A PHONOLOGICAL STUDY OF SINO-KOREAN: A COMPARATIVE STUDY OF THE INITIAL CONSONANTS

by

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ABSTRACT

This thesis consists of a comparative, historical analysis of the initial consonants in Sino-Korean.

Sino-Korean reflexes are compared with the cognates in Mandarin, Cantonese, Taiwanese South Min and Sino-Japanese.

The reflexes in the five dialects are also compared with the underlying forms of Ancient Chinese.

Various types of correspondences are established, and phonological processes behind different correspondences are determined.

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1. Introduction

My main purpose in this thesis is to determine how the consonant system of Ancient Chinese is reflected in the consonant system of modern Korean, compared with the sound systems of modern Mandarin, Cantonese, Taiwanese South Min, and Sino-Japanese.

Korean has taken many of the Chinese words into everyday use since the times of Three Kingdoms (57 B.C. - 676 A.D.) in the history of Korea. The forms of Chinese ideograms and their sounds are assumed to be preserved in modern Korean, having undergone phonological changes.

Chinese loanwords in Korean are too numerous to be simply referred to as "Chinese loanwords." Korean has been enormously influenced by them. The Koreans had had no writing system before 1446 A. D. , when the Korean phonetic alphabet, Hangul, was authorized by King Sejong (1418 - 1450 A.D.). When the Koreans made contact with the more highly developed Chinese civilization, the Chinese ideograms were adopted for literary purposes in Korea. These Chinese characters have been widely used in Korea until the present, together with the native Korean alphabet, Hangul.

Chinese and Korean are not genetically related languages, but, as far as the Chinese loanwords, i.e., Sino-Korean, are concerned, it seems tenable to regard Sino-Korean as the daughter language of Ancient Chinese and as a sister language of such modern dialects as Mandarin, Cantonese, Taiwanese South Min and Sino-Japanese (Chinese loanwords in Japanese).

Chinese ideograms are invariable in form. Sino-Korean has retained the same forms as those in the times of borrowing, just as its sister languages, even though a limited number of forms that were newly devised, when necessary, are used in the modern dialects. These forms only are not cognates.[1] Therefore, it is not difficult to identify cognates which are required for this analysis.

No linguist has ever undertaken a thoroughly systematic analysis of Sino-Korean from a modern linguistic point of view. Bernhard Karlgren was merely concerned with the reconstruction of the older forms of Chinese sounds, so that only the aspects relevant to his purpose were handled in his Etudes sur la phonologie chinoise.[2] His interest in Korean was modern Sino-Korean. His only source material in Korean was Gale's Korean-English Dictionary.[3] Ancient Chinese was directly linked with the Sino-Korean used at the close of the 19th century. The intermediate stage between Ancient Chinese and modern Sino-Korean was completely excluded from his considerations. It should also be noted that individual correspondences of cognates were the chief concern of Karlgren's analysis. The sound patterns of Sino-Korean were never touched,

[1]Eighty-two characters of Korean origin are found. See W.K. Sung, "A Study of Chinese Characters in China, Japan, and Korea," The Fan K'ung , Vol. 320 (Oct., 1968), 19-20.

[2]Bernhard Karlgren, Etudes sur la phonologie chinoise, trans. by Y.R. Chao and F.K. Li (Taipei: The Commercial Press, 1968).

[3]Ibid., p.8.

although several major types of sound changes in Mandarin and Sino-Japanese were briefly stated in his Grammata Serica.[4]

The reflexes in the modern dialects are compared with those in Sino-Korean, and identical and different correspondences in the initial consonants of the reflexes are established. This is elaborated by showing contrastive aspects of the initial consonants among the modern dialects.

The consonant segments of Ancient Chinese are compared with those in Mandarin, Cantonese, Taiwanese South Min, Sino-Japanese and Sino-Korean, after the contrastive analysis of the modern dialects. Phonological processes underlying different correspondences are analyzed in terms of distinctive features,[5] rather than the whole segments, with traditional terminology based on articulation.

