L2/03-180

Proposal to Encode Additional Phonetic Modifier Letters in the UCS

Date: 2003-06-07

Author: Peter Constable, SIL International

Address: 7500 W. Camp Wisdom Rd.
Dallas, TX 75236
USA

Tel: +1 972 708 7485

Email: peter_constable@sil.org

A. Administrative

1.	Title	Proposal to Encode Additional Phonetic Modifier Letters in the UCS
2.	Requester's name	SIL International (contact: Peter Constable)
3.	Requester type	Expert contribution
4.	Submission date	2003-06-07
5.	Requester's reference	
6a.	Completion	This is a complete proposal
6b.	More information to be provided?	Only as required for clarification.

B. Technical—General

1a.	New Script? Name?	No
1b.	Addition of characters to existing block? Name?	Yes — Phonetic Extensions
2.	Number of characters in proposal	49
3.	Proposed category	A
4.	Proposed level of implementation and rationale	1 (no combining marks or jamo)
5a.	Character names included in proposal?	Yes
5b.	Character names in accordance with guidelines?	Yes
5c.	Character shapes reviewable?	Yes
6a.	Who will provide computerized font?	SIL International
6b.	Font currently available?	Yes
6c.	Font format?	TrueType
7a.	Are references (to other character sets, dictionaries, descriptive texts, etc.) provided?	Yes

7b.	Are published examples (such as samples from newspapers, magazines, or other sources) of use of proposed characters attached?	Yes
8.	Does the proposal address other aspects of character data processing?	Yes, suggested character properties are included (see section E).

C. Technical—Justification

1.	Has this proposal for addition of character(s) been submitted before?	No
2a.	Has contact been made to members of the user community?	Yes
2b.	With whom?	Linguists
3.	Information on the user community for the proposed characters is included?	Linguists
4.	The context of use for the proposed characters	Linguistics text books, linguistic descriptions (books, journal publications, etc.); dictionaries.
5.	Are the proposed characters in current use by the user community?	Yes
6a.	Must the proposed characters be entirely in the BMP?	Preferably
6b.	Rationale?	If possible, should be kept with other phonetic symbols in the BMP.
7.	Should the proposed characters be kept together in a contiguous range?	Preferably
8a.	Can any of the proposed characters be considered a presentation form of an existing character or character sequence?	These characters have the same appearance as superscript forms of existing characters.
8b.	Rationale for inclusion?	Like other modifier letters used for phonetic transcription, these need to be considered distinct characters and not presentation forms of existing characters.
9a.	Can any of the proposed characters be considered to be similar (in appearance or function) to an existing character?	No
9b.	Rationale for inclusion?	n/a
10.	Does the proposal include the use of combining characters and/or use of composite sequences?	No.
11.	Does the proposal contain characters with any special properties?	No.

D. SC2/WG2 Administrative

1. Relevant SC2/WG2 document numbers
2. Status (list of meeting number and corresponding action or disposition)
3. Additional contact to user communities, liaison organizations, etc.
4. Assigned category and assigned priority/time frame

Other comments

E. Proposed Characters

A code chart and list of character names are shown on a new page.

E.1 Code Chart

	xx0	xx1	xx2	xx3
0	ᴐ	ɪ	ʂ	θ
1	æ	ɨ	ʃ	
2	ɕ	ʝ	ʈ	
3	ɕ	ɭ	ʉ	
4	ð	ɻ	ʊ	
5	ɘ	ʟ	ᴜ	
6	ɜ	ɱ	ʉ	
7	ɞ	ɯ	ʊ	
8	f	ɲ	ʌ	
9	ɟ	ɳ	ʎ	
A	ɡ	ɴ	ʏ	
B	ɤ	ø	ᴢ	
C	ɥ	ɵ	ʐ	
D	ɦ	œ	ʑ	
E	ɨ	ɶ	ʒ	
F	ɩ	ɸ	ʔ	

E.2 Character Names

xx00 MODIFIER LETTER SMALL TURNED ALPHA
≈ <super> 0252

xx01 MODIFIER LETTER SMALL AE
≈ <super> 00E6

xx02 MODIFIER LETTER SMALL C
≈ <super> 0063

xx03 MODIFIER LETTER SMALL C WITH CURL
≈ <super> 0255

xx04 MODIFIER LETTER SMALL ETH
≈ <super> 00F0

xx05 MODIFIER LETTER SMALL REVERSED E
≈ <super>0258

xx06 MODIFIER LETTER SMALL REVERSED OPEN E
≈ <super> 025C

xx07 MODIFIER LETTER SMALL CLOSED REVERSED OPEN E
≈ <super> 025E

xx08 MODIFIER LETTER SMALL F
≈ <super> 0066

xx09 MODIFIER LETTER SMALL DOTLESS J WITH STROKE
≈ <super> 025F

xx0A MODIFIER LETTER SMALL SCRIPT G
≈ <super> 0261

xx0B MODIFIER LETTER SMALL RAMS HORN
≈ <super> 0264

xx0C MODIFIER LETTER SMALL TURNED H
≈ <super> 0265

xx0D MODIFIER LETTER H WITH STROKE
≈ <super> 0127

xx0E MODIFIER LETTER SMALL I WITH STROKE
≈ <super> 0268

xx0F MODIFIER LETTER SMALL IOTA
≈ <super> 0269

xx10 MODIFIER LETTER SMALL CAPITAL I
≈ <super> 026A

xx11 MODIFIER LETTER SMALL CAPITAL I WITH STROKE
≈ <super> LATIN SMALL CAPITAL I WITH STROKE (see separate proposal, Constable 2003b)

xx12 MODIFIER LETTER SMALL J WITH CROSSED-TAIL
≈ <super> 029D

xx13 MODIFIER LETTER SMALL L WITH RETROFLEX HOOK
≈ <super> 026D

xx14 MODIFIER LETTER SMALL L WITH PALATAL HOOK
≈ <super> LATIN SMALL LETTER L WITH PALATAL HOOK (see separate proposal, Constable 2003a = L2/03-169)

xx15 MODIFIER LETTER SMALL CAPITAL L
≈ <super> 029F

xx16 MODIFIER LETTER SMALL M WITH HOOK
≈ <super> 0271

xx17 MODIFIER LETTER SMALL TURNED M WITH LONG LEG
≈ <super> 0270

xx18 MODIFIER LETTER SMALL N WITH LEFT HOOK
≈ <super> 0272

xx19 MODIFIER LETTER SMALL N WITH RETROFLEX HOOK
≈ <super> 0273

xx1A MODIFIER LETTER SMALL CAPITAL N
≈ <super> 0274

xx1B MODIFIER LETTER SMALL O WITH STROKE
≈ <super> 00F8

xx1C MODIFIER LETTER SMALL BARRED O
≈ <super> 0275

xx1D MODIFIER LETTER SMALL LIGATURE OE
≈ <super> 0153

xx1E MODIFIER LETTER SMALL CAPITAL OE
≈ <super>0276

xx1F MODIFIER LETTER SMALL PHI
≈ <super> 0278

xx20 MODIFIER LETTER SMALL S WITH HOOK
≈ <super> 0282

xx21 MODIFIER LETTER SMALL ESH
≈ <super> 0283

xx22 MODIFIER LETTER SMALL T WITH PALATAL HOOK
≈ <super> 01AB

xx23 MODIFIER LETTER SMALL U BAR
≈ <super> 0289

xx24 MODIFIER LETTER SMALL UPSILON
≈ <super> 028A

xx25 MODIFIER LETTER SMALL CAPITAL U
≈ <super> 1D1C

xx26 MODIFIER LETTER SMALL CAPITAL U WITH STROKE
≈ <super> LATIN SMALL CAPITAL U WITH STROKE (see separate proposal, Constable 2003b)

