Ancient Indian and Chinese Models of Sound Classification and their Reflections in the Writing Systems

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As early as in the 5th century BCE, Indian phoneticians studied exhaustively the process of producing speech sounds. They classified the sounds by place and manner of articulation as we see in the table of the Devanāgarī script. The ancient Indian model of sound classification is reflected in the order of signs of all the Indic scripts. The most outstanding common feature is found in the arrangement of the signs for the plosive consonants. That is, the signs are initiated with those for the velar plosives which are followed by those of other plosives grouped by the places of articulation. In each group the first sign is that representing the unaspirated-voiceless which is followed by the aspirated, the voiced, the voiced-aspirated (where it is distinguished) and the nasal.

Traditional Chinese studies on the speech sounds were mainly concerned with the classification of the initial consonants and rhymes of the syllables represented by individual characters. The initial consonants were classified roughly, not exactly, by five (or seven) places and four manners of articulation. The creators of the Korean alphabet in the 15th century classified the consonants in Korean utilizing the Chinese model and created the signs reflecting the systematic contrasts between the designated sounds.

Keywords: *Ancient Indian classification of speech sounds, Devanāgarī, the Indic scripts, traditional Chinese classification of initial sounds, the Korean alphabet*

1. Introduction

Classification of the sounds of a language is achieved only by a thorough study of the sounds. It presents the systematic distribution of the sounds or the phonemic structure of the language. The origin of a script does not

necessarily presuppose a complete study of the sounds, but when a model of classification of the sounds is already available, a new script can be created effectively and systematically.

A writing system consists of a set of visual signs each of which represents a sound or sounds and may or may not stand for meanings. The signs of a phonographic writing system are learned and memorized generally in a fixed *order*. If a learned knowledge of the sound system were reflected in the script, it might be found either in the graphic forms or in the order of the letters.

As is well known, the Korean alphabet, *Han'gŭl*, was created in the middle of the 15th century on the basis of phonemic classification of Korean. The consonantal sounds were classified by place and manner of articulation modeled on the Chinese paradigm. For the vowels, a new previously unknown model was introduced. The systematic contrasts between the sounds were reflected in the graphic forms of the letters.[1] In the *Hunmin chŏng'ŭm* of 1443 the order of the letters follow the rows and columns of the classification. (For details, see p. 35 below.) However, in a work published in 1527 the letters are arranged in a different way similar to that we know today.

As early as in the 5th century BCE, Indian phoneticians thoroughly observed the process of producing speech sounds. They classified the sounds by place and manner of articulation. Their findings were reflected in the order of the letters of all Indic writing systems.

In the historical study of writing, *adaptation* of an earlier script for other languages has been thought to be an indispensable presupposition. That is, once a writing system was invented for a language, it was adopted or adapted for other languages. An entirely new system free of any influence of the earlier one can hardly imaginable. To establish a historical relationship between two or more scripts, comparison of the external forms of the letters to their phonetic representations has been supposed to be a necessary requirement. Thus, in order to find the origin of the Korean alphabet *Han'gŭl*, earlier scripts, of which the shapes of certain letters are identical or similar to those of the Korean, have been sought enthusiastically for over a hundred years with few persuasive results.

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[1] Because of this feature found only in Korean *Han'gŭl*, Sampson (1985: 120-144) set up an independent category of writing, "featural system."

As will be seen in this paper, all the Indic scripts share a common feature in the *order* of the letters, which originated in the same systematic classification of sounds by the ancient Indian phoneticians. Certain letters of certain scripts may look alike, but the external similarity is not necessarily regarded as the key evidence for establishing the genetic relationship of Indic writings. It is obvious that the numerous Indic scripts were created on the basis of the classification of the sounds available. The system, not the forms of letters, was adapted when creating a new script.

Obviously the Korean alphabet was created on the basis of the systematic classification of sounds. For the creators who clearly understood the phonetic system in which individual sounds (or 'phonemes' in the modern sense) are regularly contrasting, adoption of the forms of the letters of an earlier script need not have been a major concern. Fruitless comparison of external forms of the letters to prove the origin of the Korean alphabet should be discontinued.

In this paper the ancient Indian classification of sounds is briefly introduced to demonstrate its reflection in Indic writing systems. Then, the traditional Chinese model of initial consonants is discussed in connection with the Korean alphabet.

