THE SYLLABLE AND LANGUAGE PERCEPTION

Geoffrey S. Nathan
Department of Linguistics
Southern Illinois University at Carbondale
Carbondale, IL 62901.

This paper proposes that languages have an active
process of syllabification that takes a string of
phonemes as input and organizes those sounds into a
hierarchical syllable structure. This process acts
as a filter on perception of input, such that native
speakers hear both their own and foreign languages as
if the sounds had been organized to follow the
syllabification processes of thir own language. The
results of several psycholinguistic research programs
can be offered as evidence for this claim.

This paper is an exercise in 'armchair
phonetics', in which I will argue that
syllabification in language is an active process, in
the sense used by Natural Phonology (see, e.g. Stampe
1973, Donegan and Stampe 1978). That is, I will
argue that the assembly of segments into syllabic
units is an activity carried out by the speaker in
real time as speech is produced—a process governed,
among other things, by rate of speaking, degree of
care in the production of the speech and the purpose
to which the speech is being put. Furthermore, the
setting of segments into suprasegmental organization,
although governed by universal tendencies, allows
certain options which speakers may, on occasion,
choose to exercise.

Although the syllable has had a tenuous position
in recent linguistic and phonetic theory, many have
argued eloquently for its existence. The earliest
modern discussion of the concept of syllable,
including an extensive discussion of the basis of
syllable division and the idea that the shape of the
syllable is governed by the sonority hierarchy, can
be found in Sievers (1885:179-183). Sievers is also
the first to argue that syllabification is a
heuristic rather than an algorithm: 'Equally, one
can, to a certain extent, give arbitrarily different
syllabifications to any one of several sounds of an
assembled string like [aia].' (179, my translation).

Since that time, numerous scholars have argued
that the sounds of language are assembled into larger
units that appear to be actively used in the
production and perception of speech. An extensive
discussion appears in Stetson 1951, although some of
his contentions have since been disproven (Ladefoged
1982). Kozhevnikova and Chistovich (1965) argue that
instructions to the articulators are sent in
syllable-sized chunks (122), while several
researchers have recently presented functional
arguments based on the nature of the speech-producing
mechanism for the syllable as a unit of sound
organization—Studdert-Kennedy 1975 and,
particularly, Lindblom 1983 are two notable recent
works on the subject.

I will begin by discussing a Hebrew prayer,
known as the Shma. The prayer is sung to a
traditional melody, and consists of two lines. For
the first line, there is only one possible setting
for the words, but for the second line, there are two
possible ways in which the words and the music can be
coordinated, and both are used, apparently
interchangeably:

1 a) boru.uch shem kevod ma.alchuto leolam vaed

  b) boru.uch shem kevod malchuto.o leolam vaed

Since there are more notes than syllables, additional
syllables must be created, and as 1) shows, there are
two possibilities for the creation of the extra
syllables. My primary argument is that rules of
syllabification mediate between storage of sounds and
their production (i.e. they are used in
'derivations') and between perception of sounds and
their storage (i.e. their 'underlying
representations').

My primary sources of evidence for this claim
involve investigations that have been done in
examining the acquisition of second language, where
there appears to be conflict between the processes of
syllabification in the languages involved.

An early paper on this subject is Brière et al.
(1983). The authors note that, although neither /ž/
nor /ŋ/ can begin words in English, only one, /ŋ/
appears to offer any problems for native speakers of
English learning a second language. They therefore
suggest that the correct restriction on distribution
of these phonemes is stated in terms of syllable
distribution—/ž/ may occur in syllable-initial
position (although, by accident, not in word-initial
position), while /ŋ/ only occurs in syllable-final
position, and hence may never occur word-initially.
To study this issue they had native speakers of
English produce words one syllable at a time
following the beat of a metronome. (The words were
controlled for such things as spelling and stress
placement). They then studied what their subjects
did with various consonants at the induced pauses
occasioned by the enforced divisions the metronome
produced. As one might expect, they found that while
speakers produced such forms as 'lei.sure', they
always divided 'sing.ing'.

For our purposes, however, a much more
interesting result occured with words like 'city'.
Although this word is normally pronounced with a
voiced alveolar flap in American English, it was
always pronounced as a voiceless, aspirated stop in
their experiment. Various researchers (Stampe 1973,
Kahn 1976) have argued that the choice of flap versus
stop is controlled by syllabification. Syllable
initial stops are aspirated, while syllable final (or
ambisyllabic) /t/'s are flapped. Syllabication
itself is driven by stress, with a stressed syllable
attracting single consonants leftward away from an
adjacent unstressed syllable. Since the highly
unnatural isochronic stress pattern induced by
speaking with a metronome made all /t/'s initial, it
is not surprising that they came out aspirated. But
this is to be expected only if the sounds are stored
as /t/'s, with syllabification, and consequently
segmental processes dependent on syllabification,
occurring at the time of speech production.

In a much more recent publication, Eckman (1981)
argued that there are 'natural processes' that
speakers use when attempting to acquire a second
language, even though these processes do not occur in
any known natural language or historical change—
ordinarily two major sources for the naturalness of
phonological processes. He studied how native
speakers of Spanish and Mandarin dealt with sound
sequences that do not occur in their native languages
but do in English—final voiced stops. Spanish
speakers appear to begin using the well-known process
of final devoicing, a traditional candidate for a
natural process, and one that does not, as far as we
know, occur in Spanish. Mandarin speakers, however,
frequently deal with final obstruents through the
insertion of a final schwa. Since the theory that
Eckman follows (a version of generative phonology)
requires that any systematic difference between
target language and output be attributed to the
presence of a rule, he is forced to posit a rule of

'schwa paragoge', which he also argues must be a natural process, since it occurs neither in the source nor the target language, and consequently cannot have been learned.

