

# Various Phonetic Aspects of Articulatory Features and Peculiarities: Part 1

## 調音素性と特徴に関する音声諸相（１）

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### Abstract

In this article, the co-authors (K.Miyatake & M.Tsudzuki) firstly pointed out the indispensability of Phonetics in teaching or learning English as a foreign language in Japan. We discuss the following issues, for instance, quality, quantity, variants of sounds, movements of speech organs, articulatory mechanism, sound circumstances, and allocation of English and Japanese sounds. Following the theory of Phonetics and making the prudential study forward, we consider English weak vowel schwa compared with Japanese strong central-open-vowel-*a*. Articulatory mechanisms are narrowed down in detail to the sound quality and quantity which are allocated among consonant classifications. Consonantal identification occurs by narrowing or blocking the air at the points of the speech-organ passage. The consideration concerning with not only palatalization but also velarization in English has been treated fully with examples meticulously. The phonetic terms *fortis* and *lenis* which are generally accepted have been discussed in relation to articulatory mechanism. Next, we consider quality among alveolar flap, retroflexed flap, retroflexed and

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palatalized lateral belonging to Japanese consonantal systems which disturb Japanese students to discriminate or acquire English *l-r* sounds adequately.

In subsequent sections, we move on to the research on nasals or nasality which should be produced by blocking the air in the mouth and by lowering the uvula simultaneously. We cover the topics of Japanese five nasals to discuss further with a deep focus on some important themes methodologically. The replacement of a uvular nasal for other English nasals which is likely to occur in Japanese learners of English is treated here in succession from the previous issue. If we compare nasalized vowels and uvular nasal, even though both vowelness and nasality are fundamental factors for discrimination, unchecked air is a peculiarity of these sounds. Vowels are easily influenced (nasalized) progressively, anticipatorily or with a coalescent manner of articulation. On the other hand, nasal-vowels occur independently during utterances in some languages. Not only articulatory pieces of evidence but also experimental or acoustic materials which are obtained through examining sounds can offer fundamental datum to support our theory of an articulatory transmutation or auditory perception, discernment, and recognition of sounds.

**Key words:** English Educational Phonetics, articulatory mechanism, physical attributes of speech sounds, vowelness & nasality, flap & lateral articulation

## 1. Introductory Remarks

Phonetics is an independent subject with a long history of specific study, and it is indispensable for language education. Although there are several categories of

Phonetics, scholars, researchers and phoneticians traditionally classify the theme into Theoretical Phonetics and Experimental Phonetics or General Phonetics and Specified Phonetics such as English Phonetics or Japanese Phonetics. The research accomplished by phoneticians and linguists has thrown new light on the issue of articulatory, auditory mechanism and experimental (acoustic) fields. Many phoneticians and linguists have already emphasized the importance and clarified the advantages of phonetic knowledge in teaching or learning pronunciation of English as a foreign language.

Furthermore, as is well known, Theoretical, Descriptive, Experimental and Acoustic Phonetics represented by distinguished phoneticians like H.Sweet (1845-1912), P.Passy (1859-1940), D.Jones (1881-1967), A.C.Gimson (1917-1985), M.Onishi (1898-1994), H.B.Lee, J.C.Wells, and others have extensively influenced scholars or researchers with diachronic aspects (historically) or synchronic (contemporary) phases. Outstanding pieces of research have been done by quite a few phoneticians in those areas of phonetic study. As mentioned here, it is said that the research theoretically accomplished by the present-day scholars and researchers has contributed to solve the new various issues raised not only on articulatory and auditory mechanism but also on acoustic analysis.

Among linguists and phoneticians, the growing consciousness of the importance of the English Educational Phonetics has been manifested in various fields, such as articulatory movements by speech organs, transmission of speech sounds treated physically, and auditory perception mechanism comprehended by the cerebrum. Not only the research regarding observations of segments (e.g., vowels, consonants, semi-vowels, phonetic variants, sound changes, etc.) but also the study of prosodic features (e.g., rhythm, stress, pitch, intonation, prominence, etc.) has been carried out extensively by teachers of English, scholars, researchers, linguists, and phoneticians based on Theoretical Phonetics.

From the viewpoint of teaching sound-sequences in English for Japanese students as a foreign language, various sound changes including assimilation, dissimilation, liaison, linking, inversion and dropping, etc., have been studied theoretically and concretely.

At this point, we change the topic to further the discussion on Theoretical Phonetics. Referring to the phonetic term, *Speechology* which appears in the glossary of *A Grand Dictionary of Phonetics* (1981:559-561) can clearly describe the total and indispensable study of speech sounds of human beings. Consequently, the co-authors (K.Miyatake & M.Tsudzuki) describe *Speechology* as *Human Phonetics* after considering the basic principles and concepts narrowly proposed by Masao Onishi who has an important perspective on the present issue.