2. Ancient Indian Model of Sound Classification and Its Reflections in Indic Writing Systems

As early as in the 5th century BCE Indian phoneticians contemplated the process of producing speech sounds. Their observations from various primary sources are rearranged and introduced with interpretations in Allen (1953). The following is a summary of the first part of Allen's work.

The ancient Indian phoneticians studied the sounds physiologically and divided them into two main types, 'internal' (ābhyantara) and 'external' (bāhya). The first type comprises processes occurring within the oral cavity or intra-buccal and the second, those occurring elsewhere or extra-buccal.

The intra-buccal processes include (a) closure, which is associated with the production of the stop consonants; (b) opening, which is associated with that of the vowels; and (c) constriction of two degrees, (i) which is associated with that of the fricatives and (ii) which is associated with that of the semi-vowels.

Table 1. The Sounds Associated with Closure (Stop Consonants)

	Voiceless Stops		Voiced Stops		Nasals
	Unaspirated	Aspirated	Unaspirated	Aspirated	
Velar	ka	kha	ga	gha	ŋa
Palatal	ca	cha	ɟa	ɟha	ɲa
Retroflex	ṭa	ṭha	ḍa	ḍha	ŋa
Dental	ta	tha	da	dha	na
Labial	pa	pha	ba	bha	ma

Table 2. The Sounds Associated with Opening (Vowels)

	Short	Long	Secondary	Diphthong
Glottal	a	ā		
Palatal	i	ī	e	ai
Retroflex	r̥	r̥̄		
Dental	l̥	l̥̄		
Labial	u	ū	o	au

Table 3. The Sounds Associated with Constriction (Fricatives)

|	Sonorants	Sibilants
Palatal	ja	ʃa
Retroflex	ra	ṣa
Dental	la	sa
Labial	va	
Others	(ḷa)	ha

The extra-buccal processes comprise (a) glottal, which is associated with the production of the voiced sounds; (b) pulmonic, which is associated with that of the aspirated sounds; and (c) nasal, which is associated with that of the nasal sounds.

According to the intra- and extra-buccal processes the sounds were classified as shown in the table of the Devanāgarī script.[2]

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[2] All the Romanization of individual signs of various scripts found in the present study are those quoted from the articles on the scripts in question that uploaded in the internet encyclopedia, Wikipedia (http://en.wikipedia.org/wiki) and/or a few other references. Among the two or more Romanization systems presented for each scripts, usually one or more of popular or conventional system and one by IPA, the latter is taken with a few modifications. 'Aspirated' sounds are transcribed by 'h' rather than a superscribed by 'h,' as 'kh,' 'th' and 'ph.' Retroflex sounds are represented by 'ṭ' and 'ḍ,' instead of IPA 'ʈ' and

As shown on Tables 1-3 above, the sounds classified into three groups by intra-buccal processes are further divided into five categories by place of articulation: velar or glottal, palatal, retroflex, dental and labial.[3] The five categories are arranged strictly in order from the place nearest to the origin of the air-stream, i.e., the lungs, toward the lips.[4]
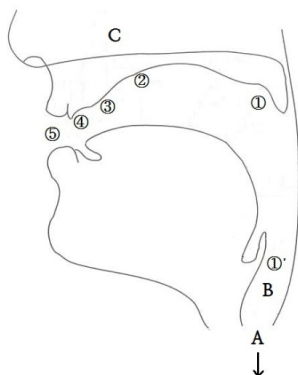
Intra-Buccal	Extra-Buccal
①' Glottis	A. The Lungs (Pulmonic)
① Velar	B. The Glottis (Voiced)
② Palate	C. Nasal Cavity (Nasal)
③ Front Palate (Retroflex)	
④ Dental	
⑤ Labial	

Each of the five categories of sounds associated with closure includes five kinds of sound that are distinguished by the three extra-buccal processes: voicing which is processed at the glottis (glottal), aspiration which is processed by the lungs (pulmonic) and nasalization which is processed in the nasal cavity (nasal). The three extra features, which follow the featureless (i.e. voiceless unaspirated) basic form, are arranged again in the order from the deepest, i.e. the lungs (aspirated), to the glottis (voiced), then a combination of previous two features (voiced-aspirated) and finally to the nearest to the lips, i.e. the nasal cavity (nasal). In sum, this yields a table of stop consonants as shown in Table 1 above.

