these constraints express morphemic regularities, they have been interpreted as MSCs prohibiting the repetition within a root of consonants with identical place, and, to some extent, manner features.
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such offending stable roots in the Semitic lexicon, which is why the regularities have always been treated as tendencies rather than absolute generalizations. Pierrehumbert (1993) sums up the statistical generalizations on homorganic restrictions as follows:

(1) **Pierrehumbert's Statistical Observations on Homorganic Restrictions:**
   i. restrictions are stronger between adjacent consonants (C₁C₂ and C₃C₄) than between non-adjacent ones (C₁C₅);
   ii. restrictions are stronger in cases of total identity than in cases of simple homorganicity;
   iii. among labials, restrictions are stronger among obstruents than between an obstruent and n;
   iv. restrictions are stronger among specific sub-classes of coronal obstruents than within the entire class of coronal obstruents;
   v. among coronal sonorants, restrictions are stronger between liquids (l, r) than between liquids and n.

Clearly, the result is a very progressive effect of consonantal incompatibility which is ill-suited to the yes-or-no diagnostics of phonology, a state of affairs which leads Pierrehumbert to advocate a more gradient psychological concept of similarity in place of the phonological concept of morphemic constraints.

The sizable number of exceptions and subregularities precludes our interpreting MSCs as absolute constraints. They can thus be construed only as tendencies. However, it is logically impossible to refute an analysis in terms of tendencies, since even clear and stable violations are insufficient for refutation. But one might argue that there would be no such tendencies in Semitic if no constraints were responsible for them. This argument is analogous to the argument that there must be burning stars giving rise to the points of light seen in the sky at night: why would there be points of light if they did not emanate from burning stars? But we in fact know that we do see light from extinct stars. All it takes is for the star's extinction to have occurred after the departure of the light that is still reaching us. Likewise, the distributional gaps now observed in the Semitic lexicon show that there were constraints, but it does not show that these constraints are still active, or that they ever applied to dict entries.

2.2.2. Semitic MSCs as tendencies: refutability called into question:

The first requirement of a scientific hypothesis is its refutability. A constraint against homorganic consonants can in principle be proven wrong by producing roots which violate it and which are not modified or eliminated from the language. Yet it is uncontroversial that there are many

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For this reason, these constraints have been used as a rich source of information on the internal structure of consonants (see e.g., Lightner 1972:53; Mester 1986; McCarthy 1988, 1993; Yip 1989a, 1989b; Mester and Ítô 1989; Sandler 1991; Elmedlaoui 1992a, 1992b).

The observed lexical regularities are valid only within roots. They do not apply to combinations of radical and affixal consonants, i.e., they do not block affixation nor give rise to any alternation of place or manner features. Because of their static nature (and because they are not universal), these would be purely passive constraints which the language-learner could detect only by scanning his/her lexicon for gaps in consonant combinations in underived environments. This is exactly the type of constraint which is excluded by Kiparsky's (1982:54) requirement, cited in Section 2.1.4, that no rule be restricted to the morpheme. This situation is quite different from that of other cooccurrence constraints such as those expressed by Lyman's and Grassman's laws. Lyman's law, as discussed in Ítô and Mester (1986:68), prevents the cooccurrence of two voiced obstruents in Yamato (native) Japanese morphemes, allowing buta but excluding buta, but it is also deducible from its blocking effect on the Rendaku obstruent voicing rule in compounds (allowing Rendaku in /nuri-futa/ → [nuri-buta] 'lacquered lid' but blocking it in /nuri-fuda/ → [nuri-fuda]/*[nuri-buda] 'lacquered sign'). Similarly with Grassman's law (Kaye and Lowenstein 1985): the predictable distribution of aspirates in Sanskrit roots morpheme-internally is made visible by the throwback undergone by aspiration when morphemes are concatenated. These blocking or triggering effects on phonological rules show that Lyman's and Grassman's laws also apply post-morphemically. In our view, as would be the case in Clayton's, these laws are genuine post-morphemic constraints. But Semitic languages provide no such clues to the language learner at junctures: the homorganicity constraints are not only subject to exceptions but they are also purely static, which led phonologists to analyze them as morphemic constraints. In keeping with the arguments against MSCs in Section 2.1, we will argue below that the Semitic lexical regularities are historical remnants of once active post-morphemic constraints. It is unnecessary and, in fact, also problematic to view these regularities as stemming from morphemic constraints.