Based on the long history of diachronic and synchronic study of English Phonetics, the results of the total research have been applied to the field of English education under the category of Practical Phonetics. In other words, during the elaborate and successive study of phonetics, phoneticians have contributed to the development of English education in Japan by reflecting multidisciplinary phonetic research in many fields, including Theoretical Phonetics, Acoustic Phonetics, Comparative Phonetics, and Applied Phonetics.

## **2. Comparative & Contrastive Phonetics - Usefulness for teaching sounds of English as a foreign language**

It is worth to compare two or three languages when phonetic differences of speech sounds are greater than similarities, such as between English and Japanese, British English and American English or among Japanese (including the field of dialectology). When we learn foreign languages, by making a comparison between the two languages, it is interesting to know

what phonetic features and peculiarities including segments and prosody each language has. In this article entitled "Various Phonetic Aspects of Articulatory Features and Peculiarities" (2022), the co-authors (K.Miyatake & M.Tsudzuki) discuss articulatory mechanism and sound values meticulously including not only English (either British English, *BrE* or American English, *AmE*) but also Japanese sounds from the perspective viewpoint of comparative research.

English and Japanese sounds have been studied widely using different approaches and in different areas of investigation by quite a few scholars, linguists, and phoneticians. However, sufficient study has not been made on the English and Japanese uvular nasal, retroflexed flap, retroflexed lateral and palatalized lateral synchronically based on Comparative or Contrastive Phonetics using different acoustic methodology, such as sound-spectrograph, electro-palatograph and flow-nasalitygraph. In respect to vowels, the next paragraph is a very good example which teaches us the importance of Comparative or Contrastive Phonetics for the Japanese learners of English as a foreign language.

In comparative & contrastive methodology, our research, investigation and experiments on speech sounds operated and accomplished by K.Miyatake & M.Tsudzuki have been successively developed along articulatory and experimental lines including comparative and contrastive methodology between English and Japanese. We also would like to draw attention to our previous accredited articles and publications which were already issued in journals of English Phonetic Society of Japan (ISSN 1344-1086, *Eigo onseigaku*) since 1995.

### 3. English weak vowel *schwa* compared with Japanese strong *a-vowel*

The English primary weak vowel *schwa* (described as *weak-mid-central vowel*)

occurs quite often in unstressed syllables in English. It commonly appears, initially (syllable initial), inter-consonantally and finally (syllable final) in words or phrases, such as *association, ago, away, afford, Asia, American, Canada, China, German, sofa*, take a trip, ding-a-ling, etc. English weak vowel *schwa* appears quite often in un-stressed syllables of the verb, the auxiliary and prepositions, such as, *am, are, was, were, have, has, had, do, at, from, for*, etc. However, not only the articulation but also acquisition of weak vowel *schwa* is one of the difficult sounds to tackle for the average Japanese learners of English in having a good command of English at an early stage.

According to the observation and theoretical description based on Comparative or Contrastive Phonetics by the co-authors (K.Miyatake & M.Tsudzuki), there are conclusive difficulties which prevent Japanese learners of English from acquiring the English weak vowel *schwa* with accuracy as shown below.

- (1) Five primary vowels (strong-moraic, equal timing) occur in the Japanese language and *schwa* (weak) is not involved in a Japanese vowel chart. So, the Japanese learners of English are not familiar with unstressed *weak-central vowel*. Japanese learners have difficulty to get not only sound quality-quantity image or acoustic impression but also articulatory posture (phonetic mechanism) of English weak vowel *schwa*.
- (2) Japanese *strong a-like vowel* (without lip-rounding) has a very wide articulatory space allocated in the Japanese vowel diagram or Primary Cardinal Vowels (*PCV*) or Secondary Cardinal Vowels (*SCV*). However, the English weak vowel *schwa* is not involved in *a-like vowel area* in the Japanese vowel diagram, so it is difficult for Japanese learners of English to discriminate *weak schwa* from *a-like*

*strong vowel quality.*

A.C.Gimson (1970; 124) describes English vowel *schwa* as three different variants which occur at different sound circumstances:

- (a) at the adjacent position to the velar,
- (b) at the non-final position,
- (c) at the final position.

Consequently, A.C.Gimson also describes *Advice to foreign learners* (1970, 126), which is very useful and helpful for Japanese learners of English to acquire the articulatory features of English weak vowel *schwa*. The same description has appeared in the work by A.C.Gimson & A. Cruttenden (1994; 118). In that sense, the theory of English weak vowel *schwa* by A.C.Gimson (1977) is inherited as it is in the new issue revised by A.Cruttenden (1994).