The central aim of this analysis is, by establishing correspondences in the initial consonants of reflexes, to determine major phonological processes, underlying differences of correspondences, which have resulted in the present sound system of Sino-Korean. Formulation of phonological rules is beyond the scope of this analysis. It will require a thoroughly systematic analysis of vowel systems of the dialects under investigation.

[4]Bernhard Karlgren, Grammata Serica: Script and Phonetics in Chinese and Sino-Japanese, (New York: Paragon Book Gallery, 1966).

[5]Distinctive features, as established in Robert T. Harms's Introduction to Phonological Theory (Prentice-Hall, Inc., 1968) and Noam Chomsky and Morris Halle's The Sound Pattern of English (Harper & Row, Publishers, 1968).

Finally, the reflexes in the Tongguk Chongun[6] will be compared with the underlying forms of Ancient Chinese.[7] This will lead to clarification of the intermediate stage between Ancient Chinese and modern Sino-Korean, which has heretofore never been attempted, in the course of historical developments of Sino-Korean.

[6]The reflexes in the Tongguk Chongun are entered in K.W. Nam's A Study of Tongguk Chongun Style Transcription of Sino-Korean (Seoul: The Korean Research Center, 1966).

[7]Ancient Chinese reconstructed in Bernhard Karlgren's Etudes sur la phonologie chinoise and Analytic Dictionary of Chinese Sino-Japanese (Paris: Librairie Orientaliste Paul Geuther, 1923).

2. Comparison of Reflexes in the Modern Dialects

The reflexes in Sino-Korean are compared with those of modern Mandarin, Cantonese, Taiwanese South Min and Sino-Japanese.

First of all, the consonant system of Korean is compared with the consonant systems of the modern dialects before any comparison of reflexes. A consonant segment is a linguistic unit in a whole phonological system of a language. Therefore, it is required to define segments in a whole sound system and to grasp what particular position a consonant segment occupies in relation to other segments in the consonant system of a language. Segment inventories may not be agreed upon by all linguists. Different linguists may propose their own segment inventories. One specific sound system should be chosen for this analysis, and segments should be defined with respect to the whole sound system, not as isolated elements.

2.1. Comparison of the Consonant Systems

2.1.0. The Consonant System of Modern Korean

The Korean consonant system consists of 19 segments with the glides, y and w, excluded. The consonants placed according to

their manners and positions of articulation are as follows:[8]

		Bilabials	Denti-Alveolars	Velars
Stops	Plain	p	t	k
	Aspirated	p'	t'	k'
	Glottal	p?	t?	k?
Fricatives	Plain		s	x
	Glottal		s?	
Affricates	Plain		ts	
	Aspirated		ts'	
	Glottal		ts?	
Nasals		m	n	ng
Liquids (Trill)			r	

Sound changes appear as changes of segments in a phonological system, but it is assumed that sound changes take place in subclasses of the segments. These subclasses or subcomponents of the segments correspond to bundles of distinctive features belonging to the segments. Therefore, it is necessary to define segments in terms of distinctive features. The analysis based on distinctive features is assumed to capture phenomena and processes of sound changes more precisely.

Distinctive features of Korean consonant segments are chosen as follows:

[8]Samuel Martin, "Korean Phonemics," Language, XXVII(1951),519-33.

Distinctive Feature Composition of Korean Consonant Segments[9]

	Cor.	Ant.	Strid.	Glot.	Asp.	Nasal	Cont.	Voice
k	−	−		−	−	−		
k'	−	−		−	+		−	
k?	−	−		+				
ng	−	−		−	−	+		
x	−	−		−	−		+	
t	+	+	−	−	−	−	−	−
t'	+	+	−	−	+			
t?	+	+	−	+				
n	+	+	−	−	−	+		
ts	+	+	+	−	−		−	
ts'	+	+	+	−	+		−	
ts?	+	+	+	+			−	
s	+	+	+	−	−		+	
s?	+	+	+	+			+	
r	+	+	−	−	−	−		+
p	−	+		−	−	−		
p'	−	+		−	+			
p?	−	+		+				
m	−	+		−	−	+		

[9]Redundant features are not marked. Besides the above features, all the consonant segments in modern Mandarin, Cantonese, Taiwanese South Min and Japanese, as well as in Korean, are −vocalic and +consonantal, except liquids.