xx27 MODIFIER LETTER SMALL V WITH HOOK
≈ <super> 028B

xx28 MODIFIER LETTER SMALL TURNED V
≈ <super> 028C

xx29 MODIFIER LETTER SMALL TURNED Y
≈ <super> 028E

xx2A MODIFIER LETTER SMALL CAPITAL Y
≈ <super> 028F

xx2B MODIFIER LETTER SMALL Z
≈ <super> 007A

xx2C MODIFIER LETTER SMALL Z WITH RETROFLEX HOOK
≈ <super> 0290

xx2D MODIFIER LETTER SMALL Z WITH CURL
≈ <super> 0291

xx2E MODIFIER LETTER SMALL EZH
≈ <super> 0292

xx2F MODIFIER LETTER SMALL GLOTTAL STOP
≈ <super> 0294

xx30 MODIFIER LETTER SMALL THETA
≈ <super> 03B8

E.3 Unicode Character Properties

All of the proposed characters should have a general category of Lm. Compatibility decompositions should be as shown above. Other properties should match those of similar characters, such as U+02E1 MODIFIER LETTER SMALL L.

Note that the proposed compatibility decomposition for xx04 MODIFIER LETTER SMALL REVERSED OPEN E is <super> 025C. The existing character U+1D4C MODIFIER LETTER SMALL TURNED OPEN E currently has a compatibility decomposition mapping of <super> 025C. It is suggested that the latter mapping is in error, and proposed that U+1D4C should rather have a compatibility decomposition mapping of <super> 1D08.

Note also that the proposed compatibility decomposition for xx12 MODIFIER LETTER SMALL L WITH PALATAL HOOK is to a character that is not yet encoded, but has been proposed for encoding in a separate document, submitted at the same time (Constable 2003).

F. Other Information

In general, modifier letters are used in phonetic transcription to represent secondary aspects of articulation. Secondary articulations may involve aspects of simultaneous articulation that are considered to be in some sense less dominant to the basic sound (for instance, nasalized vowels are typically conceived in terms of their oral counterparts but with the additional secondary articulation of nasalization); or they may involve a transitional articulation of a type that might otherwise be considered a complete speech sound in its own right but for various

reasons is interpreted by the linguist as a secondary element in a complex speech sound (for instance, diphthongs, or nasal onset of oral stop consonants). In some situations, the recommended transcription using the International Phonetic Alphabet would not involve a modifier letter; thus, many of the proposed characters are not officially-approved IPA notation. Nevertheless, the use of these modifier letters if fairly commonplace among linguists, even those that advocate the use of IPA.

The proposed modifier letters are of two types: those used in phonetic transcription to represent vowel-like sounds, and those used to represent consonantal sounds. These two groups will be discussed separately.

F.1 Vowel modifier letters

Vowel modifier letters are often used by linguists in transcribing diphthongs. Diphthongs are speech sounds involving two distinct but sequentially-contiguous vocalic gestures — two vowel targets. For instance, whereas the Spanish phoneme /e/ is typically spoken with a single vowel target, [e], the English phoneme /e/ is very often spoken with two vowel targets, [e] and [i]. Following the conventions of IPA strictly, the English phoneme could be transcribed as [ei] or [e͡i]. Occasionally, though, linguists will transcribe such a diphthong as [e^{i}] or [^{e}i], according to which component is considered to be secondary — an "on-glide" or an "off-glide":

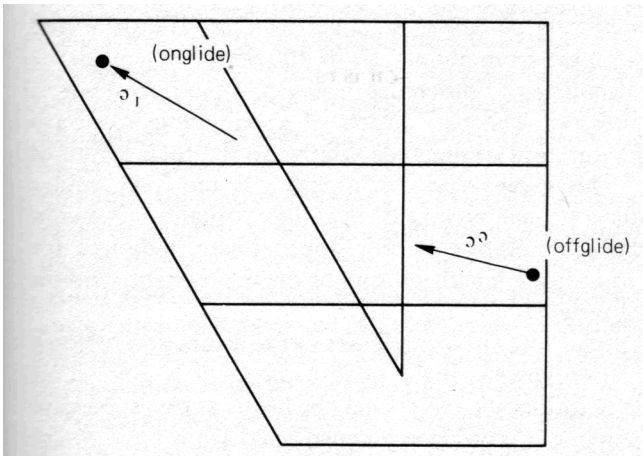


FIGURE 2.8.1 Vowel onglide and offglide

Figure 1. Vowel modifier letters used to indicate "on-glide" or "off-glide" diphthongs (Clark and Yallop 1995, p. 35).

Vowel modifier letters are also sometimes used to transcribe syllables that have a marginally-vocalic nucleus or a vocalic nucleus of very short duration, such that the vowel component of the syllable seems suppressed in relation to the consonantal components.

There are already a number of vowel modifier letters encoded in the UCS. Most of these were added in Unicode 4.0 and are in the Phonetic Extensions block:

1D43	ᵃ	MODIFIER LETTER SMALL A
1D44	ᵄ	MODIFIER LETTER SMALL TURNED A
1D45	ᵅ	MODIFIER LETTER SMALL ALPHA
1D46	ᵆ	MODIFIER LETTER SMALL TURNED AE
1D49	ᵉ	MODIFIER LETTER SMALL E
1D4A	ᵊ	MODIFIER LETTER SMALL SCHWA
1D4B	ᵋ	MODIFIER LETTER SMALL OPEN E
1D4C	ᵌ	MODIFIER LETTER SMALL TURNED OPEN E
1D4E	ᵎ	MODIFIER LETTER SMALL TURNED I
1D52	ᵒ	MODIFIER LETTER SMALL O
1D53	ᵓ	MODIFIER LETTER SMALL OPEN O
1D54	ᵔ	MODIFIER LETTER SMALL TOP HALF O
1D55	ᵕ	MODIFIER LETTER SMALL BOTTOM HALF O
1D58	ᵘ	MODIFIER LETTER SMALL U
1D59	ᵙ	MODIFIER LETTER SMALL SIDEWAYS U
1D5A	ᵚ	MODIFIER LETTER SMALL TURNED M
2071	ⁱ	SUPERSCRIPT LATIN SMALL LETTER I

Table 1. Vowel modifer letters encoded in Unicode 4.0

This covers those vowel sounds that are most commonly encountered in the world's languages. This list does not include all vowel symbols used in phonetic transcription, however, and in principle, any vowel gesture may potentially be one of the targets in a diphthong. Ladefoged and Maddieson (1996, p. 322) comment, "The kinds of vowels that occur as targets in diphthongs are no different from those that occur as single vowels."