The co-authors (K.Miyatake & M.Tsudzuki) will try to describe English *primary schwa*, *subsidiary schwa* and Japanese *schwa-like vowel*, which occurs at the syllable-termination of the word using sound-spectrographic data in our next article from the viewpoint of Comparative or Contrastive Phonetics.

## 4. Consonantal identifications - Consonantalization

Following the traditional classification of the Articulatory or Descriptive Phonetics, consonants (consonality or non-asonance) involved in a category of speech sounds can be produced unconsciously at specific points or places of articulation by modifying air flow from lungs using a definite obstruction in the vocal tract. For instance, lips, teeth, alveolar, palatal, velar, uvular, and the different points of tongue are articulatory obstructions at the oral passage in

the mouth. Any speech sounds but vowels or nasalized vowels are significantly influenced by narrowing the speech-organ passage, blocking the air for non-nasals at specified points in the mouth or lowering the uvula for producing nasals (or nasality). In languages generally, consonantalization has less quantity of sonorous or less metrical prominence than those of vowels (or vowelness) in the various sound systems of the languages.

If we compare nasalized vowels and uvular nasal, even though both vowelness and nasality are fundamental factors for discrimination, unchecked air is a peculiarity of these speech sounds (nasalized vowels and uvular nasal). The idea *vowelness* and *nasality* is introduced by the co-author (M.Tsudzuki 2009). The teachers of English must notify that when speech sounds are produced by closing the mouth passage completely at some points in the mouth and simultaneously the soft palate being in its lowered position (lowering the uvular), several nasals or nasality consonants are produced as exemplified below.

E.g.

- (a)Voicing (+) mouth passage - blocked at bilabials = voiced bilabial nasal
- (b)Voicing (-) mouth passage - blocked at bilabials = voiceless bilabial nasal
- (c)Voicing (+) mouth passage - blocked at the upper dental = voiced dental nasal
- (d)Voicing (+) mouth passage - blocked at the alveolar = voiced alveolo nasal
- (e)Voicing (+) mouth passage - blocked at the palatal = voiced palatal nasal
- (f)Voicing (+) mouth passage - blocked at the alveolo-palatal = voiced retroflex nasal

- (g)Voicing (+) mouth passage - blocked at the velar = voiced velar nasal
- (h)Voicing (+) mouth passage - un-closed at the uvular = voiced uvular nasal
- (i)Voicing (+) mouth passage - un-closed at the uvular = nasalized vowel

Consequently, taking one step further, another issue occurs regarding nasal-anticipation in the utterance. Nasalized vowel occur partially or completely under the influence of adjacent nasals by an anticipatory, regressive, or coalescent articulation respectively. Vowels are easily influenced by nasals in several ways of the manner of articulation and sound circumstances in a word or in a sentence. (M.Tsudzuki:1997,1998,2002) On the other hand, a nasal-vowel occurs independently during ordinary utterances having a fixed sound value in a certain language. These theories can be tentatively summarized in various sound circumstances as shown below.

E.g.

- (a)Vowel + Nasal > Nasalized Vowel = Regressive or anticipatory, partial nasalization.
- (b)Nasal + Vowel > Nasalized Vowel = Progressive partial nasalization.
- (c)Nasal + Vowel + Nasal > Nasalized Vowel = Coalescent or juxtaposition, complete nasalization.
- (d)Nasal-vowel = Independent nasality, complete nasality.

## 5. Palatalization & velarization

It is commonly understood among phoneticians and linguists that the palatalization occurs when the front of the tongue is raised towards the hard palate and the velarization occurs when the back of the tongue is raised towards the soft palate. Palato-alveolar sounds are usually articulated by the retracted blade of the tongue against both areas of the alveolar ridge and hard palate of the upper jaw. It is clarified that the palatalization needs the narrow space between the front of the tongue and the hard palate, and the velarization indicates the narrowness which occurs between the back of the tongue and the soft palate to modify the airstream in the mouth.

From the viewpoint of lateral articulation, the terms *clear* and *dark* used for the distinction of the lateral consonants are not suitable for describing the articulatory mechanism. These terms (*clear-l* and *dark-l*) are mainly caused from auditory or acoustic image (sense image or auditory impression) of lateral sounds articulated by the tongue tip or blade against the alveolar ridge with the different posture of the front or back of the tongue in the mouth.