The sounds associated with opening of the mouth, i.e., the vowels, are classified also by the places of articulation as shown on Table 2 above. It is noted that from the order of the vowels [a]-[i]-[u] we understand that the

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'ɖ.'

[3] On Table 3 the category glottal/velar is absent. The Indian phoneticians did not consider [h] to be a velar or glottal. Actually [h] is a fricative articulated anywhere, from the velum to the lips. The place of articulation is determined by the accompanying vowel.

[4] According to Allen (1953: 20 "Note") the order of letters shows considerable divergence in the Indian sources. "This fact, however, is explicable by the phonological, as opposed to phonetic, approach there adopted."

Indian phoneticians obviously perceived the place of articulation for [i] to be in the middle, between the glottis and the lips. They did not describe [i] as the most front and the highest vowel (in reference to the position of the tongue) as modern phoneticians do. The Indian phonetician's description seems to be more reasonable. The vowels [a], [i] and [u] may be more properly described as 'glottal,' 'palatal' and 'labial' respectively, rather than 'low-back,' 'high-front' and 'high-back.'

The sounds associated with constriction include fricatives and semi-vowels, or sibilants and sonorants. As shown on Table 3 above, these sounds may be classified by place of articulation like the plosives, but do not parallel the latter in sub-classes. That is, the sounds under this category are not distinguished by aspiration, voicing and nasalization.

The order of the Devanāgarī alphabet begins with the vowels and continues with the plosive consonants, the semi-vowels and the fricatives as shown number (1) below. Anyone may easily understand the rationale of the order of the Devanāgarī letters. It exactly corresponds to the horizontal and/or the vertical order of the sound classifications shown on Tables 1-3 above.

Devanāgarī appeared in the 8th century CE and was used for writing Sanskrit beginning ca. 12th century. But the order of the letters must be the one inherited from the earlier scripts used for writing Sanskrit such as the various Brāhmī scripts (since 3rd c. BCE or earlier), Gupta (since 400 BCE on ?) and Siddham (used ca. 600-1200 CE). The order of the letters of Siddham, almost identical to that of Devanāgarī, is found in the table of the script contained in the *P'alman taejanggyŏng* 八萬大藏經 (*Tripitaka Koreana*) of the 13th century.

The ancient Indian principle of ordering the letters was not blindly adopted but adjusted to fit the languages for which new scripts were created. It would have also experienced changes with the passage of time. However, the fundamental aspect has been maintained, especially in the order of the letters for the plosive consonants. The letters for plosive sounds are arranged, as in the Devanāgarī script, in the order of ① the velar group, ② the palatal group, ③ the retroflex group, ④ the dental group and ⑤ the labial group. In each group the letters are in the order of (a) basic or unaspirated-voiceless, (b) aspirated, (c) voiced, (d) aspirated-voiced and (e) nasal. In the case of a category (by place of articulation) or a class (by manner of articulation) not existing in a language, the letters for

them were not created. For example,[5] in the Tibetan script (3), which was created in the 7th century, letters for the sounds of the retroflex category and the aspirated-voiced class are lacking as those sounds did not exist in Tibetan. Letters for vowels were not created but marked by diacritics. In the ḥPags-pa script (4), created in the 13th century, as in Tibetan, the letters for the sounds of retroflex and aspirated-voiced sounds do not exist also. Independent letters for vowels were created which were placed after the consonants. The order of the letters of the ḥPags-pa script is found in the *Fashukao* 法書考 and *Shushi huiyao* 書史會要, both of which were compiled in the 14th century. In the Burmese script (5) the sounds of the second group, which are supposed to be palatal plosives, are transcribed as fricatives [sa sha za za]. As a matter of fact, not only in Burmese but also in many other languages a palatal plosive [c] is hardly differentiated from a palatal fricative [ç] and is often interchangeable with a post-alveolar/alveolar/dental fricative [s] etc. In the Thai script (6) each group of the plosives comprises six to eight letters, unlike the four or five found in other scripts. Yet the basic principle of ordering is retained. It is noted that the inherent vowel of the letters of the Thai script, as well as the Lao script, is [o].[6] Thus, an easily recognizable feature of Indic writing systems is that the series of the consonantal letters is headed by the letter representing a [k(a)]. In the Gurmukhī script (2) the initial letters are, unusually, those for [sa] and [ha], but they are followed by the plosive groups in the normal order.