Accordingly, the vowel modifier letters proposed here include all those that would need to make up a complete inventory of vowel modifier letters following common conventions for transcribing vowel sounds, as found in the IPA and Americanist traditions:[1]

[1] While IPA is increasingly prevalent, the Americanist tradition is still in use, and the use of superscripts to transcribe diphthongs may be more prevalent among those that use Americanist conventions. Some vowels in the Americanist system use diacritics, but it is assumed that combining marks can be used in sequences with modifier letters as well as with other letters. Capital vowel letters are used by some in the Americanist tradition to transcribe voiceless vocoids, but this proposal does not include modifier-letter counterparts to Latin capital vowel letters. I am not aware at the present time of a user need for capital vowel modifier letters in order to transcribe a voiceless, secondary component of a diphthong using Americanist conventions.

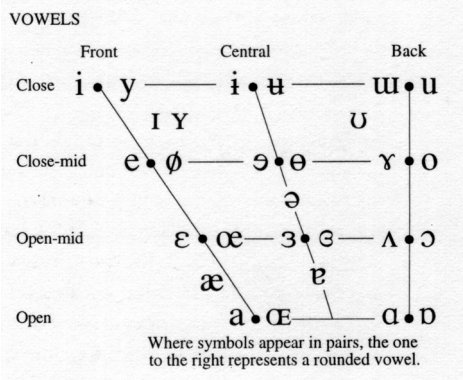


Figure 2. IPA vowels (IPA 1999, p. ix).

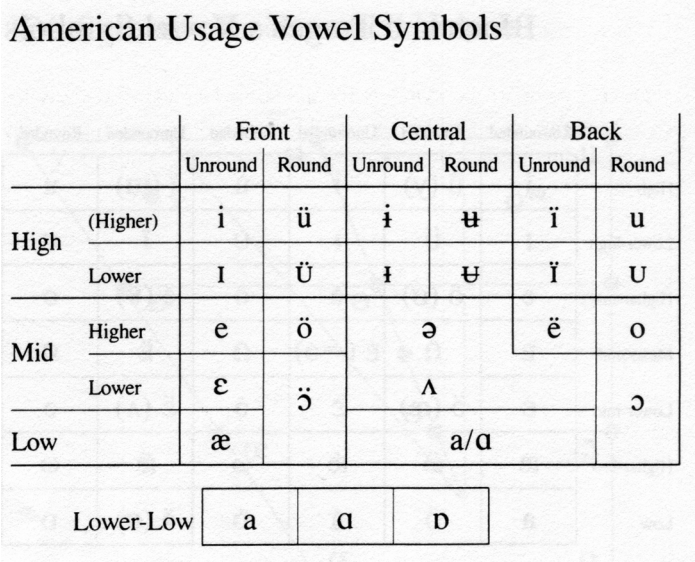


Figure 3. Americanist vowels (Pullum and Ladusaw 1996, p. 298).[2]

The vowel portion of the overall proposal is summarized in Table 2:

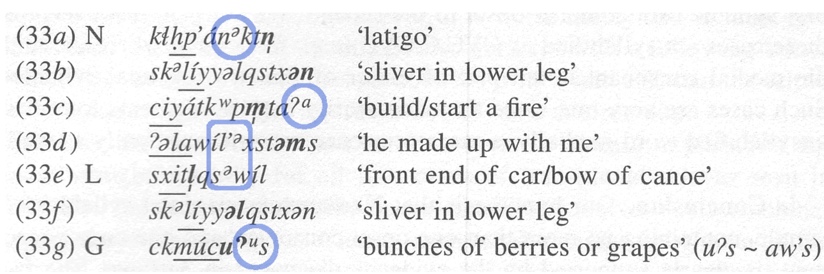
[2] There is some variation within Americanist usage. Whereas Pullum and Ladusaw show a small capital I for the front unrounded lower-high vocoid, many represent this vocoid using small iota. Also, some use a small v with hook for the back round lower-high vocoid, rather than the small capital u shown here. Barred iota and barred v-hook for central lower-high vowels are not used, however.

xx00	ᶛ	MODIFIER LETTER SMALL TURNED ALPHA
xx01	ᵆ	MODIFIER LETTER SMALL AE
xx05	ɘ	MODIFIER LETTER SMALL REVERSED E
xx06	ᶟ	MODIFIER LETTER SMALL REVERSED OPEN E
xx07	ʚ	MODIFIER LETTER SMALL CLOSED REVERSED OPEN E
xx0B	ɤ	MODIFIER LETTER SMALL RAMS HORN
xx0E	ᶤ	MODIFIER LETTER SMALL I WITH STROKE
xx0F	ᶥ	MODIFIER LETTER SMALL IOTA
xx10	ᶦ	MODIFIER LETTER SMALL CAPITAL I
xx11	ᶧ	MODIFIER LETTER SMALL CAPITAL I WITH STROKE
xx1B	ø	MODIFIER LETTER SMALL O WITH STROKE
xx1C	ᶱ	MODIFIER LETTER SMALL BARRED O
xx1D	ꟹ	MODIFIER LETTER SMALL LIGATURE OE
xx1E	ɶ	MODIFIER LETTER SMALL CAPITAL OE
xx23	ᶶ	MODIFIER LETTER SMALL U BAR
xx24	ᶷ	MODIFIER LETTER SMALL UPSILON
xx25	ᶸ	MODIFIER LETTER SMALL CAPITAL U
XX26	ᵾ	MODIFIER LETTER SMALL CAPITAL U WITH STROKE
xx28	ᶺ	MODIFIER LETTER SMALL TURNED V
xx2A	ʏ	MODIFIER LETTER SMALL CAPITAL Y

Table 2. Proposed vowel modifer letters

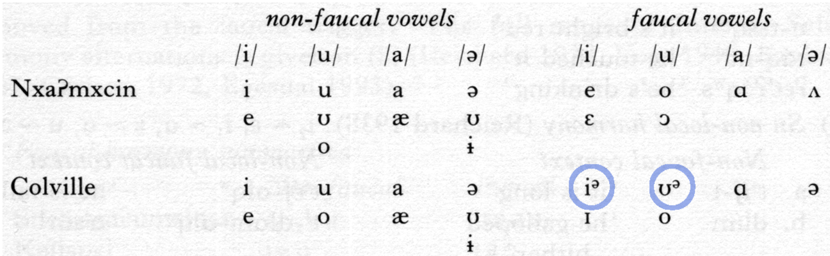
The following samples serve to illustrate the use of vowel modifier letters in general to transcribe diphthongs. The samples will contain vowel modifier letters that are already encoded as well as ones being proposed; those already encoded will be highlighted in blue; those being proposed, in red.

Samples were obtained for several but not all of the characters listed in Table 2. This should not be seen as an obstacle to encoding, however, since the rationale for inclusion of these characters is based not on the ability to demonstrate attested usage of each, but rather on a well-defined inventory and established conventions that can be readily documented. The samples provided here demonstrate these conventions in use in a varied sampling of the literature.