2.2.2. Semitic MSCs as tendencies: refutability called into question:

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non-adjacent positions, of often non-totally-identical consonants, i.e., consonants sharing only an articulator and some manner features. None of these historical processes, therefore, counts as positive evidence for the Greenberg constraints. Even if they constituted positive evidence, they would be evidence for post-morphemic constraints, rather than morphemic ones (see Section 2).

One may object that this lack of homorganicity is also valid for \( C_1C_2 \) sequences even though these seem to have always been monomorphic and hence not subject to phonological alternations. The reason why such a lack of homorganicity arose in \( C_1C_2 \) sequences in spite of the absence of MSCs is due to the fact that languages are learnt by exposure to surface forms. We suggest that learning a new word consists in assigning a DICT entry whose derivation will produce the correct surface forms. If constraints are already active in the phonology of the language, e.g., at lexical level 1, new words have to go through this sieve of constraints to be assigned DICT representations and will, with time and with each generation of language-learners, be reanalyzed in the process so as not to violate these constraints during derivations. DICT entries consequently tend to consist mostly but not only (see Section 1 on ill-formedness in the dictionary) of morphemes that conform to the constraints of the language; but MSCs are not needed for this effect to obtain. A related view is defended by Stemberger (1991:105), who argues that MSCs are the current reflection of the avoidance and elimination by former generations of speakers of ill-formed surface sequences. Thus, MSCs do not reveal the phonological content and form of today’s DICT entries: they may simply be what remains of prior, and perhaps no longer valid, constraints on surface sequences. Therefore, not only are MSCs incompatible with cases of ill-formedness in the dictionary (see Section 1), in addition to being redundant in many cases and counter-intuitive (see Section 2), but their apparent effect in derived environments can be easily accounted for otherwise, i.e., by either synchronic or diachronic language-specific post-morphemic constraint effects.

2.2.4. The OCP and disallowed \( C_1C_2C_2 \) sequences:
Before turning to empirical arguments against the interpretation of Greenberg’s homorganicity constraints as MSCs, we note that our position does not affect the apparently generalization that in most Semitic languages \( C_1C_2C_2 \) roots exist (being actually \( C_1C_2 \) biliterals, see McCarthy 1981:396) whereas \( C_1C_2 \) roots do not. As just addressed, we maintain that roots being assigned a DICT entry by going through derivations in which a constraint, here the OCP, is active tend to obey this constraint, here to exclude any sequence of identical consonants. It follows that \( C_1C_2C_2 \) patterns always originate from \( C_1C_2 \) roots in the DICT, yielding triliteral patterns at the surface after left-to-right association conventions have applied. It is important to see that we do not question the ability of the OCP, an active constraint present in the lexicon, i.e., a post-morphemic constraint, to rule out \( *C_1C_2C_2 \) sequences. But we are calling into doubt the validity of Greenberg’s constraints as synchronic ones as well as rejecting altogether the notion of MSCs. The OCP, in its standard use, applies to totally identical adjacent segments, while Greenberg’s constraints do not require total identity between consonants to prohibit their co-occurrence; nor do they require adjacency. Even cases where the OCP is activated on a single segmental tier, say labial (see Yip 1988), are not comparable to Greenberg’s co-occurrence restrictions, often involving sub-classes of segments, e.g., coronal sonorants, which clearly must share more than one tier to form a sub-class, i.e., [sonorant] and a Coronal articulator. Furthermore, Greenberg’s constraints express only tendencies, as we have already seen, whereas the OCP is an absolute constraint. Thus we posit that morphemic regularities in Semitic stem from two sources: i) universal OCP effects; 2) extinct (i.e., diachronic) language-specific post-morphemic constraints.