Alphabetical Orders by Transcriptions of Represented Sounds[7]
(1) Devanāgarī
a i u ṛ ḷ e o // ka kha ga gha ŋa / ca cha ɟa ɟha ɲa / ṭa ṭha ḍa ḍha ŋa / ta tha da dha na / pa pha ba bha ma / ja ra la wa ʃa sa ha (In the vowel listings long vowels and diphthongs have been omitted.)

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[5] See the appropriate number under "Alphabetical Orders by Transcriptions of Represented Sounds" below for the ordering of the scripts mentioned here.

[6] Actually the inherent vowels of the scripts of many languages, which are commonly transcribed by 'a,' sound more like a schwa [ə].

[7] Regarding the arrangements of the letters of the scripts, the appropriate articles in the internet encyclopedia, Wikipedia (http://en.wikipedia.org/wiki) and Nakanishi (1990) were consulted. A pair of slash '//' denotes the boundary between vowels and consonants and a single slash '/' separates sound categories. Transcriptions are in IPA but aspirated sounds are transcribed by 'h' rather than a superscribed 'ʰ,' as 'kh,' 'th' and 'ph.' Retroflex sounds are represented by 'ṭ' and 'ḍ,' instead of IPA 'ʈ' and 'ɖ.'

(2) Gurmukhī
(three vowel-basis letters) // sa ha / ka kha ga gha ŋa / ca cha ɟa ɟha ɲa /
ṭa ṭha ḍa ḍha ṇa / ta tha da dha na / pa pha ba bha ma / ja ra la wa ra

(3) Tibetan
ka kha ga ŋa / tɕa tɕha dʑa ɲa / ta tha da na / pa pha ba ma / tsa tsha dza
wa ɕa sa ʔa ja ra la ɕa sa ha a

(4) ḥP'ags-pa
ka kha ga ŋa / tɕa tɕha dʑa ɲa / ta tha da na / pa pha ba ma / ça çha ɟa wa
za za ja ra la ʃa sa ha 'a // i u e o (next 7 letters are omitted)

(5) Burmese
a i u e o an // ka kha ga ga ŋa / sa sha za za ɲa / ta tha da da na / ta tha
da da na / pa pha ba ba ma / ja ya la wa θa ha la (long vowels have been
omitted)

(6) Thai
ko kho kho kho kho kho ŋo / tɕo tɕho tɕho so tɕho yo / do to tho tho tho no
/ bo po pho fo pho fo pho mo / jo ro lo wo so so so ho lo 'o ho

3. Chinese Model of the Classification of the Initial Consonants and Its Reflection in the Korean Alphabet

The study of speech sounds in China is said to have begun in the 1st
century CE, perhaps under the influence of ancient Indian phonetics which
was introduced along with Buddhism. Terms for the classification of sounds
appear in works from the 6th century onward, but the traditional Chinese
model of classification was not fully established until the 9th-10th century.
Probably because of monosyllabic nature of the Chinese language, the
traditional study of sounds in China was mainly concerned with classification
of the initial consonants or *sheng* 聲 and the rhymes or *yun* 韻.

The initial consonants were classified by five (later seven) *yin* 音,
which may be understood as five places of articulation, and four *sheng* 聲,[8]
which may be interpreted as four manners of articulation. Thirty initial

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[8] In traditional Chinese phonetics a term frequently appears in multiple senses. The basic
meaning of *sheng* 聲 is 'sound,' but may denote 'initial consonant' or 'one of the four
manners of articulation' depending upon the context.

Table 4. Traditional Chinese Classification of Initial Consonants

		All-clear 全清	Second-clear 次清	All-muddy 全濁	Not-clear Not-muddy 不清不濁	Clear 清	Muddy 濁
Molar Sounds 牙音		見 k	溪 kh	群 g	疑 ŋ		
Tongue Sounds 舌音	Tongue-head 舌頭音	端 t	透 th	定 d	泥 n		
	Tongue-up 舌上音	知 c	徹 ch	澄 ḍ	娘 ɲ		
Lip Sounds 脣音	Lip-heavey 脣重音	幫 p	滂 ph	並 b	明 m		
	Lip-light 脣輕音	*非 f	*敷 fʼ	*奉 v	*微 w		
Tooth Sounds 齒音	Tooth-head 齒頭音	精 ts	清 tsh	從 dz		心 s	邪 z
	Tooth-proper 正齒音	照 tɕ	*穿 tɕh	*牀 dʑ		審 ɕ	禪 ʑ
Throat Sounds 喉音		影 0	曉 x	匣 ɣ	喩 j		
Half-tongue S. 半舌音		來 l					
Half-tooth S. 半齒音		日 ṇʑ					

* Initials not included in the earlier list of thirty.

consonants were distinguished in the earlier works but later the number increased to thirty-six. Each initial consonant was represented by a specific character, e.g., [k] by 見, [kh] by 溪, [g] by 群 etc. The most widely known classification of the 36 initial consonants is shown on Table 4 below with literal translations of the Chinese names of the categories and classes.