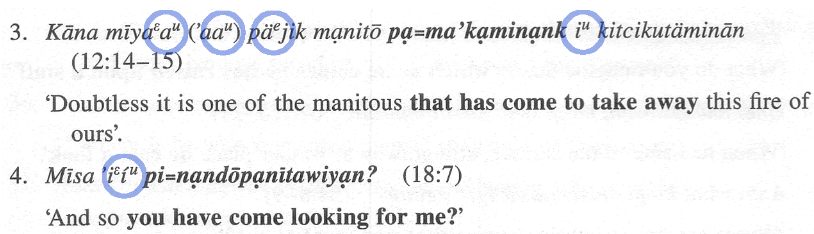
(33*a*) N	*kɬḥp'ánᵊkṭṇ*	'latigo'
(33*b*)	*skᵊlíyyəlqstxən*	'sliver in lower leg'
(33*c*)	*ciyátkʷpṃtaʔᵃ*	'build/start a fire'
(33*d*)	*ʔəlawíl'ᵊxstəms*	'he made up with me'
(33*e*) L	*sxitḷqsᵊwíl*	'front end of car/bow of canoe'
(33*f*)	*skᵊlíyyəlqstxən*	'sliver in lower leg'
(33*g*) G	*ckmúcuʔᵘs*	'bunches of berries or grapes' (*uʔs* ~ *aw's*)

Figure 4. Vowel modifier letters: a, schwa, u (Czaykowska-Higgins and Willett 1997, p. 408).



	non-faucal vowels				faucal vowels			
	/i/	/u/	/a/	/ə/	/i/	/u/	/a/	/ə/
Nxaʔmxcin	i	u	a	ə	e	o	ɑ	ʌ
	e	ʊ o	æ	ʊ ɨ	ɛ	ɔ		
Colville	i	u	a	ə	iᵊ	ʊᵊ	ɑ	ə
	e	o	æ	ʊ ɨ	ɪ	o		

Figure 5. Vowel modifier letters: schwa (Bessell 1998, p. 5).



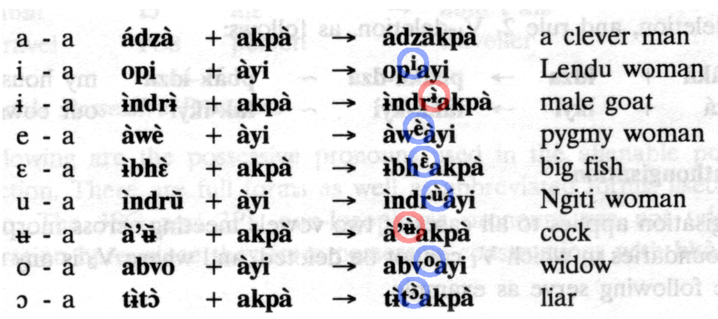
3. *Kāna mīyaᵋaᵘ (’aaᵘ) päᵉjīk mạnitō* ***pạ=ma’kạminạnk*** *iᵘ kitcikutäminān* (12:14–15)

‘Doubtless it is one of the manitous **that has come to take away** this fire of ours’.

4. *Mīsa* ***’iᵋiᵘ pi=nạndōpạnītawiyạn?*** (18:7)

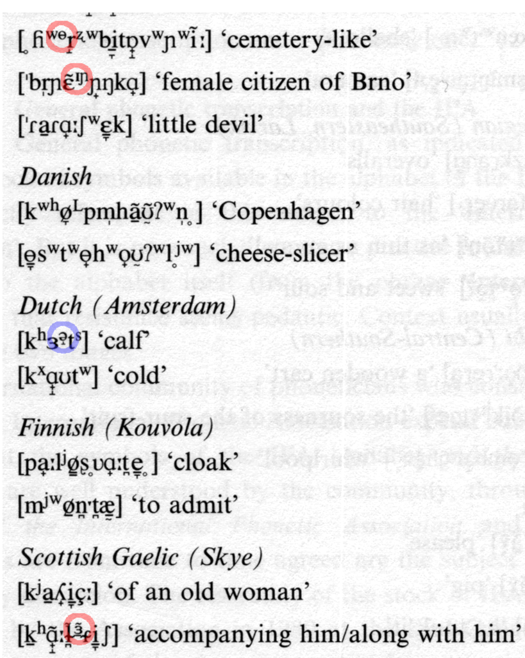
‘And so **you have come looking for me?’**

Figure 6. Vowel modifier letters: e, open-e, u (Malone 1999, p. 353).



a - a	ádzà	+ akpà	→	ádzākpà	a clever man
i - a	opi	+ àyi	→	opⁱàyi	Lendu woman
ɨ - a	ìndrɨ̀	+ akpà	→	ìndrᶤakpà	male goat
e - a	àwè	+ àyi	→	àwᵉ̀àyi	pygmy woman
ɛ - a	ìbhɛ̀	+ akpà	→	ìbhᵋ̀akpà	big fish
u - a	ìndrū	+ àyi	→	ìndrᵘàyi	Ngiti woman
ʉ - a	à’ʉ̀	+ akpà	→	à’ᶶ̀akpà	cock
o - a	abvo	+ àyi	→	abvᵒàyi	widow
ɔ - a	tɨ̀tɔ̀	+ akpà	→	tɨ̀tᵓ̀akpà	liar

Figure 7. Vowel modifier letters: I, i-bar, e, open-e, u, u-bar, o, open-o (Lojenga 1994, p. 90).



[ɦʷᶱr̝ʷbi̞tɒvʷɲʷĩː] ‘cemetery-like’

[ˈbr̩ɲɛ̃ᶦᶯɲŋkɑ] ‘female citizen of Brno’

[ˈɾa̠ɾɑːʃʷɛ̠k] ‘little devil’

Danish

[kʷʰø̠ᴸpm̩hɑ̃ʊ̃ʔʷn̩] ‘Copenhagen’

[e̠sʷtʷe̠hʷo̠ʊʔʷl̥ʲʷ] ‘cheese-slicer’

Dutch (Amsterdam)

[kʰɜᵊtˢ] ‘calf’

[kˣɑʊtʷ] ‘cold’

Finnish (Kouvola)

[pɑːlʲø̠s̬ʋɑːt̪e̥] ‘cloak’

[mʲʷø̠n̪t̪æ̠] ‘to admit’

Scottish Gaelic (Skye)

[kʲa̠ʎi̞çː] ‘of an old woman’

[kʰɑ̃ːl̪ᵌɛi̞ʃ] ‘accompanying him/along with him’

Figure 8. Vowel modifier letters: o-bar, small capital I, schwa, reversed open e (Laver 1994, p. 559).

(*tw*ᵊ nettoyere)
(*tr* Patric)
(*tj* gytje)
tr ytre
-
(*kw*ᵊ Equador)

Figure 9. Vowel modifier letters: open-o (Brink et al 1998, p. 99).