2.1.1. Comparison of the Mandarin and Korean Consonant Systems

The consonant system of modern Mandarin is tabulated on the basis of articulation as follows:[10]

	Labials	Labio-Dentals	Dentals	Retroflexes	Palatals	Velars
Stops						
Unasp.	p		t			k
Asp.	p'		t'			k'
Fricatives		f	s	ʂ	ɕ	x
Affricates						
Unasp.			ts	tʂ	tɕ	
Asp.			ts'	tʂ'	tɕ'	
Liquids			l	r		
Nasals	m		n			ng

I have chosen the following distinctive feature representations for the inventories of the Mandarin consonant segments given above.

	Cor.	Ant.	Strid.	Asp.	Cont.	Nasal	Retr.	Voice	Palatal[11]
k	−	−		−	−	−			
k'	−	−		+					
x	−	−		−	+				
ng	−	−		−	−	+			
ɕ	+	−	+	−	+		−		(+)
tɕ	+	−	+	−	−		−		(+)
tɕ'	+	−	+	+	−		−		(+)

[10] C.C. Cheng, A Synchronic Phonology of Mandarin Chinese (The Hague: Mouton, 1973), p.35. The term retroflex is used in place of "distributed."

[11] The feature palatal is redundant, but it is employed for the convenience of my descriptive purpose.

	Cor.	Ant.	Strid.	Asp.	Cont.	Nasal	Retr.	Voice	Palatal
ʂ	+	−	+	−	+		+		(−)
ʈʂ	+	−	+	−	−		+		(−)
ʈʂʰ	+	−	+	+	−		+		(−)
r	+	−	−						
t	+	+	−	−		−		−	
tʰ	+	+	−	+					
n	+	+	−	−		+			
s	+	+	+	−	+				
ts	+	+	+	−	−				
tsʰ	+	+	+	+					
l	+	+	−	−		−		+	
p	−	+	−	−		−			
pʰ	−	+	−	+					
f	−	+	+						
m	−	+	−	−		+			

A careful examination of the segments in both systems leads to the discovery of some similarities and differences in the consonant inventories.

A. Similaries

1) All the stops, fricatives, and affricates are voiceless in both languages.

2) The ten consonants below occur at similar positions and with similar manners of articulation:

p	t	k
pʰ	tʰ	kʰ
	s	x
	ts	
	tsʰ	

3) Aspiration plays a major distinctive role in both systems.

4) The same number of nasals occur at the same articulatory positions:

m n ng

The velar nasal occurs only finally in both languages.

B. Differences

1) The characteristics of the Mandarin consonant system are the set of retroflexes, the set of palatals and the labio-dental fricative, none of which is distinctive in Korean:

f ʂ ɕ
ʈʂ tɕ
ʈʂʻ tɕʻ

2) The retroflex r occurs in Mandarin, while the trill r occurs in Korean.

3) The feature glottal is a major distinctive feature in Korean, but not distinctive in Mandarin.