For example, when the front of the tongue is raised towards the hard palate, auditory impression *clear* (clearness) occurs. Contrary to the *clear-l*, the back of the tongue is raised towards the soft palate, acoustic image *dark* (darkness) can be heard in producing sounds. A scientific distinction or terminology (academic phonetic terms) expressing *l*-sound quality is not involved in these two words *clear* and *dark*. The phonetic terms (*clear-l* and *dark-l*) are not able to indicate the characteristic sound features based on the theory of phonetics or linguistics. At the primary articulation, the tip of the tongue allocates against the teeth ridge in both cases (*clear-l* and *dark-l*). Simultaneously in the secondary articulation (modification), the back of the tongue makes different postures from those of

the primary articulation, respectively. The suitable phonetic terms here are *palatalized clear-l* and *velarized dark-l*. In both cases, these sound attributes or auditory tone impression accompanied with palatal and velar sounds represented by *clear-l* and *dark-l* are not easy for Japanese learners of English to understand theoretically.

The detail description and experimental data on these two phonetic issues (*palatalized* and *velarized phenomenon*) obtained by using electro-palatograph (exclusive of sound-spectrographic data) will be treated concretely by the co-authors (K.Miyatake & M.Tsudzuki) in the next paper.

## 6. Fortis and Lenis Discrimination

Fortis and lenis are phonetic criteria used for determining a voiceless or voiced consonant in respect to breath pressure in the oral cavity during the articulation of sounds. An ordinary voiceless consonant is articulated without vibration caused by vocal folds. However, it is usually pronounced with relatively strong degree of breath pressure from lungs. The total energy which is needed for articulation of a voiceless consonant (fortis) is relatively strong caused by greater amount of muscular force of the articulators. On the other hand, a voiced consonant (lenis) which is the opposite to fortis, has the different phenomena regarding to a breath pressure in the speech organs. It is accredited to phoneticians and linguists that lenis is the phonetic term used as the counterpart to fortis. For example, a voiceless alveolar fricative is defined phonetically as fortis, and voiced counterpart to alveolar fricative is lenis which is articulated with less muscular effort during its production.

Examining the chart of the International Phonetic Alphabet including consonants (non-pulmonic) and other symbols (IPA 2015, International Phonetic

Association), 24 fortis and lenis combinations appearing in pairs are allocated along the speech organs of the oral cavity as tentatively listed below from the front to the back position of the speech organ horizontally.

E.g.

bilabial ⇒ labiodental ⇒ dental ⇒ alveolar ⇒ alveolo-palatal ⇒

labial-palatal ⇒ post alveolar ⇒ retroflex ⇒ palate-alveolar ⇒

palatal ⇒ velar ⇒ labial-velar ⇒ uvular ⇒ pharyngeal ⇒ glottal

In connection with basic articulatory treatments, one of the essential binary features of fortis and lenis is vocal cords vibration as mentioned above. In a field of Practical Phonetics, in observing voice production, it is easy to check the vocal folds vibration by touching vocal cords with his or her fingers or by covering both ears with their both hands. In our phonetic tutorial classes, just as a point of interest, theoretical explanation of vocal cords vibration for voicing is concretely monitored and reinforced with practical manners mentioned here.

## 7. Japanese flap and lateral obstructing English / & r segments' acquisition

### 7.1. Flap

In regard to the Japanese flap, vowel quality affects the Japanese word-initial flap and the intervocalic flap. Two variants of the word-initial flap occur under the influence of the adjacent vowels in different contexts. One is a voiced alveolar flap occurring in *ri* and the other is a voiced retroflexed flap in *ru*. It is appropriate to determine that the Japanese intervocalic flap has two variants conditioned by the adjacent vowels in different contexts: an alveolar flap in *iri* and a retroflexed flap in *ere*, *ara*, *oro*, and *uru*. These sound circumstances

affecting flap-articulations are tentatively shown as follows:

E.g.

(1) Variants in word-initial positions:

(a) an alveolar flap = *ri*.

(b) a retroflexed flap = *ru*.

(2) Variants in intervocalic positions:

(a) an alveolar flap = *iri*.

(b) a retroflexed flap = *ere, ara, oro* and *uru*.

(M.Tsudzuki; 2009, 2021)

## 7.2. Trill & Tap

In the field of Articulatory or Descriptive Phonetics, a Japanese flap is produced by a single rapid flapping (or rather gliding) movement between the two articulators (tip of the tongue and alveolar) in the mouth, and so it differs from those of a trill and tap in other languages. On the other hand, a trill indicates several consecutive vibrating or taping motions quickly one after the other. According to D.Crystal (1987; 123, 318, 304), a flap consonant indicates the single flapping movement in its gliding, however, the trill consonant indicates several consecutive vibrating movements. The phonetic term tap indicates a single contact of the articulators during articulations. Japanese language has not only an alveolar flap but also a retroflexed flap as described in the previous section.