	First element			Second element	
Breathy	Vowels	F1	F2	F1	F2
ព្រាប	[iːᵋ]	365	2556	531	2115
ទ្យែន	[iːᵋ]	326	2658	548	2149
ជឿ	[iːᴬ]	364	1587	508	1544
ទួត	[uːᴬ]	401	937	554	1284
ផ្ដៃ	[ɛᴵ]	535	2280	329	2551
ភ្លៅ	[əᵁ]	580	1336	428	882
Clear	Vowels	F1	F2	F1	F2
ត្រចៀក	[iːᵋ]	340	2784	571	2275
ប្រឿង	[iːᵊ]	478	1416	542	1453
ចួត	[uːᴬ]	414	1027	547	1304
ក្តី	[ɛᴵ]	620	1943	341	2829
ផ្លូវ	[əᵁ]	557	1313	452	840
ម៉ឺង	[əːᴵ]	566	1519	369	1518
ព្រឹ	[əːᴵ]	526	1577	378	1447
កោស	[ɔːᵒ]	713	1121	615	979
កើត	[aːᵊ]	768	1489	554	1496
កែ	[aᴵ]	792	1983	436	2659
ចៅ	[aᵁ]	855	1626	510	880

Figure 10. Vowel modifier letters: open-e, schwa, i, i-bar, o, u, turned-v, (Wayland and Allard 2001, p. 76).

listed in the earlier table), the initial voiced stops are unexploded. These are not sequences of the form **d°t**, but are simply homorganic pairs of stops, with the first member being voiced and unreleased, and the second being voiceless and, on some occasions, also ejective and affricated.

Figure 11. Vowel modifier letters: schwa (Ladefoged and Maddieson 1996, p. 80).

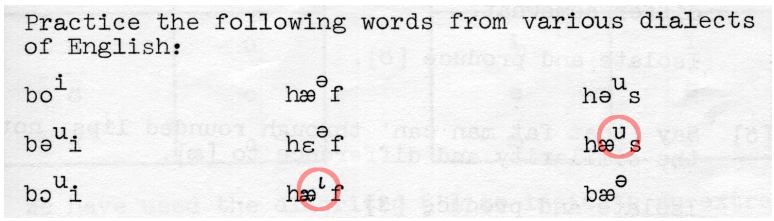


Figure 12. Vowel modifier letters: iota, small v-hook (small capital u) (Floyd 1996, p. 80).

Note the following in relation to Figure 12: there are some variations within the Americanist tradition, and this source uses a small v with hook to represent back round lower-high vocoid whereas other Americanists may use small capital u. The small v with hook is used as a consonant symbol within IPA, and the corresponding modifier letter is discussed below. Therefore, under this proposal, the MODIFIER LETTER SMALL V WITH HOOK would be available, whether for use by Americanists to represent a back round lower-high vocoid, or for use by others to represent labiodentalization.

F.2 Consonant modifier letters

Consonant modifier letters are often used to transcribe articulatory modifications that may apply to a wide variety of consonantal sounds, such as aspiration (typically transcribed as [ʰ]) or labialization (typically transcribed as [ʷ]). Consonantal modifier letters can also be used to transcribe sounds that involve a secondary consonantal articulation in addition to the dominant consonant, either simultaneously or as a transitional effect, such as a lateral release (typically transcribed as [ˡ]).

The most commonly-used consonant modifier letters are already encoded in the UCS. Several others are also in use, however. The inventory that seems to be needed includes nasals (e.g. to transcribe nasal onset or release of oral stops), fricatives (for fricative release of stops), approximants and some stops. Modifier counterparts for other symbols, such as clicks and trill, are not required. The samples shown below demonstrate attestation of most of the proposed inventory. The proposed consonant modifiers are listed along with an index to the samples illustrating each one in Table 3 to Table 6.

Note that a modifier counterpart to small c is proposed. The small letter c is used to represent a palatal stop. In fact, the modifier that is attested (see Figure 18) is c-cedilla, which represents a palatal fricative. It is assumed that that an voiceless affricate with a secondary palatal fricative component can be represented using a sequence < modifier letter small c, combining cedilla >.

Note also that modifier letters l-palatal hook and t-palatal hook are proposed. While the use of palatal hook for indicating palatalization is no longer an IPA recommendation, l-palatal hook and t-palatal hook are proposed here because they are attested, as seen in the samples.

Character			Samples
xx16	ᵐʲ	MODIFIER LETTER SMALL M WITH HOOK	(no sample available)
xx18	ᶮ	MODIFIER LETTER SMALL N WITH LEFT HOOK	Figure 13, Figure 14, Figure 15, Figure 16, Figure 17
xx19	ᶯ	MODIFIER LETTER SMALL N WITH RETROFLEX HOOK	Figure 14, Figure 15
xx1A	ᴺ	MODIFIER LETTER SMALL CAPITAL N	Figure 14, Figure 15

Table 3. Proposed nasal consonant modifier letters and figures that illustrate them

Character			Samples
xx02	ᶜ	MODIFIER LETTER SMALL C (base for c-cedilla)	Figure 18, Figure 22
xx03	ᶝ	MODIFIER LETTER SMALL C WITH CURL	Figure 23, Figure 27
xx04	ᵭ	MODIFIER LETTER SMALL ETH	Figure 19
xx08	ᶠ	MODIFIER LETTER SMALL F	Figure 18, Figure 20, Figure 28
xx0D	ᶣ	MODIFIER LETTER H WITH STROKE	(no sample available)
xx12	ᶡ	MODIFIER LETTER SMALL J WITH CROSSED-TAIL	Figure 19
xx1F	ᵠ	MODIFIER LETTER SMALL PHI	Figure 18
xx20	ᶳ	MODIFIER LETTER SMALL S WITH HOOK	Figure 13, Figure 18
xx21	ᶴ	MODIFIER LETTER SMALL ESH	Figure 18, Figure 21, Figure 22, Figure 27, Figure 28
xx2B	ᶻ	MODIFIER LETTER SMALL Z	Figure 19, Figure 21, Figure 27, Figure 28
xx2C	ᶼ	MODIFIER LETTER SMALL Z WITH RETROFLEX HOOK	Figure 13, Figure 19
xx2D	ᶽ	MODIFIER LETTER SMALL Z WITH CURL	Figure 13, Figure 23, Figure 27
xx2E	ᶾ	MODIFIER LETTER SMALL EZH	Figure 19, Figure 22, Figure 28
xx30	ᶿ	MODIFIER LETTER SMALL THETA	Figure 18, Figure 21, Figure 24, Figure 25, Figure 26

Table 4. Proposed fricative consonant modifier letters and figures that illustrate them

Character			Samples
xx0C	ᶣ	MODIFIER LETTER SMALL TURNED H	Figure 29
xx13	ᶩ	MODIFIER LETTER SMALL L WITH RETROFLEX HOOK	Figure 34
xx14	ᶪ	MODIFIER LETTER SMALL L WITH PALATAL HOOK	Figure 34
xx15	ᴸ	MODIFIER LETTER SMALL CAPITAL L	Figure 13
xx17	ᶬ	MODIFIER LETTER SMALL TURNED M WITH LONG LEG	Figure 36
xx27	ᶹ	MODIFIER LETTER SMALL V WITH HOOK	Figure 33
xx29	ᶺ	MODIFIER LETTER SMALL TURNED Y	(no sample available)

Table 5. Proposed approximant consonant modifier letters and figures that illustrate them

Character			Samples
xx09	ᶨ	MODIFIER LETTER SMALL DOTLESS J WITH STROKE	Figure 23
xx0A	ᶢ	MODIFIER LETTER SMALL SCRIPT G	Figure 23, Figure 32
xx22	ᶵ	MODIFIER LETTER SMALL T WITH PALATAL HOOK	Figure 35
xx2F	ᶲ	MODIFIER LETTER SMALL GLOTTAL STOP	Figure 30, Figure 31

Table 6. Proposed stop consonant modifier letters and figures that illustrate them

In the samples below, modifiers that are already encoded will be highlighted in blue, while those being proposed will be highlighted in red.

