

## Bibliography II. Cyclical Segmental Rules\*

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### A. Introductory remarks

Along with the assertion in Chomsky 1965:ch. 3 that syntactic transformations apply (as a group) cyclically, early generative phonology assumed that at least some phonological rules applied in a group, first to innermost constituents, then to larger and larger constituents. The position was first enunciated for English stress rules in Chomsky, Halle, and Lukoff 1956. Since then it has been argued for Serbo-Croatian stress and pitch (McCawley 1962), Spanish word stress (Foley 1965:sec. 5.4 and Harris 1969:93-6, 125-7), German sentence stress (Kiparsky 1966) and intonation (Bierwisch 1966), Japanese accent (McCawley 1968:ch. 3), and various other prosodic phenomena; the analysis for English stress is developed further in Chomsky and Halle 1968:ch. 2, secs. 1-5; ch. 3.

Arguments for cycles are based on the fact that some rule A must apply before another rule B in certain forms, while B must apply before A in others, or on the fact that A must apply twice in the same form. Consequently, the cyclicity issue is tied up with problems of local ordering, iterative application, global rules, simultaneous ordering, and anywhere rules, which are not surveyed here.

Cyclical rules may be classified according to their domain of application (below the level of the word, both below and above, or only above) and according to the type of feature predicted by the rule (prosodic or segmental). It has been generally assumed that some prosodic rules are cyclic, though even prosodic cycles below the level of the word have been disputed (as in the reanalyses of English word stress by Lee 1969 and Ross 1972). The prediction of segmental features by cyclical rules, however, has always been an uneasy point. The cautious position of Chomsky and Halle 1968:349-50 is that

Examples of cyclical application of rules seem to be restricted to prosodic features and segmental modifications associated closely with prosodic features...We have experimented with cyclical rules in accounting for segmental features...but we are at present inclined to believe that all cases explored can be handled better with noncyclical rules. It would, however, be premature to rule out the possibility that cyclical rules may play a role in the segmental phonology as well.

In the next section I list (roughly in order of their original appearance) the cases I know of where cyclical segmental rules have been suggested. These concern either word-internal rules or rules that apply in both internal and external sandhi; I know of no cases where an analyst has argued for segmental cyclical rules above the level of the word.

## B. The literature

The first cases discussed were word-internal cycles in Russian (Halle 1961, 1963; Lightner 1962, 1963a, 1963b, 1963c, 1963e, 1965a, 1965b, 1966a) and other Slavic languages--Old Church Slavonic (Lightner 1963f, 1966b) and Polish (Lightner 1963d). There is a summary of the OCS and Russian evidence in Lightner 1972:ch. 4. The Russian analyses have been disputed by Kayne (ms. 1967).

The McCawley 1963 analysis of Serbo-Croatian stress and pitch orders several rules introducing and deleting glides and vowels within a word-internal cycle.

Cyclical application has been used to account for alternations of e and o in Indo-European languages by Bever and Langendoen 1963, with development for Old English by Bever 1963 and for Greek by Langendoen 1963.

Hale 1965:299-300 discusses a Papago rule of unstressed vowel reduction which he says 'applies cyclically from right to left' (300), adding in a footnote that

It is almost certain that the superficial phrase marker...provided by the syntax is relevant to the correct formulation of this rule--the details are still under investigation...It appears, at present, that the correct formulation of this rule will be highly similar to the formulation of the English stress rule given by Chomsky and Halle in their *The Sound Pattern of English* (forthcoming).

and that a similar length alternation had been described for Tibatulabal by Voegelin 1935.

For Sanskrit, consider Zwicky 1965:sec. 2.3 (a putative case of rule repetition in internal and external sandhi) and 4.1.3. (a putative case of a word-internal segmental cycle). The latter case depends upon the unity of the so-called ruki rule, which is in question (cf. Zwicky 1970).

Schane 1968:ch. 1 treats a case of rule repetition in internal and external sandhi (the French Truncation rule). Schane's cyclicity argument is disputed by Milner 1967, and Selkirk 1972:ch. 4 gives an analysis in which cyclical application is replaced by reference to one or two instances of the word boundary # in surface structure.

Kuroda 1967:sec. 2.6 argues for word-internal cyclical rules in the Yawelmani dialect of Yokuts, a conclusion attacked by Rice 1969:275 (citing a personal communication from Halle) and Kisseberth 1970:342-4. Rice suggests an iterative-rule solution, Kisseberth a reformulation of Kuroda's rules.