## 7.3. Lateral

Examining the data obtained by using electro-palatograph by M.Tsudzuki (2005), it is observed that the articulatory point or articulatory manner of the lateral varies noticeably depending on the distinguishing qualities of the adjacent

vowels in Japanese. The variants of the word-initial lateral occur under the anticipatory or regressive influence of the adjacent various vowel qualities. It can be concluded that the Japanese word-initial lateral in *re*, *ra* and *ro* is pronounced as a retroflexed lateral. In respect to palatalization, Japanese consonant lateral is pronounced as a palatalized lateral in the sound circumstance followed by a palatal consonant. In this articulation, the front of the tongue is raised towards the hard palate causing the noticeable resonance of palatality. Palatalization also occurs in the sound sequences as *nja*, *njo*, *nju* (an alveolar nasal *n* followed by palatal closely) in Japanese. Sound circumstances of the retroflexed lateral and palatalized lateral are itemized as shown below:

E.g.

(1) Variants of the Japanese word-initial lateral:

a retroflexed lateral = *re*, *ra*, *ro*.

(2) In respect to palatalization:

the Japanese lateral in *rja*, *rjo* and *rju* can be designated as

a palatalized lateral = *rja*, *rjo*, *rju*.

(M.Tsudzuki; 2009, 2021)

Regarding the Japanese lateral and flap consonants, the distinguishing qualities, peculiarities or features conditionally influenced in different contexts are still disputed amongst linguists and phoneticians. The arguments, however, have basically narrowed down to the above issues which are accredited to the co-author (M.Tsudzuki; 2005a, 2005b).

Because of the articulatory mechanism and complicated systems of several variants involved in flap and lateral segments in Japanese mentioned here, Japanese students of English have noteworthy difficulties in pronouncing words or phrases which include either *r* or *l*-spelling in numerous sound circumstances,

such as:

E.g.

*rural, aurora, radical, rhythmical, really, irregularity, lyrical, librarian, Rome, Greek, graphical, crystal, liberal, reliable, memorial, Colorado, Latin America, Australia and New Zealand, Lions Club, cherry blossom, lingua franca, green grass, Romeo and Juliet, Roland, rival, dead lock, rice ball, rice or lice, Golden Globe Awards, ring-a-ring-a-roses, lily of the valley, rock 'n' roll, fried rice or flied lice, role play, ram or lamb, rally, flea market or free market, crash or clash, Rolls-Royce, fresh or flesh, free or flee, race or lace, etc.*

The above examples (materials) are described in no specified order or at random. Other chapters follow this description. These words and phrases (including flap and lateral) are selected broadly and generally for *l-r* discrimination and pronunciation practices, initially, intervocally, finally for concentrating his or her knowledge on teaching pronunciation with an awareness of English spoken by Japanese learners as a foreign language. (K.Miyatake 2017a & 2017b)

When considering the pronunciation of *r* along the diachronic approach, it is easily understood that *r* is recognized as mute consonant letters which often appear in the words, such as, *number, center, later, there, here, mother, for, far, tower* and *pour*, etc. However, *r* has a sound value and is often pronounced as *numbe-r-eight, cente-r-ing, la-ter-on, the-re-are, he-re-is, moth-er-of, fo-r-instance, fa-r-away, Towe-r-of London* and *pou-r-ing the milk out of the bottle*, etc. These phonetic phenomena are known as linking-*r* in traditional Phonetics. If we pronounce *idea of* as *idea-r-of*, *blue ink* as *blue-r-ink*, (inserting *r* between vowels accidentally), it is phonetically accepted habitual rule known as intrusive *r*.

(D.Jones 1978; 195-198)

Lateralness involved in the following sound circumstances (consonantal sequence or gemination) of words or phrases is difficult to pronounce for average Japanese learners of English.

E.g.

- (a) As a second element of lateral plosion: *little, settle, kettle, bottle, beetle, battle, riddle, idle, noodle, meddle, middle, paddle, puddle, hurdle, would like, saddle, candle, good looks*, etc.
- (b) Nasal + lateral plosion: *mantle, recently, candle, handle, endless, landless, landlord, sandal, mantle, gentle*, etc.
- (c) Nasal plosion + lateral: *suddenly, eaten lots, written language*, etc.
- (d) Lateral + voiced alveolar plosive + alveolar nasal: *Golden Globe Awards, coldness, olden*, etc.
- (e) Alveolar nasal + voiceless dental fricative + lateral: *monthly, tenth line, nineteenth lecture*, etc.
- (f) Bilabial nasal + bilabial plosive + lateral: *ample, sample, simple, temple*, etc.
- (g) Lateral + (either voiced or voiceless) alveolar plosive: *cold, sold, told, hold, scold, field, bald, salt, malt, bolt*, etc.
- (h) Mute *l* (etymologically or depending on synchronic sound circumstances): *Lincoln* (the second *l*), *calm, calmly, palm, salmon, Arnold Palmer* (the second *l*), *napalm bomb, balk (baulk), salmonberry, balm, should, would, could*, etc.