2.2.5. MSC falsification: loanword and non-word adaptation:
As already shown in Section 2.2.2, the claim that the co-occurrence restrictions in Semitic are due to MSCs is difficult to refute on intrinsic grounds, given that these are construed as tendencies instead of absolute constraints. However, the hypothesis that MSCs do not exist, in Semitic or in any other language, is refutable on extrinsic grounds, i.e., in the light of loanword or non-word adaptation. One noteworthy case in which lexical regularities are empirically tested is that of Zimmer (1969). Zimmer tests the ability of native speakers of Turkish to judge non-words containing vowels whose values for height and rounding/palatality conflict with surface generalizations. He concludes (p. 319) that speakers tend to overgeneralize the productive labial harmony rules of the language while ignoring lexical regularities which, like the Semitic homorganicity restrictions, are true morpheme-externally but do not give rise to alternations (within or between morphemes).

The available literature on Semitic likewise seems to indicate that loanword adaptation disregards the homorganicity restrictions. This, for instance, is the view of Cantineau (1946:136), who analyzes them as historical remnants because they are freely violated by borrowings. Greenberg (1950:163) seems to concur when he adds that

some use of this principle [the lack of homorganicity in roots] is made by Arab lexicographers as a criterion for loan-words. For example, the Tāj al-‘Arād tells us, under the article sa’d:b ‘roe (an herb) that this form is not genuine Arabic because s and d are never found in the same Arabic root.\(^4\)

\(^4\)Psychological testing procedures, such as those of Campbell (1986:169) and Ohala and Ohala (1986), are also conceivable but they are not available in the
As mentioned in Section 1, several recent studies also question or argue against the presence of the Greenberg constraints in Semitic. Elmedlaoui (1992b), for instance, argues that the constraints ceased to be active in Proto-Afro-Asiatic based on the following grounds:

3. Elmedlaoui's arguments against MSCs:
   i. (f,b)Cnm roots are frequent in Classical Arabic and Biblical Hebrew;
   ii. there are a number of Persian borrowings in Classical Arabic including two coronal obstruents, such as dast ‘pillow’ and daftar ‘notebook’;
   iii. modern Arabic dialects include numerous Indo-European borrowings including allegedly ill-formed sequences, e.g., film, which is so adapted as to have a broken plural Pafkaam;
   iv. phonemic mergers in modern languages have taken place regardless of the alleged homorganic constraints (e.g., *g became ʃ in the North African pronunciation of Classical Arabic even in roots containing the homorganic /ʃ/, such as saʃər ‘tree’ and ʃayş ‘army’).

In the same vein, Sandler (1991) mentions that:

4. Sandler's arguments against MSCs:
   i. Modern Hebrew speakers readily accept roots including identical articulators;
   ii. Modern Hebrew uvular ʃ still behaves with respect to the Greenberg generalizations like the *b pharyngeal it comes from and not like the dorsal it has become.

Finally, we have already discussed in Section 2.2.2 the results of Pierrehumbert's statistical analysis of Arabic roots, given in (1), which shows how the homorganicity constraints reveal a number of smaller sub-groupings ill-suited to a strictly phonological analysis.

3. Further Issues: MSCs and Coronal Underspecification

Arguments for MSCs usually take the form of distributional arguments, as in the Semitic homorganicity constraints just discussed. This evidence can, in our view, be reanalyzed as:

5. Further considerations:
   i. active constraints operating in and/or after the lexicon (but not in the DICT);
   ii. historical remnants of post-morphemic constraints (as in Semitic).

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cases at hand since, to our knowledge, they have not been applied to Semitic constraints.

3.1. Arguments based on MSCs: DICT entries and segment structure

Now since we question the existence of MSCs, we must also ask what kind of arguments have been based on them, since the non-existence of MSCs may invalidate several previous phonological analyses. As shown in Sections 2 and 3, MSCs have often been argued to rule the structure of DICT entries, a view we contest since it is incompatible with the DICT ill-formedness cases mentioned in Section 1. However, MSCs are also used as arguments for segment structure. We consider this use legitimate as long as MSCs are reinterpreted either as synchronic or diachronic post-morphemic constraints. Both synchronic and diachronic post-morphemic constraints reveal as much about segment structure as alleged MSCs. From extant so-called MSCs such as those in Semitic, we can hope to discover properties of yesterday's synchronic post-morphemic constraints on segmental representations by studying their fossilized lexical effects. They are a source of information on segmental structure as it appears at some level after the DICT, much like dinosaur footprints reveal information about dinosaurs themselves.

