# PEIPING TONAL PHONOTACTICS

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This paper[1] is an application of stratificational techniques of linguistic description[2] to tone sandhi phenomena in the Peiping dialect.[3]

Characteristic of the stratificational technique is its description of the facts of a given language in terms of a network of relationships. This network is divided into six stratal systems arranged in the following order, from semantic stimulus to speech output: hypersememic, sememic, lexemic, morphemic, phonemic, and hypophonemic. A given utterance begins with stimuli from the world outside the network. These stimuli initiate further stimuli via relationships in the network established according to the peculiar structure of the particular language involved. The process is thought of as analogous to the way an electric impulse travels along a wire in a circuitry network, and it is sometimes convenient to refer to a speech 'impulse' activated by a stimulus from the outside world, 'traveling' along connections within the network from the hypersememic stratal system to the hypophonemic, which produces speech sounds. The process is reversed in speech reception.

Each stratal system has two subsystems: (1) realizational, which, when a unit in one stratal system is realized as one or more units in the next stratal system, specifies the choices available; and (2) tactical, which, by specifying the available arrangements of units on that level, also specifies which choice may be made when. Each tactical subsystem, or 'tactics', is proper to its own stratal system and has no contact with the rest of the world. Thus '2' at the lexemic level of the Peiping dialect has two realizations at the morphemic level: *liaŋ3* and *ər4*; which one will occur in any given utterance is specified in the tactics of the morphemic stratal system, or 'morphotactics'. This means that when an impulse passes from '2' at the lexemic level, it travels to *liaŋ3* if the neighboring impulses forming the context for *liaŋ3* fulfil certain conditions specified in the morphotactics, e. g. if a measure follows; and it travels to *ər4* if certain other

conditions are fulfilled, e. g. if an ordinalizing prefix precedes.

Lamb has introduced various terms to label further sub-subsystems within the realizational subsystem, and to label the various units involved. I shall not go into them all here; the ones necessary in describing Peiping tonal behavior will be introduced below. First, it should be pointed out that Peiping tonal sandhi phenomena are best explained in terms of two stratal systems: phonemic, and hypophonemic. Phonemes in stratificational description are intermediate between classical phonemes and classical morphophonemes; hypophonemes roughly correspond to components.

Units in the morphemic realizational system that are realized as units in the phonemic realizational system are called 'morphons'. Within the phonemic realizational system, morphons are realized as 'phonemes', which are in turn realized as combinations of 'phonons'.[4] Symbols for these various kinds of units are placed between slashes; just what kinds are referred to is indicated by letters preceding the first slash: MN/2/ means the (tonal) morphon 2; P/2/ means the (tonal) phoneme 2; PN/2/ means the phonon 2; H/∧/ means the hypophoneme ∧ Here are some other notational conventions: instead of using two slashes as a way of writing 'is realized as' (Lamb's usage), I will use a colon, merely for the sake of typographical convenience ; a space between two symbols for units means 'conjunction': PN/2 ∧/ means 'tonal phonon 2 followed by tonal phonon;∧ a comma between two symbols means 'alternation'; P/3, *3*, 2/ means 'tonal phoneme 3 or *3* or 2'.

Peking tone sandhi involves two sets of alternations: (1) alternation between tonal phonemes, and (2) alternation between tonal hypophonemes. This paper is primarily concerned with the first type; a tentative description of part of the second type is also given.

1. Alternation of tonal phonemes. There are six tonal morphons: MN/1,2, 3, 4, 0, 0<3/.[5] MN/1, 2, 3, 4/ correspond to the tones traditionally referred to as inpyng, yangpyng, shaang, and chiuh: high-level, high-rising, (low-) rising, and falling. MN/0, 0<3/ both correspond to the so-called neutral tone of most modern descriptions, In order to account adequately for certain phonotactical phenomena involving tones, the neutral tone is split up into two morphons: MN/0,0<3/. As the symbol suggests, a syllable now carrying MN/0<3/ carried MN/3/ earlier in its history. Setting up MN/0<3/ accounts for the following phenomena in normal, non-slow speech: (1) MN/3/ : P/2/ before another MN/3/ :

P/2/ before MN/0<3/: P/0<3/. Example: MN/hen3 khe3 i0<3/: P/hen2 khe2 i0 <3/ 'quite possible'. (2) In a contrastively stressed syllable, MN/3/: P/3/ before any MN/3/, including, of course, a MN/3/: P/2/ before MN/0<3: P/0<3/. Exa mple: MN/ˈˈhen3 khe3 i0<3/: P/ˈˈhen*3* khe2 i0<3/ '*quite* possible'.

Alternate realizations of MN/3/, depending on the context as specified in the phonotactics add one more unit in the phonemic stratum, so that there are in all seven tonal phonemes:

MN/1/: P/1/,
MN/2/: P/2/,
MN/3/: P/3, *3*, 2/
MN/4/: P/4/,
MN/0/: P/0/,
MN/0<3/: P/0<3/.

2. Tonal phonotactics. The tonal part of the phonemic alternation pattern given at the end of the above section specifies which tonal morphons have multiple phonemic realizations; the phonotactics gives the conditions for their occurrence. The description is complicated but can be clarified if various parts of it are introduced gradually:

A phonological word consists of one of three sequences, A, B, or C, to be described below, followed by pause.