Regarding the sequences consisting of *ndldn* (nasal+voiced plosive+lateral+voiced plosive+nasal), J. C. Wells & C. Colson (1981; 69) indicates as follows:

Notice that, in a long sequence of alveolar plosive, nasal, and laterals

such as *ndldn* in *long-handled knife*, the tip of the tongue does not have to move at all. The successive plosive approaches and release are all nasal or lateral, depending on movements of the side of the tongue or the soft palate. It is a marvelous thing how the human speaker can perform articulatory movements as intricate as these entirely without conscious thought and at very high speeds.

With respect to *lateral plosion or release*, D. Crystal (1987; 175, 262) describes as shown below:

/t/ and /d/ followed by /l/ in English are often released “laterally”, the phenomenon of “lateral plosion”: the air escapes round the sides of the tongue, the closure between tongue and ALVEOLAR ridge remaining, as in *bottle*, *cuddle*. It is possible to say the final SYLLABLE of such words without moving the front of the tongue from its contact at all. (p.175)

A term used in Phonetics to refer to the type of moving made by the Vocal Organs away from a point of Articulation, particularly with reference to Plosives, for example may be released with or without aspiration, or as a lateral or nasal (as in *button* and *bottle*). (p.262)

As the actual pronunciation including lateral *l-sequence* is clearly explained from the two documents cited above, Japanese learners of English need to pay special attention to the specified sequences of *plosives and lateral or nasal and lateral* in English. For that reason, it is very useful for us to practice pronunciation of words and phrases (including lateral) mentioned or referred to in this section. In particular, since there is no consonant sequences peculiar to English in our language, Japanese learners of English tend to insert vowels

between consonants and pronounce them (inserted vowels) carelessly due to the habitual influence of Japanese pronunciation rule. It must be pointed out again here in respect to consonant *l*-clusters, such as *tl*, *dl*, *ntl*, *ndl*, *tnl*, *dnl*, *mpl*, *lt* and *ld*, etc.

## 8. Five independent nasals (bilabial, alveolar, palatal, velar and uvular) in Japanese

### 8.1. Nasal variants & their sound circumstances

In the field of Japanese synchronic methodology of phonetics, it is commonly acknowledged that the Japanese language has five conditional variants of nasal systems depending on their allocations and circumstances. Among them the specific articulatory features of the uvular nasal which is peculiar to the Japanese people has already been delineated by phoneticians and linguists.

In Japanese, as mentioned above, there are five definite nasals such as, bilabial, alveolar, palatal, velar, and uvular nasal conditioned and influenced by adjacent sounds or sound circumstances. Among these nasals, bilabial, alveolar, palatal, and velar nasal occur either syllabically or non-syllabically depending on the segment-circumstances. However, the uvular nasal is always produced syllabically.

It is noteworthy that there are only two languages in the world, that is, Inuit and Japanese that involve uvular nasal in their nasal sound systems.

As discussed thoroughly here, this issue on five fundamental nasals (also flap & lateral) involved in the Japanese language is interesting to study diachronically for scholars and researchers, just a hypothesis, assuming that the extremely long historical process of the sound system formation had been significantly affected by southern, continental (including Mongolian, Chinese and Korean languages,

etc.), and also northern languages respectively. Phoneticians and linguists also acknowledge the fact that the phonetic systems of Japanese pronunciation (especially vowels) had also been formed particularly under the influence of other Pacific Rim languages such as Micronesia and Polynesia including the Hawaiian Islands. While acknowledging that not only the account and explanation of the origin but also formation and development of Japanese sound systems (including *vowel harmony*, *nasal*, *lateral* and *flap* consonants) are intricate and controversial, it is a matter of interest for linguists and phoneticians to study further on the subject along the diachronic approach. (M.Tsudzuki; 2022)

From the point of sound circumstances, the bilabial, the alveolar, and the palatal nasals are found in the initial position. Velar and uvular nasals do not occur at the initial position. The Inter-vocalically, there are four different nasals: bilabial, alveolar, velar, and uvular nasals. Moreover, all nasals appear pre-consonantly. And geminate nasals commonly occur in the utterance. However, in the final position of the word, we find the uvular nasal only (syllabic or moraness) in Japanese. Providing another explanation for the Japanese nasals, the Japanese *nasal n diaphone* is tentatively characterized as a regressively (anticipatory) assimilated syllabic (moraic) nasal conditioned by neighboring sounds or sound circumstances. (M.Tsudzuki; 1987b, 2009)

E.g.