[kʷr̥̝ᶳʷiːdɑ̝] ‘chalk’

[ˈdʷr̝ᶻʷɛ̝ʊɔ̝] ‘wood’

[ˌɦʷᵉr̝ᶼʷbi̞tɒ̝vʷɲʷĩː] ‘cemetery-like’

[ˈbr̩ɲɛ̃ᶮɲ̟ŋkɑ̝] ‘female citizen of Brno’

[ˈɾa̱ɾɑ̝ːʃʷɛ̝k] ‘little devil’

Danish

[kʷʰø̝ᴸpm̩hɑ̱̃ʊ̰ʔʷn̩̥] ‘Copenhagen’

Figure 13. Consonant modifier letter: s-hook, z-curl, z-retroflex hook, n-lefthook, small capital L (Laver 1994, p. 559).

Labial	Dental	Dent/Al	Alveol	Post-al	R’flex	Palatal	Velar	Uvular	**Total**
[ᵐb	ⁿd̪	ⁿd̪ ~ ⁿd	ⁿd	ᶮd̠	ᶯɖ	ᶮɟ	ᵑg	ᶰɢ]	

Figure 14. Consonant modifier letter: n-left hook, n-retroflex hook, small capital n (Laver 1994, p. 583).

Labial	Dental	Dent/Al	Alveol	Post-al	R’flex	Palatal	Velar	Uvular	**Total**
[bᵐ	d̪ⁿ	d̪ⁿ ~ dⁿ	dⁿ	d̠ᶮ	ɖᶯ	ɟᶮ	gᵑ	ɢᶰ]	

Figure 15. Consonant modifier letter: n-left hook, n-retroflex hook, small capital n (Laver 1994, p. 584).

sequence (ibid., p. 16). Sequences spanning a morpheme boundary furnish many examples of two-phoneme sequences. The difference is shown by the words *ki.ṯa.ᶮṯi* “circumcised boy” and *kar.kaɲ-.ṯi* “kitehawk-erg.”

Figure 16. Consonant modifier letter: n with left hook (Evans 1995, p. 732).

(52) *root* *2nd person*

a. puht ᵐbʸuhtu ‘you went out’
tih ᶮdʸihu ‘you arrived’
ciŋ ᶮɟiŋu ‘you bathed’
ken ᵑgʸenu ‘you looked’

Figure 17. Consonant modifier letter: n with left hook (Pigott 1997, p. 469).

Labial	Lab-dnt	Dental	Dent/Al	Alveol	Post-al	R’flex	Palatal	Velar	Uvular	**Total**
[pᶲ	pᶠ	t̪ᶿ	t̪ᶿ ~ tˢ	tˢ	t̠ᶴ	ʈᶳ	cᶜ̧	kˣ	qᵡ]	

Figure 18. Consonant modifier letter: phi, f, theta, esh, s-hook, c-cedilla (Laver 1994, p. 581).

Labial	Lab-dnt	Dental	Dent/Al	Alveol	Post-al	R’flex	Palatal	Velar	Uvular	**Total**
[bᵝ	bᵛ	d̪ᶞ	d̪ᶞ ~ dᶻ	dᶻ	d̠ᶾ	ɖᶼ	ɟᶨ	gᵞ	ɢᵡ]	

Figure 19. Consonant modifier letter: eth, z, ezh, z-retroflex hook, crossed-tail j (Laver 1994, p. 581).

(19) *Distribution of Old Allemanic non-fricative phonemes*

initial			*medial*			*final*		
p	t	k	p	t	k	p	t	k
			pp	tt	kk	pp	tt	kk
pᶠ	tˢ	kˣ	pᶠ	tˢ	kˣ	pᶠ	tˢ	kˣ

Figure 20. Consonant modifier letter: f (Kraehenmann 2001, p. 139).

[ɲiᵊd̥ᶿɾ̥ʌx'k̠] ‘(family) washing’

Scottish Gaelic (Islay)

[kʰʷoɰ̥ˣʷt̪ʷʃʲ] ‘cat’

[n̥d̥ᶻɑʔə̰] ‘the day’

Figure 21. Consonant modifier letter: theta, esh, z (Laver 1994, p. 559).

Affrication is transcribed in any of three ways. One way is to write a small superscript homorganic fricative symbol after the stop symbol, as in [tˢ, tʃ, dʒ, cç, ɟʝ, kˣ, gˠ]. The alternative modes of transcription involve writing both components on the line and either joining them with a linker diacritic, as in [t͡s], or joining the two symbols physically together, as in [ʦ].

Figure 22. Consonant modifier letter: esh, ezh, c-cedilla (Laver 1994, p. 364).

otherwise. However, the conventional way of transcribing preploded nasals, i.e. a nasal preceded by its homorganic stop [ᵇm, ᵈn, ᶡɲ, ᶢŋ], has been retained in the present material.

Second, as also acknowledged by Bishop (1996:235) for Kensiw, the preploded nasals are historically and cognitively developments from simple nasals and have simple nasal reflexes in other Mon-Khmer languages. Importantly, reduplications of preploded nasals are always realised as the simple nasal counterpart: [səmsɔᵇm] /smsɔm/ ‘to buzz around a nest’, [hənhəᵈn] /hnhən/ ‘to devour’, [ɟiɲɟɛᶡɲ] /ɟɲɟɛɲ/ ‘to dream’, [ᶻəɲɟᶻɛᶢŋ] /ɲɟɛŋ/ ‘wide’. Furthermore, Malay loanwords which originally have final nasals are usually realised with the preploded counterpart: [hajaᵇm] from Malay *ayam* ‘poultry’, [bulaᵈn] from Malay *bulan* ‘moon’, [kucᶝɛᶢŋ] from Malay *kucing* ‘cat’.

Figure 23. Consonant modifier letters: c-curl, script g, dotless j-stroke, z-curl (Burenhult 2001, p. 35).