3.2. Segment structure: the representation of coronals in the DICT

In several instances, MSCs have been invoked as evidence that some phonological information is present in DICT entries, like typically the presence of a Coronal articulator in some unmarked coronals. Thus, Mester and Itô (1989:264–265) maintain that the Arabic homorganicity MSCs must refer to the presence of a Coronal articulator to rule out combinations of coronal obstruents or sonorants. Manner features alone do not suffice because obstruents (or sonorants) can co-occur as long as they have different articulators (e.g., b and g can co-occur, as can m and n). Noting that Japanese hypochoristic formation singles out one consonant (the liquid r) as a non-target for palatalization, they hypothesize that the difference between Arabic and Japanese lies in their consonant inventories: Japanese, unlike Arabic, has only one liquid. If a model of Contrastive Specification (see e.g., Halle 1959:32; Steriade 1987; Clements 1988) or Modified Contrastive Specification (see Avery and Rice 1989) is used, the liquid r can be unspecified for place features in Japanese, where it is the only liquid, but not in Arabic, where it contrasts with l. Mester and Itô conclude that this difference argues against models in which only one value of a feature can be present underlyingly regardless of contrasting phonemes, such as in radical underspecification (e.g., Kiparsky 1982).

Other arguments for the underlying presence of Coronal are based on the absence of English segment sequences treating both the marked (non-anterior) and unmarked (anterior) coronals alike, thus requiring full specification of all coronals. For instance, McCarthy and Taub (1992) report the absence of both *θl and *θl, or the fact that the diphthong aw can
be followed only by coronals, regardless of whether they are marked, as in mouth/couch, or unmarked, as in out, crowd; see also Kenstowicz (1993). Clements (1988:86) holds a MSC partly responsible for the lack of English *σz, *ζs, *εz, *εs, *σθ, *ζθ, *σθ, *εθ sequences. To account for the need to refer to coronals in the DICT, one may think of allowing reference to gaps on a given articulator tier (as Stemberger and Stoel-Gammon 1991:195 and Paradis and Prunet 1991:24 do for cases where two anterior coronals are referred to), but here this solution would not solve the problem because no restrictions would be predicted between a gap (the absence of an anterior coronal) and a Coronal articulator (a non-anterior coronal), as necessitated for sequences such as *εs, *ζs, *σs, *ζθ, *σθ, *εθ sequences. Referring to gaps would not account either for the absence of both *σθ (two unmarked coronals) and *θ (an unmarked coronal preceded by a marked one) in English, nor for the scarcity of roots containing the unmarked coronal s and the marked one θ in Arabic.

However, these claims are problematic because there are otherwise numerous arguments to the effect that unmarked coronals lack a Coronal articulator in early lexical levels, and, consequently in the DICT (see e.g., Paradis and Prunet 1989a, 1989b and the contributors to Paradis and Prunet 1991). For English in particular, these claims are in direct contradiction with Davis (1991), who argues that MSCs are responsible for the absence of English CVC words in which both Cs are homorganic and non-coronal stops (e.g., *spip, *skake vs. well-formed state). This fact follows if, contrary to the position of, for instance, Clements (1988), English coronal stops are interpreted as lacking place features in the DICT. As noted by Clements himself, the constraint against *σσ, *ζζ, *εε, *εε, *σσ, *ζζ, *εθ, *εθ, *εθ sequences is not restricted to DICT entries: “it holds over roots and level 1 stems”, thus indicating that the constraint can easily be reinterpreted as a post-morphemic constraint, i.e., here a constraint whose domain is lexical level 1 instead of both the DICT and the lexical level 1. In line with Clayton (1976), discussed in Section 2.1, we consider the latter option redundant. Such a treatment is also flawed with an unnatural exception, σθ as in un-derived eschew and pasture, reported in Clements (1988:86). This exception is readily eliminated if we posit that the constraint does not hold in the DICT, i.e., if we assume that regularities in roots result only from the indirect leveling effect of post-morphemic constraints. LaCharité (1993) analyzes such restrictions in English as the result of the OCP activated on the [strident] tier till as late as level 2 or 3 (e.g., church → church-e-s *church-θ), [strident] being a Coronal dependent in her framework (see also LaCharité, this volume). Her treatment also accounts straightforwardly for the fact that sθ, as in esthetics, represents a permitted sequence, construed as another exception by Clements. Since in LaCharité’s treatment the constraint bears on sequences of [+strident] segments, θ, which is [−strident], is simply not affected by the constraint.