Five or Seven Categories by Place of Articulation

The arrangement of the five primary categories is in the order of molar (back-tooth), tongue, lip, tooth and throat which roughly, but not exactly, correspond to velar, alveolo-palatal, labial, alveolar/dental and glottal

respectively in articulatory phonetic terms. At a glance, the arrangement appears to be similar to that of ancient India's. However, it is noted that in the Indian tradition the categories of the sounds are referred to by the names of the upper parts of the speech organ, i.e., 'velar,' 'palate' etc. Whereas in the Chinese classification the articulator 'the tongue' is used as a category name and the other four are names of the organs that comprise both upper and lower parts. Anyhow, the first three categories are in the order of the organs from the deeper part toward the front. This order can be interpreted as fundamentally identical with that of the Devanāgarī alphabet shown on Table 1 above.

However, the next two categories, the 'tooth' (alveolar/dental) and the 'throat' (glottal) are in a different order. Physically speaking, their arrangement is from front to back, the opposite direction from that of the first three. I have not found an adequate explanation why the Chinese arranged the categories of the initial consonants in this order. In this connection, it may be pertinent to point out one fact, i.e., the consonants under the first three categories are stops or plosives, whereas those under the last two categories are affricates and sibilants, or fricatives. When a stop consonant is produced, a complete closure, or a contact of the upper and the lower parts of the speech organ is required. But for fricatives, the upper and lower parts are not closed, but narrowed. For the affricates both contact and narrowing of the upper and lower parts occur in sequence. It is noted that in the Indian tradition those sounds under the Tooth and Throat categories in the Chinese classification do not belong to the first five categories of plosives. Actually the Palatal and the Retroflex categories of the Indian classification are missing in the Chinese.

The Tongue-up sounds correspond to Palatal plosives in the Indian model. The sounds under this category merged with those under Proper-tooth. The retroflexes did not exist in Chinese.[9] However, in modern Chinese retroflex fricatives are distinguished from the palatals and the dentals.

The term 'molar' looks inadequate for what is known in modern linguistics as 'gutturals' or 'velars.' The origin of the term might have had a certain connection with the Indian tradition, in which the *sthāna* ('position'

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[9] Karlgren (1954) reconstructed palatal stops for the 'tongue-up' and 'proper-tooth' sounds. But Pulleyblank (1971: 213) argued that they must have been retroflex stops mainly based upon Sino-Vietnamese readings.

or 'place') of the *k*-series is said to be *hanu-mūla* or 'root of the (upper) jaw' (Allen 1953: 51-52). If the Chinese person who decided the Chinese names of the categories had knowledge of the Indian terms, he might have chosen 'molar' (*ya* 牙) for 'root of jaw' as the molars are near to the root of the tongue.

The category of 'lip-light sounds' or 'labial fricatives' was added in the later period. This category is lacking in the Indian model.

The 5th category of Throat sounds includes the zero-initial, semi-vowel and glottal fricative. And, for the liquid [l] and alveolar fricative [n̠z], two extra-categories, Half-tongue and Half-tooth, were set up. As the number of categories increased by two, the name changed from 'five sounds' (*wuyin* 五音) to 'seven sounds' (*qiyin* 七音).