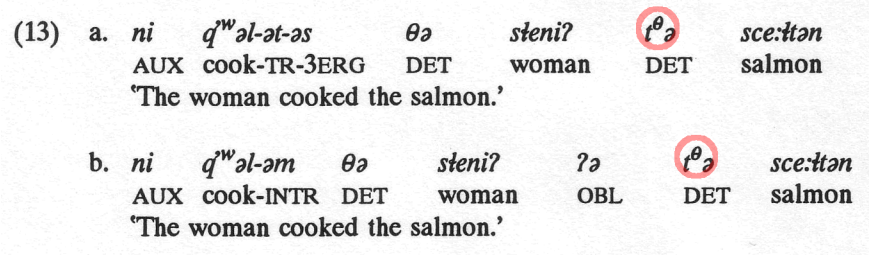
```
25.  pənəsθət      ʔə     tᶿəyʔ    c̓əlʔc̓s     tᶿə    sceeɬtən.
     sprinkle self with   that     its scale  the    salmon

26.  niʔ   xʷəst̓əlʔiʔt̓iyamʔ   tᶿəyʔ,   st̓e      ʔəwʔniis
           they were stuck on  that     be like
     The little things would stick on, just like a garment.
```

Figure 24. Consonant modifier letter: theta (Hukari et al, p. 43).

ʥ	D-Curly-tail-Z ligature	Voiced alveolo-palatal affricate *Superseded by 104+183*	216	02A5	E2FB
ᶿ	Superscript theta	Voiceless dental fricative release	217	------	E21B
ᵊ	Superscript schwa	Mid central vowel release	218	------	E21A

Figure 25. Consonant modifier letter: theta (IPA 1999, p. 179).



(13) a. *ni* *q'ʷəl-ət-əs* *θə* *słeni?* *tᶿə* *sce:łtən*
AUX cook-TR-3ERG DET woman DET salmon
'The woman cooked the salmon.'

b. *ni* *q'ʷəl-əm* *θə* *słeni?* *?ə* *tᶿə* *sce:łtən*
AUX cook-INTR DET woman OBL DET salmon
'The woman cooked the salmon.'

Figure 26. Consonant modifier letter: theta (Gerdts 1998, p. 309).

and Polish. As shown in (3), the stem-final consonants /t d/ in Polish (Rubach 1984) are affricated into the alveolo-palatals [tᶜ dᶻ] when followed across a morpheme boundary by the locative singular /ɛ/, verbalising /e i/ or the feminine suffix /itᶜ + a/, by virtue of Coronal Palatalisation.

(3) *Polish Coronal Palatalisation* (Rubach 1984)

	nom sg				
a.	brat	'brother'	*loc sg* /ɛ/	brac + ie	[bratᶜ + ɛ]
	cud	'miracle'		cudz + ie	[cudᶻ + ɛ]
b.	lot	'flight'	*verbalising* /e/	lec + ie + ć	[letᶜ + e + tᶜ]
c.	brud	'dirt'	*verbalising* /i/	brudz + i + ć	[brudᶻ + i + tᶜ]
d.	kot	'cat'	*fem* /itᶜ + a/	koc + ic + a	[kotᶜ + itᶜ + a]

Another source of sibilant affricates is Strident Assimilation, as in Polish (Rubach 1994). The anterior obstruents /t d/ in Polish are optionally affricated before sibilant fricatives or affricates within a lexical item or across word boundaries, as shown in (4).[4]

(4) *Polish Strident Assimilation* (Rubach 1994)

od soboty	[t s] ~ [tˢ s]	'since Saturday'
twardszy	[t ʃ] ~ [tʲ ʃ]	'harder'
odcedzić	[t tˢ] ~ [tˢ tˢ]	'drain'
świadczyć	[t tʲ] ~ [tʲ tʲ]	'witness'
odznaczyć	[d z] ~ [dᶻ z]	'distinguish'
budżet	[d ʒ] ~ [dʒ ʒ]	'budget'
przed dzwonkiem	[d dᶻ] ~ [dᶻ dᶻ]	'before the bell'
oddzielić	[d dʒ] ~ [dʒ dʒ]	'separate'

Figure 27. Consonant modifier letters: c-curl, esh, z, z-curl (Kim 2001, p. 93).

Similarly, there is a sound change from Proto-Bantu to Mvumbo which also shows plosive assibilation before the high vowels /i/ and /u/. As shown in (14a), the plosives /b d t g k/ in Proto-Bantu were affricated in Mvumbo, to /$d^{ʒ}$ $t^{ʃ}$/ before /i/ or to /b^{v} p^{f}/ before /u/. But plosives before non-high vocoids in Proto-Bantu were not affricated in Mvumbo, as in (14b) (from Ohala 1983, after Guthrie 1967–71).

(14)	*Proto-Bantu*	*Mvumbo*	
a.	*-buma	b^{v}umo	'fruit'
	*-dib-	$d^{ʒ}$iwo	'shut'
	*-dut	-b^{v}ure	'pull'
	*-tiitʊ	$t^{ʃ}$ir	'animal'
	*-tud-	-p^{f}ule	'forge'
	*-gida	ma-$t^{ʃ}$ie	'blood'
	*-gubʊ	m-b^{v}uu	'hippopotamus'
	*-kiŋgo	$t^{ʃ}$iuŋ	'neck, nape'
	*-kuba	p^{f}uwo	'chicken'
b.	*-bod	-buo	'become rotten'
	*-dɪ	-di	'eat'
	*-toog	-tuog	'boil up'
	*-gada	-kala	'mat'
	*-konde	-kwande	'banana'

In contrast, the underlying plosives /t d/ in Quebec French are usually affricated into [t^{s} d^{z}] only before high front vocoids. As shown in (15), the consonants /t d/ are affricated before the high front vowel /i/, the high front rounded vowel /y/, the palatal glide /j/ or the high front rounded glide /ɥ/ within a morpheme (Charbonneau & Jacques 1972, Cedergren *et al.* 1991, Ostiguy & Tousignant 1993, Papen 1998).

(15)	*Standard French*	*Quebec French*	
	pe[ti]t	pe[t^{s}i]t	'little'
	[ti]pe	[t^{s}i]pe	'type'
	[tj]ens	[t^{s}j]ens	'(I) hold'
	[ty]rc	[t^{s}y]rc	'Turk'
	[tɥ]er	[t^{s}ɥ]er	'to kill'
	[di]x	[d^{z}i]x	'ten'
	[di:]re	[d^{z}i:]re	'to say'
	[dj]eu	[d^{z}j]eu	'God'
	[dy:]rer	[d^{z}y:]rer	'to continue'
	[ty] viens le matin	[t^{s}y] viens le matin	'you come in the morning'
	il est plain[ti]f	il est plain[t^{s}i]f	'he is plaintive'

Figure 28. Consonant modifier letters: ʃ, esh, ʒ, ezh (Kim 2001, p. 91).

Alveolo-palatal affricates in Kurdish (Suleimaniya accent)

[t͡ɕ^{ɥ}ɛ] 'where' [ʒ͡ʑ^{ɥ}ɛ] 'ear'

Figure 29. Consonant modifier letter: turned h (Laver 1994, p. 365).

Syllabic voiceless oral stops (plosive and ejective) in Nez Perce

[t^{h}à + q^{h}ɑ + k'ál +k^{h} + ṭ^{h}] 'to close a door'

[q^{h}o + q^{h}o + q^{h}eɪ^{ʔ} + k^{h} + ṭ^{h}] 'galloped'

Figure 30. Consonant modifier letter: small glottal stop (Laver 1994, p. 240).