2.1.2. Comparison of the Cantonese and Korean Consonant Systems

The consonant system of Cantonese is very similar to that of Korean.[12] It is tabulated below:

	Labials	Labio-Dentals	Dentals	Velars
Stops				
Unasp.	p		t	k
Asp.	p'		t'	x
Fricatives		f	s	
Affricates				
Unasp.			ts	
Asp.			ts'	
Nasals	m		n	ng
Liquids			l	

The following distinctive feature representations are chosen:

	Cor.	Ant.	Asp.	Strid.	Nasal	Cont.	Voice
k	-	-	-		-	-	
k'	-	-	+				
x	-	-	-		-	+	
ng	-	-	-		+		
t	+		-	-	-		-
t'	+		+	-			
s	+		-	+		+	
ts	+		-	+		-	
ts'	+		+	+			
n	+		-	-	+		
l	+		-	-	-		+
p	-	+	-	-	-		
p'	-	+	+				
f	-	+	-	+			
m	-	+	-	-	+		

[12] D.L. Kao, Structure of the Syllable in Cantonese (The Hague: Mouton, 1971), pp. 77-78.

Only one consonant of Cantonese that does not occur in Korean is the labio-dental fricative, while Korean has its own unique set of glottal segments which are not distinctive in Cantonese.

2.1.3. Comparison of the Taiwanese South Min and Korean Consonant Systems

The consonant system of Taiwanese South Min includes the voiced stops and affricates as contrastive units, as shown below:[13]

		Labials	Dentals	Velars
Stops				
Vl.	Unasp.	p	t	k
	Asp.	p'	t'	k'
Vd.		b		g
Laterals			l	
Fricatives			s	x
Affricates				
Vl.	Unasp.		ts	
	Asp.		ts'	
Vd.			dz	
Nasals		m	n	ng

The feature voice is not distinctive in the non-sonorants of Mandarin, Cantonese and Korean, but it plays a major distinctive function in Taiwanese South Min.

[13]Robert L. Cheng, "Tone Sandhi in Taiwanese," Linguistics, XLI (1968), 22.

The status of the nasals and the lateral is not clear. Robert L. Cheng sets up three autonomous phonemes, each of which includes its homorganic nasal as its allophonic member:[14]

/b/ = [b, m]
/l/ = [l, n]
/g/ = [g, ng]

Cheng claims that the oral segments occur only initially before oral vowels and the nasals elsewhere. But some counter-examples are found in my source material,[15] and some of the pairs of the subphonemic members of the autonomous phonemes are historically derived from two different sources. The recognition of these nasal segments and the feature nasal seems to be required to describe the dialect from the points of view of historical comparison.

Distinctive feature composition of Taiwanese South Min consonant segments is as follows:

	Cor.	Ant.	Voice	Asp.	Strid.	Nasal	Cont.
k	-	-	-	-			-
k^{h}	-	-	-	+			
g	-	-	+			-	
x	-	-	-	-			+
ng	-	-	+			+	

[14]Robert L. Cheng (1968), 22.

[15]The dental nasal occurs initially in the two examples below:
尼, 年.
The labial nasal occurs initially in such examples as follows:
命, 問, 門, 麻, 玟 每, 媒, 滿, 瞞, 名, 棉, 眠, 螟, 馬.

	Cor.	Ant.	Voice	Asp.	Strid.	Nasal	Cont.
t	+		−	−	−		
t'	+		−	+	−		
l	+		+		−	−	
s	+		−	−	+		+
ts	+		−	−	+		−
ts'	+		−	+	+		
dz	+		+		+		
n	+		+			+	
p	−	+	−	−			
p'	−	+	−	+			
b	−	+	+			−	
m	−	+	+			+	

2.1.4. Comparison of the Japanese and Korean Consonant Systems

The consonant segments of Japanese are as follows:[16]

	Labials	Denti-Alveolars	Palatals	Velars
Stops				
Vl.	p	t		k
Vd.	b	d		g
Fricatives				
Vl.	ɸ	s	ś	
Vd.		z		
Affricates				
Vl.		ts	t́ś	
Vd.			d́ź	
Nasals	m	n		
Liquids (Flap)		r		

[16] J.D. McCawley, The Phonological Component of a Grammar of Japanese (The Hague: Mouton, 1968), pp. 88-91. Such segments as ɸ, ś, t́ś, d́ź, are not agrred upon by the linguists, but the recognition of these segments seems to be required for the historical description of Sino-Japanese.