Four Classes by Manner of Articulation

The four sub-classes, All-clear, Second-clear, All-muddy and Not-clear Not muddy correspond to Voiceless-unaspirated, Voiceless-aspirated, Voiced-unaspirated and Nasals respectively in the Indian model. The Voiced-aspirated category in the Indian paradigm does not exist in the Chinese.[10]

Adaptation of the Chinese Model of Consonantal Classification by the Creators of the Korean Alphabet

In the traditional study of Chinese the reading of a Chinese character *zi* 字, or a 'syllable' in modern sense, was analyzed into two elements: *shengmu* 聲母 or the initial sound and *yunmu* 韻母 or the rhyme. The creators of the Korean alphabet further analyzed the rhyme into two parts upon which they conceived the minimal pronounceable unit of speech as consisting of three elements: *chosŏng* 初聲 or 'the initial sound,' *chungsŏng* 中聲 or 'the medial sound' and *chongsŏng* 終聲 or 'the final sound.' They explained that a unit in Chinese is necessarily made up of the three elements. However, in Korean an initial and a medial sound are required but the final is optional. The creators of *Han'gŭl* also realized that the initial and the final sounds belong to the same class. In terms of modern linguistics, they recognized

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[10] Karlgren reconstructed voiced-aspirated consonants for the All-muddy sub-class, but a number of scholars have been critical about Karlgren's reconstructions.

Table 5. Classification of the Korean Consonants

	All-clear 全清	Second-clear 次清	All-muddy 全濁	Not-clear Not-muddy 不清不濁
Molar sounds 牙音	ㄱ **k**	ㅋ kh	ㄲ g	ㆁ ŋ
Tongue sounds 舌音	ㄷ t	ㅌ th	ㄸ d	**ㄴ n**
Lip sounds 脣音	ㅂ p	ㅍ ph	ㅃ b	**ㅁ m**
Tooth sounds 齒音	ㅈ c ㅅ **s**	ㅊ ch	ㅉ ɟ ㅆ (z)	
Throat sounds 喉音	ㆆ ʔ	ㅎ h	ㆅ x	**ㅇ 0**
Half-tongue s. 半舌音	ㄹ r			
Half-tooth s. 半齒音	△ z			

the positional variants of a phoneme.

For the classification of the initial/final sounds, i.e., the consonants, the Koreans took the traditional Chinese model shown on Table 4 above. The 'seven categories' (by place of articulation) and the 'four classes' (by manner of articulation) were kept but the sub-divisions of the Tongue, Lip and Tooth categories were ignored since those consonants were not distinguished in Korean.

While 36 sounds were registered in the Chinese model, 23 initial/ finals are listed in the Korean classification as shown on Table 5. But, the six letters/sounds in the All-muddy class were not counted as regular members of the Korean consonants.[11] The remaining 17 letter/sounds were considered as 'regular' members and were listed in the introductory

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[11] The All-muddy class has been considered to be voiced consonants. In Korean voiced plosives do not exist as phonemes. In many Chinese dialects voicing has lost its distinctive power for many centuries but it has been maintained in the historical studies of Chinese. Until the new orthography was introduced in the 1930s, the use of the All-muddy letters was extremely limited for writing native Korean. In the new orthography those letters represent the tensed plosives.

section of the *Hunmin chŏng'ŭm* in the order exactly corresponding to that of the letters on Table 5. The order is presented as "(7) Korean 1" below in the same manner as the Indic scripts shown (1)-(6) above. This order also reveals a few similarities to those of the Indic scripts such as the head being the letter for [k], placing the letters for the sounds belonging to the same category together and so on.

The original order of the letters of the Korean alphabet, however, seems to have been replaced after several decades. In the *Hunmong chahoe* 訓蒙字會 of 1527 (a collection of elementary Chinese characters for children's learning), the Korean letters are listed in a different order as shown in "(8) Korean 2" below. The author Ch'oe Se-jin was one of the most eminent phoneticians in the five-hundred-year history of the Chosŏn dynasty. He compiled a number of works for the study of Chinese and Chinese characters.

In the order of the letters in the *Hunmong chahoe* of 1527, the first eight letters are defined as "those used for both the initial and the final sounds" and the next eight as "those used only for the initial sounds." The first eight letters are none other than those explained in the *Hunmin chŏng'ŭm* as "For the final sounds eight letters are enough." In Korean all consonants are unreleased in final position. As a result, distinctions of aspiration and tension are neutralized in final position. For example, final /-k/, /-kh/ and /-kk/ are pronounced the same. Accordingly the number of consonants occurring in final position is reduced. Perhaps, for the practical purpose of learning the Korean alphabet, the arrangement of 1527 turned out to be more useful than the original one which reflects the theoretical classification of the sounds. At a glance the first eight letters are in an order severely distorted from the original. But, by a careful examination the principle of ordering the letters is understandable. The head letter is the one for the sound of Molar (velar) category [k] which is followed by those of the Tongue [n, t], that of Half-tongue [r], those of Lip [m, p], that of Half-tooth [s] and finally that of [ŋ]. Among the two sounds in the Tongue and Lip categories, the one representing the category was placed first. The five sounds/letters representing the five categories are in bolded in Table 5 above.