One might object that, no matter what the bottom line regarding coronal underspecification is, Davis’s treatment itself requires a so-called MSC. However, it seems that some syllabic constraints are at work here. Stemberger (1991:103) advocates a syllable-based alternative to Davis’s analysis, based on the fact that words like cake [keik], as opposed to *skake, are permitted. Whether or not the syllable plays a role, it is clear that the presence of an initial s is essential in the *sCVC constraint, but it is not clear why this s should be unspecified for Coronal only in the DICT, i.e., why s would not also be unspecified at early derivational levels. Similar reasoning, in our view, applies to the absence of both *θθ and *θθ sequences, and to any similar cases: there is no evidence that these constraints must apply to DICT entries as opposed to later derivational levels, where coronals have already been specified, especially since different syllabic conditioning sometimes permits such sequences across syllable boundaries, as in underived athlete and atlas. As for the conclusions Mester and Itô draw from Japanese hypocoristic formation, they are not at issue here since they are not based on MSCs (but see Stemberger 1991:104 and Shourup and Tamori 1992a, 1992b for alternative views).

More importantly, there are many general empirical and theoretical reasons discussed in the literature, which were briefly reviewed in Section 2, to doubt the existence of MSCs altogether. As for the well-known cases of Arabic and Hebrew in particular, this paper has presented several arguments that call into question the existence of active homorganic constraints in the DICT, notably their gradience and the fact that they require idiosyncratic Russian doll-like grouping into smaller phonological classes (Pierrehumbert 1993) as well as their lack of effect on borrowings and native judgements (Elmedlaoui 1992b; Sandler 1991). We have shown that these constraints were once active but, when they were (i.e., in pre-Proto-Semitic), they operated across morpheme boundaries, that is as post-morphemic constraints at lexical or post-lexical levels.

In several cases, it is possible to show that DICT entries do not correspond to what early lexical constraints enforce. Apart from the DICT ill-formedness cases already mentioned in Section 1 (Paradis 1988a, 1988b, 1993, this volume; Paradis and Prunet 1989a:331; Bagemihl 1991:641; Paradis and El Fenne 1991, 1992, 1993; and Ulrich 1991), we may also consider the case of coronals in Fula. These may seem to be specified in the DICT because a constraint blocking a level 1 lexical rule refers to coronals but, in the same language, several transparency cases show that they are not. Paradis and Prunet (1989b:338) reconcile these properties by suggesting that Fula coronals are underspecified in the DICT but that they are specified
cyclically as early as level 1. This indicates that early lexical phonology is not always an accurate reflection of the content of DICT entries.

McCarthy (1993) advocates a somewhat similar view of some of the Arabic lexical regularities. Based on the transparency of coronal sonorants to vowels in several Bedouin Arabic dialects, he concludes that these consonants lack place features in the DICT. Yet coronal sonorants are subject to Greenberg’s constraints and, by current reasoning on MSCs, must be specified in the DICT. To account for these contradictory properties, McCarthy maintains coronal sonorant underspecification and claims that the constraints which prevent homorganicity in a root, i.e., the OCP and a No-Branching Condition forbidding branching place nodes in underlying representation, block the filling-in of the empty nodes when the application of redundancy rules would violate these constraints. As a result, surface violations of the constraints fail to be generated from underspecified DICT entries. Nothing in principle prevents this reasoning from applying also to coronal obstruents, though McCarthy refrains from doing so because of their opacity to vowel spreading. In our view, DICT representations, whether or not they contain material identified as ill-formed by post-morphemic constraints, do not surface as ill-formed, because potentially offending forms are weeded out in going through the sieve of lexical and post-lexical constraints. Potential ill-formedness either has a blocking effect on redundancy rules, as in McCarthy’s treatment and, more extensively, in Declarative Phonology, or a triggering effect on repair strategies. Therefore, morphemic regularities do not have to be explained in terms of constraints applying directly to DICT entries, i.e., MSCs.