Japanese and Korean have only eight consonants in common at the same positions and with the same manners of articulation:

p	t	k
	s	x
	ts	
m	n	

Voiced non-sonorants are distinctive in most of the positions of articulation where voiceless counterparts occur. Therefore, Taiwanese South Min and Japanese share the feature voice in non-sonorants, which is not distinctive in Mandarin, Cantonese and Korean.

The bilabial fricative ɸ is peculiar to the consonant system of Japanese. No other languages under investigation have the segment in their segment inventories.

The Japanese sound system does not include the glottal stops and affricates found in Korean.

The palatals are distinctive in Japanese, though they are not recognized by some linguists.

The flap r is unique in the Japanese sound system. It is not found in the other languages under study, though the trill r occurs in Korean and the retroflex r occurs in Mandarin.

The feature aspirate plays a major distinctive role in Mandarin, Cantonese, Taiwanese South Min and Korean, but it is not distinctive at all in the Japanese consonant system.

Distinctive feature composition of Japanese consonant segments is as follows:

	Cor.	Ant.	Voice	Strid.	Cont.	Nasal	Son.	(Palatal)
k	−	−	−		−			
g	−	−	+					
x	−	−	−		+			
t	+	+	−	−	−			
d	+	+	+	−	−	−	−	
n	+	+	+	−	−	+		
s	+	+	−	+	+			(−)
z	+	+	+	+				(−)
ts	+	+	−	+	−			(−)
r	+	+	+	−		−	+	
ś	+	−	−		+			(+)
ťś	+	−	−		−			(+)
ďź	+	−	+					(+)
p	−	+	−	−				
b	−	+	+					
p	−	+	−	+				
m	−	+	+			+		

2.2. Comparison of Reflexes

The reflexes in modern Sino-Korean are compared with those of modern Mandarin, Cantonese, Taiwanese South Min and Sino-Japanese.

2.2.1. Korean Reflexes Compared with Those in Mandarin

Mandarin, a translation of kwan hwa 'official language', is the standard dialect in China. Actually, it was the dialect spoken in Peking, the capital city, so that it is referred to as Pekingese by some linguists. It is now widely recognized as the national language whether or not it covers some local varieties of Northern Chinese.

All the individual characters contained in the Dictionary of Spoken Chinese have been compared with the corresponding cognates of Ancient Chinese in Sino-Korean.[17]

Identical Correspondences

Identical correspondences are found in the pairs of reflexes below.

Examples	Gloss	S.-K.	Mandarin	No. of Reflexes
半	half	p	p	77
皮	skin	p'	p'	33
母	mother	m	m	87

[17] The Institute of Far Eastern Languages, Yale University, comp., Dictionary of Spoken Chinese (New Haven: Yale University Press, 1966).

Examples	Gloss	S.-K.	Mandarin	No. of Reflexes
答	answer	t	t	77
他	he	t'	t'	43
私	private	s	s	54
南	south	n	n	44
再	again	ts	ts	32
村	village	ts'	ts'	32
歌	song	k	k	109
快	pleasant	k'	k'	2
海	sea	x	x	104

Different Correspondences

Various types of differences in correspondences are classified on the basis of distinctive features..

A. Aspirate

Six pairs of correspondences show -aspirate in Korean and +aspirate in Mandarin.

朋	friend	p	p'	40
同	same	t	t'	36
粗	coarse	ts	ts'	27
朝	morning	ts	ts'	13
開	open	k	k'	50
乞	beg	k	~~ts'~~ k'	52

Six pairs of correspondences below are opposite to the above: +aspirate in Korean and -aspirate in Manadarin.

Examples	Gloss	S.-K.	Mandarin	No. of Reflexes
板	board	p'	p	46
打	hit	t'	t	11
醉	drunk	ts'	ts	17
針	needle	ts'	ʈʂ	28
濺	sprinkle	ts'	ʈ́ʂ	11
逮	arrest	ts'	t	4

B. Continuant

Nine pairs of correspondences show +continuant in Mandarin and -continuant in Korean.