The sound [ŋ] actually belongs to the Molar category. This sound was explained by the creators of the Korean alphabet as one that cannot represent the Molar category because of its peculiarity, i.e., nasality, of

the sound. So, they not only did not set this sound as the representative of the Molar category, but also did not make a letter containing an element shared by others of the category.[12] For this reason the letter representing [ŋ] might have been placed at the end of the eight.

The letter for [ʔ] of the Throat category is omitted from the original 17 members. Actually the phonetic value represented by this letter was questioned from the time of the creation of the Korean alphabet. It must have been made to fill out the logical distribution of the sounds in the classification table.

The eight letters occurring only initially are in the order of the categories. That is the Molar [kh], the Tongue [th], the Lip [ph], the Tooth [c ch], the Half Tooth [z] and the Throat [0].

The order of the first eight letters in the *Hunmong chahoe* of 1527 has been the standard arrangement of the Korean alphabet until the present. But the order of the other letters has not remained constant. A justification for the change of order is difficult to identify. See " (9) Korean 3" below for the modern order of the Korean alphabet.

Korean Model for the Classification of the Vowels

The creators of the Korean alphabet created their own model for the classification of the vowels. They conceived the three vowels [a̠],[13] [ɯ] and [i] as the fundamentals for which three symbols ·, ― and ㅣ were created respectively. The first one symbolized the roundness of the heaven, the second one, the flatness of the earth and the third one, the verticality of the

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[12] The creators considered the sounds belonging to the Not-clear Not-muddy class as representative of the categories. However, because there is no Not-clear Not-muddy sound in the Tooth category, and the sound [ŋ] cannot represent the Molar category, in these two categories the All-clear sounds were designated as basic. The basic letters for the five basic sounds were created by modeling them after the shapes of the speech organs involved, and the other letters through addition of a line or lines or by a combination of the already existing letters.

[13] In the *Hunmin chŏng'ŭm* the most fundamental vowel sound represented by a circle (a dot) is described as "the sound is produced with the tongue contracted and the sound is deep" which must be an [a] or the like. However, as the sound was merged with the vowel represented by the letter 'ㅏ' [a], the phonetic value of the fundamental vowel has been an important subject of investigation in the historical study of Korean. Since there has not been a definite conclusion everyone agrees, it has been transcribed for convenience by 'a' with a dot underneath.

Table 6. Classification of the Korean Vowels

		Yang 陽	Ŭm 陰	Neutral 中
I	The Fundamental Three	ㆍ [ạ]	ㅡ [ɯ]	ㅣ [i]
II	First-Stage Combinations	ㅗ [o] ㅏ [a]	ㅜ [u] ㅓ [ə]	
III	Second-Stage Combinations	ㅛ [yo] ㅑ [ya]	ㅠ [yu] ㅕ [yə]	

human being. Other vowels were perceived and explained systematically in connection with the fundamentals and the symbols representing them were created by the logical combinations of the three fundamental symbols. Creation of the symbols step by step, which also reveal co-relationships among the sounds represented are shown in the table below.

In the *Hunmin chŏng'ŭm* of 1446 the order of the vowel letters was also identical to that found in classification Table 6 above. But, it was changed in the *Hunmong chahoe* of 1527 just as the order of the consonants was. Since that time the order of the vowels has not changed.

> **Order of the Korean Alphabet by Transcription of Represented Sounds**
> (7) Korean 1 (*Hunmin chŏng'ŭm* of 1446)
> k kh ŋ / t th n / p ph m / c ch s / ʔ h 0 / r z // ạ ɯ i / o a u ə / jo ja ju jə
>
> (8) Korean 2 (*Hunmong chahoe* 訓蒙字會 of 1527)
> k n t r m p s ŋ / kh th ph c ch z 0 h // a ja ə jə o jo u ju ɯ i ạ
>
> (9) Korean 3 (Modern)
> k n t r m p s 0/ŋ / c ch kh th ph h // a ja ə jə o jo u ju ɯ i (compounded letters are omitted)

4. Conclusion

The order of any writing system would have been originally accompanied by a rationale, either phonetic or cultural. But, as the rationale was a matter unnecessary to remember for the learners and users of the script, it may be completely forgotten. Meanwhile, the arrangement of letters can be distorted over time. And, in the course of recurrent adoptions and

adaptations for writing other languages, addition or omission of certain letters and modifications in the order commonly occur. Yet, traces of the original orders are detectable in most writing systems, although they cannot be properly explained by themselves.