Sequence A is any number of choices made from list D.

List D includes syllables carrying tones other than P/3/ or P/*3*/: optionally stressed, either P/1, 2, 4/, or, stressless, P/0,0<3/.

Sequence B consists of a syllable carrying P/3/ optionally stressed, optionally preceded by any number of syllables in D or by any number of syllables carrying P/*3*/, stressed, and optionally followed any number of times by a syllable carrying P/1, 2, 4/, optionally stressed, or by a sequence consisting of a syllable carrying P/0/, optionally followed by a syllable carrying P 0<3.

Sequence C consists of any number of syllables carrying P/*3*/, stressed, optionally preceded by any number of syllables in D, and followed by a sequence consisting of a syllable carrying P/0<3/ optionally followed by any number of syllables in D.

3. Tonal phonemes. Tonal phonemes are realized as phonons and sequences of phonons as follows:

P/1/: PN/∧ ∧/.
P/2/: PN/2 ∧/,
P/3/: PN/∨ 3/,
P/4/: PN/∧ ∨/,
P/0, 0<3/: PN/0/,
P/3/: PN/∨ ∧/.

Notice that by the time the transition from phoneme to phonon has been made, the two neutral tone units have been neutralized and realized as one unit PN/0/.

4. Alternation of tonal hypophonemes. Whereas the tonal hypophonotactics has yet to be satisfactorily worked out, the realizational part of the tonal hypophone mics can be reasonably guessed at; it is presented here in the hope that it will aid in understanding the tonal part of the phonemic stratal system presented above.

The five tonal phonons arrived at in Section 3 above are realized as hypophonemes via the hypophonemic alternation pattern as follows:

PN/∧/: H/∧/,
PH/∨/: H/∨/,
PN/2/: H/∨, 0/,
PN/3/: H/∧, ∨/,
PN/0/:H/∧, ∨, 0/,

There are thus three hypophonemes: H/∧, ∨, 0/.

5. Tonal hypophonotactics. The relationships governing the alternations in the realizations of PN/2, 3, 0/ appear in the hypophonotactics: they will be published at a later date.

6. Hypophonemic realization. The three tonal hypophonemes are realized phonetically as follows:

H/∧/: 'pitch higher than what is normal at the particular point in the particular intonation curve that the syllable occurs at,'

H/∨/: 'pitch lower than what is normal at the particular point in the particular intonation curve that the syllable occurs at',

H/0/ has no realization; this means that there is no difference in pitch from what is normal at the particular point in the particular intonation curve that the syllable occurs at.

Thus there are two hypophonemes, with realizations, which are observed in speech as raised and lowered pitch, respectively.

7. Concl usion. The question 'How many tones are there in the Peiping dialect?' has now to be rephrased into a series of questions: 'How many tonal morphons...?'(Answer: six main ones); 'How many tonal phonemes...?' (Answer: seven); 'How many tonal phonons...?' (Answer five); 'How many tonal hypophonemes...?' (Answer: three); 'How many different realizations of tonal hypophonemes are there...?' (Answer: two).

Notice finally that the tonal sandhi phenomena are accounted for entirely by realization formulation. Rather than saying 'Tone 3 changes to tone 2 before tone 3', we say something like '3 and 2 have the same realization before 3'

## NOTES

1 The following remarks comprise a reworking of a talk given April 28, 1967, for the University of Kentucky Foreign Language Conference, Linguistics Section. The comments of some of the participants at the section, chiefly Professors Ilse Lehiste and Lloyd Swift, have been remembered during the revision of the paper, and are hereby gratefully acknowledged.

2 These techniques are being developed at Yale by Professor Sydney Lamb, whose assistance in teaching me his theories and in working out some of the details of their application to Peking tonal sandhi phenomena is much appreciated, and is hereby also gratefully acknowledged. Though his theories have changed somewhat from those expressed in his most recent writings, the following titles from at least a background for his present thought and have helped me in the preparation of this paper: Sydney M. L amb, "On alternation, transformation, realization, and stratification," *Monograph series on languages and linguistics* 17 (Report of the 15th *Annual Round Table Meeting on Linguistics and Language Studies*, Georgetown University, Washington, D. C., 1964; "Prolegomena to a theory of phonology," *Language* 42.536-73 (1966); *Outline of stratificational grammar*, Georgetown University Press, Washington, D, C,. 1966.

3 Only tone sandhi that apply without respect to the individual morphemes they occur in connection with are treated here. Most of the data are well known, and found in Yuen Ren Chao, *Mandarin Primer*, Harvard University Press, Mass., 1948, especially pp. 25-7, 107-113.

4 Portmanteau realization does not figure in the description of Peiping tonal behavior, so there are no alternations in the top part of Lamb's 'sign pattern'. For this reason, and to keep this presentation as uncluttered as possible, I have not mentioned Lamb's 'sign pattern' at all.

5 Not counting tonal morphons that would have to be set up if we were to account for tonal sandhi attached to particular morphemes, e. g. *bu* 'not', *i* 'one', *chi* 'seven', and *ba* 'eight'.

6 Hockett's term for a stress group. See Charles F Hockett, Peiping phonology, *JAOS* 67.253-67 (1947; in Martin Joos, ed., *Readings in linguistics*, 217-28, ACLS, New York, 1958; see especially 218).