The word-internal cyclic rules of The Sound Pattern of English

fall together in the ordering, and all but rule (16) (which changes i to y and y to i) are rules of primary stress assignment...We noted that the justification for ordering (16) before [the Alternating Stress Rule] is not overwhelming, and there is no relation between (16) and [the Main Stress Rule]. If, furthermore, the analysis is revised in such a way as to drop rule (16) from the cycle, then the cycle would be restricted to a single elaborate schema abbreviating a complex set of rules...all assigning primary stress in certain positions. In Chapter Three we explained why we were unable to accept this analysis, but it seems sufficiently attractive for more thought to be given to its consequences. (Chomsky and Halle 1968:237)

The cyclical rules of Italian presented by Saltarelli 1970: 78-89 include (in addition to stress assignment) rules predicting length of consonants, glide formation, glide deletion, vowel ellipsis, and consonant ellipsis. The rules are cyclical by virtue of applying both within words and between words.

Carrell 1970 argues for cyclical application of tone level rules in Igbo, according to Harms 1968:97. Harms 99-100 also develops a case for a word-internal cycle for a vowel insertion rule in Komi.

Drachman 1969:123-5 claims that a contradiction in rule ordering motivates a word-internal cycle for a shwa-insertion rule in Twana.

Nasal harmony within the word in Desano is analyzed as involving cyclical application of rules by Kaye 1971.

Klamath has been argued to have a word-internal cycle by Kisseberth 1972a, 1972b, and Kean 1973. White 1973:ch. 4 gives counterarguments to Kisseberth.

In a discussion of Sundanese nasalization, Howard 1972:99-105 offers a word-internal cycle as an alternative to the local ordering treatment of Anderson 1972.

Kaye and Piggott 1973 argue for word-internal cyclical application for the Ojibwa T-Palatalization rule.

Brame 1972b considers the general hypothesis that 'only stress-assigning rules may be cyclic' (63), suggesting a reexamination of the English y ↔ i rule. Brame goes on to argue that an English vowel reduction rule and a Spanish glide formation rule are (word-internal) cyclic. Since both rules mention stress (though they don't predict stress), Brame advances the hypothesis that 'only rules that specify the feature stress in the matrix of the affected segment may be cyclic' (71). Several of the cases cited above do not conform to this generalization, though reanalysis might well be called for.

Footnote

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C. Items cited

- Anderson, Stephen R. 1972. On nasalization in Sundanese. *LingI* 3.3.253-68.
- Bever, Thomas G. 1963. The e/o ablaut in Old English. *MIT QPR* 69.203-7.
- \_\_\_\_\_ and D. Terence Langendoen. 1963. The reciprocating cycle of the Indo-European e/o ablaut. *MIT QPR* 69.202-3.
- Bierwisch, Manfred. 1966. Regeln für die Intonation deutscher Sätze. *StGr* 7.99-201.
- Brame, Michael K. (ed.). 1972a. Contributions to generative phonology. Univ. of Texas Press, Austin.
- \_\_\_\_\_. 1972b. The segmental cycle. In Brame 1972a:62-72.
- Carrell, Patricia. 1970. A transformational grammar of Igbo. Cambridge Univ. Press, Cambridge. Revision of 1967 Ph.D. dissertation, Univ. of Texas.
- Chomsky, Noam. 1965. Aspects of the theory of syntax. MIT Press, Cambridge.
- \_\_\_\_\_ and Morris Halle, 1968. The sound pattern of English. Harper and Row, New York.
- \_\_\_\_\_, Morris Halle, and Fred Lukoff. 1956. On accent and juncture in English. For Roman Jakobson, 65-80. Mouton, The Hague.
- Drachman, Gaberell. 1969. Twana phonology. *OSU WPL* 5. Reprint of 1969 Ph.D. dissertation, Univ. of Chicago.
- Foley, James A. 1965. Spanish morphology. Ph.D. dissertation, MIT.
- Hale, Kenneth. 1965. Some preliminary observations of Papago morphophonemics. *IJAL* 31.4.295-305.
- Halle, Morris. 1961. Note on cyclically ordered rules in the Russian conjugation. *MIT QPR* 63.149-55.
- \_\_\_\_\_. 1963. O pravilax ruskogo sprjaženija. American Contributions to the Fifth International Congress of Slavists 1.113-32. Mouton, The Hague.
- Harms, Robert T. 1968. Introduction to phonological theory. Prentice-Hall, Englewood Cliffs, N.J.
- Harris, James W. 1969. Spanish phonology. MIT Press, Cambridge. Revision of 1967 Ph.D. dissertation, MIT.
- Howard, Irwin. 1972. A directional theory of rule application in phonology. *UH WPL* 4.7. Reprint of 1972 Ph.D. dissertation, MIT.
- Kaye, Jonathan D. 1971. Nasal harmony in Desano. *LingI* 2.1.37-56.
- \_\_\_\_\_ and Glyn L. Piggott. 1973. On the cyclical nature of Ojibwa T-Palatalization. *LingI* 4.3.345-62.
- Kayne, Richard S. Ms. 1967. Arguments against cyclic rules in Russian phonology.
- Kean, Mary-Louise. 1973. Nonglobal rules in Klamath phonology. *MIT QPR* 108.288-310.
- Kiparsky, Paul. 1966. Über den deutschen Akzent. *StGr* 7.69-98.
- Kisseberth, Charles W. 1970. Review of Kuroda 1967. *LingI* 1.3.337-43.
- \_\_\_\_\_. 1972a. Cyclical rules in Klamath phonology. *LingI* 3.1.3-34.
- \_\_\_\_\_. 1972b. A further argument for the cycle in Klamath phonology. *PiL* 5.3.344-53.
- Kuroda, Sige-Yuki. 1967. Yawelmani phonology. MIT Press, Cambridge.