What, then, is the import of so-called MSCs for segmental structure, and the coronal underspecification hypothesis in particular, if MSCs do not exist? We believe that the so-called MSCs, reinterpreted as post-morphemic constraints, still constitute a rich source of information on segmental structure and, thus, on coronal underspecification. The nature of information obtained remains the same. What changes is simply the locus at which the information is gathered. However, since the coronal underspecification hypothesis is tightly bound to domains of underspecification in the grammar and since MSCs have often been invoked against its universality, this change has strong bearings on it. It is not our purpose here to address each of the arguments brought against the coronal underspecification hypothesis as an explanation, or its universal status (for these arguments, see McCarthy and Taub 1992), but to suggest that, among these arguments, those based on MSCs may be vacuous. For them to be convincing, one has to show first that MSCs can be part of speakers’ competence, i.e., that speakers have intuitions about DICT entries, and second that they constitute the best way of accounting for the data, which is precluded by their often redundant status.

4. Conclusion
As addressed in Section 1, MSCs, i.e., well-formedness constraints on DICT entries, are incompatible with the TCRS (Paradis 1988a, 1988b, etc.), which states that DICT entries can be scanned as ill-formed by post-morphemic constraints in some cases. More specifically, the TCRS claims that ill-formedness in the DICT constitutes one of the three sources of constraint violations. This incompatibility has forced us to reassess the status of MSCs. We first saw in Section 2.1 that adherents to Natural Generative Phonology reject MSCs on several grounds: syllabic post-morphemic constraints can achieve the same results as MSCs in many cases; MSCs are duplicates of post-morphemic constraints and are thus redundant; speakers do not have intuitions about DICT entries, etc. In Section 2.2, we discussed so-called MSCs in Semitic and subdivided them into two classes: i) absolute universal constraints, which require total identity between adjacent consonants, and ii) gradient language-specific constraints, which require only partial identity between optionally adjacent consonants. We claimed that constraints of the first type are active post-morphemic OCP effects, while constraints of the second type are the result of extinct post-morphemic constraints. Not only can the latter be dispensed with, but they are also disconfirmed by evidence from loanword and non-word adaptation. Section 3 showed that MSCs have been used as an argument for i) the content of DICT entries, and ii) the representation of segmental structure, that of coronals in particular. We saw that while so-called MSCs, advantageously reinterpreted as post-morphemic constraints, still constitute a rich source of information on segmental structure, it is doubtful whether they can be used as arguments against the coronal underspecification hypothesis. In a more general perspective, we claimed that MSCs are either synchronic or diachronic post-morphemic constraints. The lexical regularities they are meant to capture can be attributed to the fact that language learning tends to result in assigning DICT entries that conform to post-morphemic constraints.

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On the Need for Negative Constraints and Repair: Consonant Mutation in Setswana

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1. Introduction

I argue here for the necessity of negative constraints, specifically the claim in (1). This position contrasts with that taken by Declarative Phonology (Scobbie 1992; this volume) and with the view that positive and negative constraints are equivalent (Itô 1988:32).

(1) A constraint-based theory must allow negative constraints.

Furthermore, I show that a constraint theory must also allow constraint violation, and claim that it must include the following notion of repair:

(2) Repair:
A context-free phonological operation (insertion or deletion) that applies according to the Minimality Principle to make a phonological unit conform to a phonological constraint.

(3) Minimality Principle (Paradis, this volume; Béland, Paradis, and Bois, this volume):
A Repair must apply at the lowest phonological level to which the violated constraint it preserves refers.

The lowest phonological level is determined by the following scale, which is adapted from Paradis (1988b:7):

1My first debt of thanks is to Carole Paradis for many insightful and helpful comments on this paper. Thanks also to Emmanuel Nikiema and Caroline Lebel, and to Doug Pulleyblank, Keren Rice, and Pat Shaw for extensive comments on my thesis, from which the material for this article is taken. I acknowledge SSHRC grant 410-96-0575 and FCAR grant 90-NC-0383 to Paradis’ project and Faculté des lettres at Université Laval for its financial support.