Laryngealization in Bwe Karen

High level tone	*Mid level tone*	*Low level tone*
[ʔwi] 'prophet'	[ʔwi] 'tasty'	–
[wa] 'finished'	[wɛ] 'rain'	[wɛ] 'smelt'

Figure 31. Consonant modifier letter: small glottal stop (Laver 1994, p. 333).

Now, if you add voicing, you can pronounce "ɡbɑ ɡbɑ ɡbɑ." Do you remember the Igbo people of Western Nigeria (Biafra)? Their tribal name was usually spelled Ibo in American newspapers since outsiders seldom correctly pronounce the double consonant. You can pronounce it correctly if you say Iɡbo — be careful not to just say Ibo, or Ig-bo.

Figure 32. Consonant modifier letter: script g (Brewster and Brewster 1976, p. 275).

Labiodentalization, which can be marked with a superscript [ᵛ], is quite common as an extralinguistic idiosyncrasy of particular individuals. In English, it is sometimes heard as a segmental feature modifying [s] and [z], and is not uncommon as a modification of [ɹ].

Figure 33. Consonant modifier letter: v-hook (Laver 1994, p. 323).

3.3 *Prelateralized Stops*

Most languages of the Iwaidjan family have a series of complex segments that have been described as "lateral flaps" (Pym and Larrimore 1979) or "prelateralized stops" (Handelsmann 1991). In all four languages apico-alveolar and apico-postalveolar complex segments /ˡt/ and /ˡʈ/ exist; fuller investigation of these languages may reveal palatal /ˡc/ as well. The complex segments contrast with simple laterals /l/ and /ɭ/, and with true clusters /lt/, /ɭʈ/ which span two syllables. Prelateralized stops pattern phonotactically like single phonemes. Unlike clear clusters, they can be syllable- and word-initial, as in Amurdak /ˡtaɲ/ "dingo" and /a.ˡta.wuʈ/ "water", and in slow syllabifications

Figure 34. Consonant modifier letters: l-retroflex hook, l-palatal hook (Evans 1995, p. 735).

Note that there is a typographic anomaly in the sample shown in Figure 34: retroflex (right-turning) hooks have been used on the t and modifier l, but the author was clearly discussing palatalization. What the author was intending, then, was a modifier l-palatal hook. It is not clear whether this was a typographic error or merely an attempt to approximate the palatal hook to compensate for an incomplete selection of type.

or altogether overlooked. Note also that as a consequence of rule P 6c, {t} in the first example becomes plain before {c}.
{pad=č'ašk+oj} [paᵗč'aškəj] "under the cup" and {pod=š'ašk+oj} [paᵗš'aškəj]

Figure 35. Consonant modifier letter: t-palatal hook (Halle 1971, p. 71).

(21)	$\check{c}^{u}\underline{o}^{42}$	'egg'		$c^{w}\underline{a}^{3}$	'his mouth'
	$n^{u}\underline{i}^{42}$	'father'		$nt^{j}\underline{a}^{34}$	'house'

Figure 36. Consonant modifier letters: turned-m with long leg (Golston and Kehrein 1998, p. 323).

G. References

Bessell, Nicola J. 1998. “Local and non-local consonant-vowel interaction in Interior Salish.” Phonology 15.1–40.

Brewster, E. Thomas, and Elizabeth S. Brewster. 1976. *Language acquisition made practical: Field methods for language learners.* Colorado Springs, CO: Lingua House.

Brink, Lars; Jørn Lund, Steffen Heger, J. Normann Jørgensen. 1991. *Den Store Danske Udtaleordbog.* [Copenhagen:] Munksgaard Ordbøger.

Burenhult, Niclas. 2001. “Jahai phonology: A preliminary survey.” Mon-Khmer Studies 31.29–45.

Clark, John, and Colin Yallop. 1995. *An introduction to phonetics and phonology, 2nd edn.* (*Blackwell textbooks in linguistics*.) Oxford: Blackwell.

Constable, Peter. 2003a. *Proposal to encode phonetic symbols with palatal hook in the UCS.* L2/03-169.

——. 2003b. *Proposal to encode additional phonetic symbols in the UCS.* L2/03-17?

Czaykowska-Higgins, Ewa, and Marie Louise Willett. 1997. “Simple syllables in Nxaʔamxcín.” IJAL 63.385–411.

Evans, Nick. 1995. “Current issues in the phonology of Australian languages.” *The handbook of phonological theory* (*Blackwell handbooks in linguistics*, 1), ed. by John A. Goldsmith, 723–61. Oxford: Blackwell Publishers.

Floyd, Rick. 1981. *Manual for articulatory phonetics.* Dallas: Summer Institute of Linguistics.

Gerdts, Donna. 1998. “Mapping Halkomelem voice.” *Salish languages and linguistics: theoretical and descriptive perspectives* (*Trends in linguistics: studies and monographs*, 107), ed. by E. Czaykowska-Higgins and M.D. Kinkade, 305–24.

Golston, Chris, and Wolfgang Kehrein. 1998. “Mazatec onsets and nuclei.” IJAL 64.311–337.

Halle, Morris. 1971. *The sound pattern of Russian.* The Hague: Mouton & Co.

Hukari, Thomas E.; Ruby Peter; and Ellen White. “Halkomelem.” *Northwest coast texts* (*International journal of American linguistics native American text series, volume 2, number 3*), ed. By Barry F. Carlson, 33–68. Chicago: University of Chicago Press.

International Phonetics Association. 1999. *Handbook of the International Phonetic Association: a guide to the use of the International Phonetic Alphabet.* Cambridge: Cambridge University Press.

Kim, Hyunsoon. 2001. “A phonetically based account of phonological stop assibilation.” Phonology 18.81–108.

Kraehenmann, Astrid. 2001. “Swiss German stops; geminates all over the word.” Phonology 18.109–45.

Ladefoged, Peter, and Ian Maddieson. 1996. *The sounds of the world's languages.* Oxford: Blackwell Publishers.

Laver, John. 1994. *Principles of phonetics.* (*Cambridge textbooks in linguistics*.) Cambridge: Cambridge University Press.

Lojenga, Constance Kutsch. 1994. *Ngiti: a Central-Sudanic language of Africa.* (*Nilo-Saharan linguistic analyses and documentation*, 9.) Köln: Rüdiger Köppe Verlag.

Malone, Joseph L. 1999. “Some observations on the Ojibwa preverb bi.” IJAL 65.343–370.

Pigott, G.L. 1997. “Licensing and alignment: a conspiracy in harmony.” Phonology 14.437–77.

Pullum, Geoffrey K., and William A. Ladusaw. 1996. *Phonetic symbol guide, 2nd edn.* Chicago: University of Chicago Press.

Wayland, Ratree P., and Allard Jongman. 2001. “Chanthaburi Khmer vowels: Phonetic and phonemic analyses.” Mon-Khmer Studies 31.65–82.