- Langendoen, D. Terence. 1963. The e/o ablaut in Greek. MIT QPR 69.207-11.
- Lee, P. Gregory. 1969. English word-stress. CLS 5.389-405.
- Lightner, Theodore M. 1962. On pon,át, and obrazovát, type verbs in Russian. MIT QPR 67.177-80.
- \_\_\_\_\_. 1963a. Nasal diphthongs in Russian. MIT QPR 70.293-7.
- \_\_\_\_\_. 1963b. Notes on the verbs čitat' and -čest'. MIT QPR 70.297-8.
- \_\_\_\_\_. 1963c. On the present tense theme e/o in Russian. MIT QPR 68.190-3.
- \_\_\_\_\_. 1963d. Preliminary remarks on the morphophonemic component of Polish. MIT QPR 71.220-35.
- \_\_\_\_\_. 1963e. Remarks on the morphophonemic component of Russian. MIT QPR 69.193-9.
- \_\_\_\_\_. 1963f. The shift of s to x in Old Church Slavonic verb forms. MIT QPR 70.298-300.
- \_\_\_\_\_. 1965a. O cikličeskix pravilax v ruskom sprjaženii. Voprosy jazykoznanija 2.45-54. English translation 1967: On the phonology of Russian conjugation. Linguistics 35.35-55.
- \_\_\_\_\_. 1965b. Segmental phonology of Modern Standard Russian. Ph.D. dissertation, MIT.
- \_\_\_\_\_. 1966a. Ob al'ternacii e ~ o v sovremennom ruskom literaturnom jazyke. Voprosy jazykoznanija 5.64-80. English translation 1969: On the alternation e ~ o in Modern Russian. Linguistics 54.44-69.
- \_\_\_\_\_. 1966b. On the phonology of Old Church Slavonic conjugation. IJSLP 10.1-29.
- \_\_\_\_\_. 1972. Problems in the theory of phonology. Volume 1: Russian phonology and Turkish phonology. Linguistic Research, Inc., Edmonton and Champaign.
- McCawley, James D. 1963. Stress and pitch in the Serbo-Croatian verb. MIT QPR 70.282-90.
- \_\_\_\_\_. 1968. The phonological component of a grammar of Japanese. Mouton, The Hague. Revision of 1965 Ph.D. dissertation, MIT.
- Milner, J.-C. 1967. French truncation rules. MIT QPR 86.273-83.
- Rice, Lester A. 1969. Review of Kuroda 1967. IJAL 35.3.274-5.
- Ross, John Robert. 1972. A reanalysis of English word stress (part 1). In Brame 1972a:229-323.
- Saltarelli, Mario. 1970. A phonology of Italian in a generative grammar. Mouton, The Hague. Revision of 1966 Ph.D. dissertation, Univ. of Illinois.
- Schane, Sanford A. 1968. French phonology and morphology. MIT Press, Cambridge. Revision of 1965 Ph.D. dissertation, MIT.
- Selkirk, Elisabeth O. 1972. The phrase phonology of English and French. Ph.D. dissertation, MIT.
- Voegelin, Carl F. 1935. Tübatulabal grammar. UCPAAE 34.2.
- White, Robin B. W. 1973. Klamath phonology. UW SLLL 12. Reprint of 1972 Ph.D. dissertation, Univ. of Washington.
- Zwicky, Arnold M. 1965. Topics in Sanskrit phonology. Ph.D. dissertation, MIT.
- \_\_\_\_\_. 1970. Greek-letter variables and the Sanskrit ruki class. LingI 1.4.549-55.