Contextual or Juxtaposition Circumstances in words or phrases of five nasals in Japanese:

- (a) Bilabial Nasal = pre-position of bilabial plosive (voiced or voiceless) & bilabial nasal.

- (b) Alveolar Nasal = pre-position of alveolar plosive (voiced or voiceless), lateral, flap & alveolar nasal.
- (c) Palatal Nasal = pre-position of palatal (voiced) & palatal nasal (voiced).
- (d) Velar Nasal = pre-position of velar plosive (voiced or voiceless) & velar nasal.
- (e) Uvular Nasal = pre-position of alveolar fricative (voiced or voiceless), alveolo-palatal fricative (voiced or voiceless), palatal fricative (voiced or voiceless), between vowels, before semi-vowels & at the final position.

## 8.2. Typical articulatory mechanism & definition of the Japanese uvular nasal

In producing the uvular nasal, the out-going air current can be allowed to escape through the nose as well as through the mouth by lowering the uvula. Simultaneous air current (mouth with nose) from the lungs is the articulatory characteristic of the uvular nasality.

However, Japanese uvular nasal tends to be a velar nasal in the syllable-final position because of the reduction of the articulatory energy towards utterance termination. The co-author (M. Tsudzuki 1996) made reference to vowelness and nasality instead of using traditional phonetic terms, such as nasalization or nasalized vowel. This work on the Japanese uvular moraic nasal and nasality is widely acknowledged.

As described above, the uvular nasal represents the peculiar sound value either of the consonantality or vowel-like in various circumstances in Japanese. The uvular nasal has characteristics both an oral-coloured syllabic nasal and oralized moraic nasal. In the articulation of the Japanese uvular nasal, there is

always a lax and incomplete closure around the velum against the back of the tongue. As a result, the uvular nasal is idiosyncratic in that the air from the lungs flows out not only from the nasal cavity but also from the oral cavity in specific contexts. All nasals (except the uvular nasal) are produced by exhalation through the nasal cavity with a tight and complete closure between the articulators in the oral cavity. It is inevitable that Japanese learners of English (elementary and pre-intermediate learners of English) tend to use uvula nasal instead of alveolar nasal.

It is noteworthy that the uvula nasal (instead of the alveolar nasal) is used in the following sound circumstances in English by Japanese learners of English:

E.g.

- (a) Inter vocalic = *on it, in it, on us, tin opener, son of, down-and-out, in Italy, in England, in Egypt, an island life, fun of, turn away, nine-eleven, etc.*
- (b) Before voiced alveolar fricative = *run zigzag, London Zoo, tins, opens, a special lens, green zone, etc.*
- (c) Before voiceless alveolar fricative = *in September, in Scotland, in Spain, consult, tense, turnstile, run scoring, sunset, once, etc.*
- (d) Before voiced palato-alveolar fricative = *injure, injury, etc.*
- (e) Before voiceless palato-alveolar fricative = *conscious, tension, insure, sunshine, sunshade, etc.*
- (f) Before yod (palatal) = *ten years, ten yards, in youth, on your, in yesterday's paper, etc.*
- (g) Before semi-vowel = *in whisky, in winter, a baby lion with his keeper, etc.*

### 8.3. *Flow-nasalitygraph (FNG)* and its functions

It is easily understood that not only the theoretical phonetic study but also applied research should be based on the several acoustic and experimental approaches. For example, the device *flow-nasalitygraph (FNG)* was originally invented for medical and therapeutic purposes in Japan. The invention of the FNG is accredited to Rion Co. (Tokyo) in the late 1970's. It is said that the detection of the air flow is extremely difficult to visualize for both engineers and phoneticians. In particular, it was not easy to separate the exhalation outflow from the oral cavity and the exhaled air outflow from the nasal cavity and to measure each of them simultaneously. (M.Tsudzuki 1998 & 2002)

As detailed here, previously it was very difficult to detect alternating or simultaneous detection of air outflow from the nose and exhaled air outflow (exhalation) from the mouth. However, engineers and researchers have successfully developed equipment (*FNG*) to solve this problem. As a result, it became possible to easily consider even the ratio of the outflow of air from the nose to the outflow of exhaled air from the mouth using *FNG* at the equipped phonetic laboratory. This is an epoch-making development for phoneticians not only in the traditional experimental phonetics but also in the history of acoustic phonetics.

The co-author (M.Tsudzuki) used this tool (*FNG*) as a suitable means to study the characteristics of Japanese nasal sounds and nasalized vowel. Furthermore, phoneticians and speech therapists started to study which non-normal sounds were produced and affected differently from normal sounds due to disorders of the articulatory organs of patients such as inability to distinguish between oral and nasal sounds.