In most phonographic writing systems the first letters stands for the sound [a] or a glottal stop, as in the Latin and the Arabic scripts. In the systems where signs for the vowels are distinguished from those for the consonants, as in the Devanāgarī and Korean *Han'gŭl*, the series of vowel signs are headed by the letter for [a]. An [a] sound is the most common, inherent vowel of the basic sounds that individual letters of most Indic and other writings represent. These facts suggest that [a] has been universally recognized as the primary, principal sound since antiquity.[14] The universal recognition would have been the reflection of a natural perception of human beings or would have been the result of a thorough observation of the sounds.

In the arrangements of other letters that follow the head letter for an [a], no universal principle can be easily observed. Nonetheless, certain similarities can be detected in the order of letters of the scripts that are known to be offsprings of a common ancestor. As an example, the arrangements, by transcriptions of the basic represented sounds, of the letters of five writing systems, which are known to be derivatives of the Phoenician syllabary of the 11th century BCE, are shown below.

(10) Classical Greek   a̲ b̲ g d e dz ɛ th i k̲ l̲ m̲ n̲ x o p r s t u/y ph ch ps o

(11) Classical Latin   a̲ b̲ k d e f g h i k̲ l̲ m̲ n̲ o p kw r s t u x i z

(12) Cyrillic (Russian)   a̲ b̲ v g d je jo ʑ z i -j k̲ l̲ m̲ n̲ o p r s t u f x ts tɕ ʃ ʃtɕ - ɨ - e ju ja

(13) Hebrew   a̲ b̲ g d h v z h/x t j k̲ l̲ m̲ n̲ s ʻa p ʻs k r ʃ t

(14) Arabic   a̲ b̲ t θ ʤ/ʒ h x d ð r z s ʃ ṣ ḍ ṭ ẓ ð/z ʕ ɤ f q k̲ l̲ m̲ n̲ h w j

In all of the five scripts the initial letters represent [a] which is followed by that for [b]. The four letters for [k], [l], [m] and [n] appear in the same sequence also. As both the Latin and the Cyrillic alphabets are

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[14] According to UPSID (The University of California at Los Angeles Phonological Segment Inventory Database) the low-unrounded vowel phoneme /a/ is not the most widely distributed vowel in the 317 languages investigated, but the 4th, after /i/, /e/ and /o/. See Crystal (1987: 167). English is one the languages where pure [a] rarely occurs.

derived from the Greek, the partial correspondences in the arrangements of the sounds of letters are not a surprise. The Greek alphabet is known to have originated from the Semitic.[15] However, as the external forms of the Hebrew and Arabic letters are so different from those of the Greek, it would be an unexpected fact for the commoners that the same sequences are also found in them.

Ullman (1932/1969, p. 20) wrote, "The order of the letters, which we know from very old Greek and Semitic sources, such as the alphabetic Psalms, is the same in Greek and Semitic. This order seems to be one of chance."[16] If we follow Ullman, we may assume that the two identical sequences [a-b] and [k-l-m-n] found in the above five scripts are remnant traces of Phoenician or an unknown earlier writing system from which Greek and Semitic scripts derived. Whether the original order of the letters was, as Ullman says, 'one of chance' or a phonetic or cultural reasoning was involved, cannot be easily judged. However, it is obvious that they could be taken as a common feature found both in Greek and Semitic writings. Considering the radical differences in graphic forms between Greek and Semitic, the two identical sequences of phonetic values of the letters could be regarded as an additional, significant evidence for the genealogical classification of the scripts.

As presented above, all Indic scripts share a common feature in the ordering of the letters which originated in the ancient Indian phoneticians' classification of sounds. The creators of the Korean alphabet took the Chinese model for the classification of the Korean consonants. The Chinese model of consonant classification was reflected in the order of the letters of the Korean alphabet.

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[15] Gelb (1952: 176-7) discusses in detail the Semitic origin of the Greek alphabet.

[16] Gelb (1952: 177) also remarks the identical order of the letters of the two writings.

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