There is, however, an alternative explanation for the frequently attested action of learners (and borrowers) of adding syllables to foreign words to avoid unacceptable consonant configurations. The Japanese borrowing of 'baseball' as /beisuboru/ is a parallel example.

Let us suppose that principles of syllabification, as well as other phonological processes mediate between mental storage and pronunciation, and between hearing and mental storage. Foreign words, especially at the beginning of the study of a foreign language, will be storable only in native language terms. If the sounds perceived are, when produced in the L1, subject to L1 processes, then they will be so pronounced—thus native speakers of French unaspirate initial English voiceless stops and native speakers of English do the reverse. If the perceived sounds occur in positions in which they do not in the native language, unsuppressed natural processes which have never come into play in the first language may well do so in attempts at the L2. This explains the final devoicing of native speakers of Spanish. However, Spanish does have some final obstruents. Mandarin has no final obstruents at all. This forces native speakers to attempt something that I propose to term second language restructuring. They increase the phonetic substance of the target so that segments (such as final obstruents) that their native language patterns forbid them from producing will be retained. This creative restructuring of the input is not the same as the application of a natural phonological process, but is rather the invention of input which will be sufficiently immune to the natural processes the speaker already possesses that the otherwise deleted consonant will remain intact. Since the syllable-structure processes of Mandarin do not permit final obstruents, the creation of an additional syllable, particularly when it is made up only of the threatened consonant and a schwa, is a natural strategy for keeping phonic information that Mandarin and other universal processes would threaten.

A similar claim is made by Broselow (1984), who argues that the syllabification processes in English and Egyptial Arabic differ with respect to whether word boundaries play any role, with the result that English speakers misperceive word boundaries in Arabic and vice versa.

In conclusion, I will argue that the process of syllabification—that is, of setting strings of consonants and vowels to syllables—occurs as an active, ongoing, mental event in the speech production process. It is partly controlled by universal factors (more sonorant sounds are more likely to be syllable nuclei than less sonorant sounds), but also subject to language particular constraints. English allows syllabic nasals under certain limited, unstressed, circumstances, while French does not. French allows syllable-final consonant clusters (for example in 'quatre') that English does not. These processes apply to whatever 'underlying' (that is, mentally stored) strings the speaker has, whether native or foreign, and act as input filters constraining the possible set of underlying strings in the first place. However, despite their filtering effects, they allow for some slippage, particularly in differences between careful and 'sloppy' speech.

Finally, for speakers of one language learning a second, when input is encountered that would lead to impossible syllabifications (from the point of view of the native language) the input can be adjusted, either through the deletion of segments, or through the addition of supplementary segments which will allow the retention of the offending segments (usually consonants) by permitting the consonants to act as syllable onsets rather than codes. The addition of such 'epenthetic' consonants is itself not a natural process (i.e., serving neither morphophonemic nor allophonic speech adjustment roles) but is rather a creative use of language perception, adapting the input to the constraints the native speaker brings to the language.

Bibliography

Aronoff, Mark and Richard T. Oehrle, eds. 1984. Language Sound Structure Cambridge: MIT Press

Bell, Alan and Joan B. Hooper, eds. 1978. Syllables and Segments. Amsterdam: North Holland.

Brière, Eugene, Russell N. Campbell and Soemarmo. 1983. A need for the syllable in contrastive analyses. In Robinett and Schachter.

Broselow, Ellen. 1984. An Investigation of transfer in second language phonology. IRAL 22:253-269.

Donegan, Patricia and David Stampe. 1978. The syllable in phonological and prosodic structure. In Bell and Hooper pp 25-34.

Eliasson, Stig. Ed. 1984. Theoretical Issues in Contrastive Phonology. Heidelberg: Groos.

Eckman, Fred. 1981. On the naturalness of interlanguage rules. Language Learning 31.1:195-216.

Fromkin, Victoria A. 1985. Phonetic Linguistics: Essays in Honor of Peter Ladefoged. Orlando: Academic Press.

Fujimura, Osamu and Julie B. Lovins. 1982. Syllables as Concatenative Units. Indiana University Linguistics Club.

Kahn, Dan. 1976. Syllable-based generalizations in English phonology. Indiana University Linguistics Club.

Kavanaugh, James F. and James E. Cutting, eds. 1975. The Role of Speech in Language. Cambridge: MIT Press.

Kozhevnikova, V. and L. Chistovich. 1965. Speech: Articulation and Perception. Translation: Washington, D.C.: Joint Public Research Service.

Ladefoged, Peter. 1982. A Course in Phonetics. New York: Prentice Hall.

Lindblom, Björn. 1983. Economy of Speech Gestures in MacNeilage, ed.

MacNeilage, Peter F., ed. 1983. The Production of Speech. New York: Springer Verlag.

Robinett, Betty Wallace and Jacqueline Schachter, eds. 1983. Second Language Learning. Ann Arbor: University of Michigan Press.

Sievers, Eduard. 1885. Grundzüge der Phonetik Leipzig: Breitkopf und Härtel.

Stampe, David. 1973. A Dissertation on Natural Phonology. Indiana University Linguistics Club.

Stetson, R. H. 1951. Motor Phonetics. Amsterdam: North Holland.

Studdert-Kennedy, Michael. 1983. Psychobiology of Language. Cambridge: MIT Press.
_____ 1975. From Continuous Signal to Discrete Message: Syllable to Phoneme. In Kavanaugh and Cutting.

Tarone, Elaine. 1984. The role of the syllable in interlanguage phonology. In Eliasson.