This apparatus (*FNG*) can detect both oral and nasal outflows simultaneously and quantify the ratio of each (oral and nasal). The condition

of the airflow through nose and mouth are graphically shown either in M-N (Mouth-Nose airflow) display or NFQ (Nose airflow Quotient) monitor. The *FNG* is particularly useful and reliable in studying Japanese complicated five nasals including bilabial, alveolar, palatal, velar and uvula nasals and also their variants including nasality, vowel-nasalization, palatalized nasalization and nasal-vowels. Not only medical professionals (speech therapists) but also phoneticians in collaboration with engineers contributed to the invention and development of the equipment namely, *flow-nasalitygraph*. The characteristic mechanism and phonetic data of the *FNG* will be concretely treated together with the results and observation of other experiments (sound- spectrograph and electro-palatograph) in our next article.

## 9. Discussions & Conclusion

Summarizing several points discussed in this article so far, it is easily understood that the phonetic study of the English language in Japan is a matter of great importance and a problem of major concern in teaching or learning English as a foreign language. In other words, the continuous study of phonetics by phoneticians have contributed to the development of English language education in Japan by reflecting multidisciplinary phonetic research in many fields by synchronic and diachronic methodology including Theoretical Phonetics, Acoustic Phonetics, Comparative Phonetics, and Applied Phonetics respectively.

In the field of Educational Phonetics, the special difficulties which Japanese students have in learning English lie in the field of not only vowels and consonants but also various sound changes in definite sound circumstances. Teachers of English should consider the mechanism of English sounds and Japanese sound system including different qualities of vowels, diphthongs, short-

long vowel discriminations, articulation of consonants, variants of lateral, flap, different types of nasals and consonant-gemination. These difficulties which result in misunderstanding make Japanese students' pronunciation relatively monotonous. As we have summarized and emphasized in synopsis, these ideas are considered enormously important. As a result, it is once again recognized that knowledge of phonetics is indispensable in English education in Japan.

Therefore, in order to master the specified pronunciation of English involving special or difficult consonant clusters such as, incomplete plosive plosion, nasal plosion, lateral plosion, etc., at any stage, whether in elementary school or in junior high school, repeated pronunciation practice taught by experts is indispensable providing concrete materials based on the theory of English phonetics. It can be said that what is described here is exactly the essence of teaching English pronunciation. It should be noted that teachers of English must recognize again that there are so many complicated consonant clusters in English to be taught at an early stage as discussed in our article.

Even though numerous attempts have been made by linguists and phoneticians, we are sure that our study will receive notable attention and contribute to throw new light on the issue of English Educational Phonetics in Japan. This work “Various Phonetic Aspects of Articulatory Features and Peculiarities: Part 1” which has been completed by the co-authors (K.Miyatake & M.Tsudzuki) and submitted to the *KIU Journal of Economics and International Studies*, No.9 (2022) really contributes to the development of English education in Japan in respect to sounds and pronunciation methodologically.

## Appendix

The co-authors (K.Miyatake & M.Tsudzuki) study phonetics with each other

along different methodology in academic activities of the English Phonetic Society of Japan (EPSJ) for quite a few years. However, we finally realized the importance of Educational Phonetics and started our research as illuminated in the co-authored manuscript here. In our continuation based on not only Theoretical Phonetics but also Acoustic Phonetics, we will discuss our experimental record and analysis using the electro-palatograph, the sound-spectrograph, and the flow-nasalitygraph which are not allowed to be illustrated here because of the journal space limitation. We approach each issue from acoustic phonetical point of view.

By way of conclusion, due to technical problems of phonetic notation and transcription of either English or Japanese sounds, the co-authors try not to use positively phonetic symbols or diacritical marks of speech sounds and tone marks of intonation. Furthermore, we avoid trying replacements among phonetic symbols and tone marks in our article. Articulatory terms and attribute description of sounds are adopted instead of using diacritical marks or phonetic symbols of the International Phonetic Alphabet (IPA) intending to avoid typographical errors and complications in printing. As the solution adopted in this article is not entirely satisfactory, the co-authors regret the substitution and limitation of phonetic symbols either in sounds of English or in those of Japanese. Consequently, due to space limitation here, the references and citations will be treated in more detail in our next article.

This paper was written in commemoration of the inaugural conference of the English Educational Phonetic Society of Japan (EEPSJ) held in Matsumoto city, Japan on October 20, 2021. The co-author, Professor Kaori Miyatake participated in the conference as one of the leading scholars and joined the society as a founding director.

The series of our research is edited by a trio or quartet of works including

the present paper (2022). Practically, the part in charge of the co-authors in this article cannot be specified precisely for co-authorship.

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(To be continued)

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