父	father	p	f	68
風	wind	p'	f	6
适	hasten	k	ʂ	1
匣	casket	k	ʂ́	3
褐	brown	k	x	6
臊	rank-smelling	ts	s	1
拴	choose	ts	ʂ	4
縮	shrink	ts'	s	1
稍	gradually	ts'	ʂ	1

In the seven pairs of correspondences below +continuant in Sino-Korean corresponds to -continuant in Mandarin.

Examples	Gloss	S.-K.	Mandarin	No. of Reflexes
塾	private school	s	t	1
箒	broom	s	t'	2
革	leather	x	k	14
靠	depend on	x	k'	7
舶	ship	s	ṭṣ'	1
詞	expression	s	ts'	1
詐	deceive	s	ṭṣ	6

C. Strident

Eight pairs of correspondences show -strident in Sino-Korean and +strident in Mandarin.

棹	oar	t	ṭṣ	2
宅	dwelling	t'	ṭṣ	3
江	river	k	ʨ	147
乞	beg	k	ʨ'	52
枝	branch	k	ṭṣ	4
仇	enemy	k	ṭṣ'	2
匣	casket	k	ś	3
适	hasten	k	ṣ	1

The following pairs of correspondences show that +strident in Sino-Korean corresponds to -strident in Mandarin.

Examples	Gloss	S.-K.	Mandarin	No. of Reflexes
弟	brother	ts	t	43
題	subject	ts	t'	10
逮	arrest	ts'	t	4
剃	shave	ts'	t'	14

D. Palatal

All the pairs of correspondences below show -palatal in Sino-Korean and +palatal in Mandarin.

西	west	s	ś	55
錢	money	ts	ʨ'	36
姐	elder sister	ts	ʨ	13
聚	assemble	ts'	ʨ	11
妻	wife	ts'	ʨ'	23
江	river	k	ʨ	147
乞	beg	k	ʨ'	52
匣	casket	k	s	3

E. Retroflex

The following pairs of correspondences show + retroflex in Mandarin only. The feature retroflex is not distinctive in Korean.

Examples	Gloss	S.-K.	Mandarin	No. of Reflexes
棹	oar	t	ʦ	3
殺	kill	s	ʂ	138
詐	deceive	s	ʦ	6
戰	fight	ts	ʦ	99
朝	morning	ts	ʦʻ	27
拴	choose	ts	ʂ	4
治	govern	tsʻ	ʦ	28
虫	insect	tsʻ	ʦʻ	57
稍	gradually	tsʻ	ʂ	1
枝	branch	k	ʦ	4
适	hasten	k	ʂ	1

F. Nasal

Two pairs of correspondences show that +nasal in Sino-Korean corresponds to -nasal in Mandarin.

路	road	n	l	54
耗	decrease	m	h	2

In the following pairs of correspondences, +nasal in Mandarin corresponds to -nasal in Sino-Korean.

轉	turn	ʦ	n	3
虐	cruel	h	n	2

The two pairs of correspondences below show that some nasal segments are lost. The labial nasal in Sino-Korean corresponds to ø in Mandarin and the dental nasal in Mandarin corresponds to ø in Sino-Korean.

Examples	Gloss	S.-K.	Mandarin	No. of Reflexes
問	ask	m	ø	27
牛	ox	ø	n	3

G. Loss of Segments

Some segments in Mandarin correspond to ø in Sino-Korean in the following pairs of correspondences.

獃	foolish	ø	t	2
吭	laugh	ø	t'	1
利	profit	ø	l	88
熊	bear	ø	ś	2
鉛	lead	ø	ťś'	1
熱	hot	ø	r	29
剩	surplus	ø	ṣ	2
捐	throw away	ø	ťś	2
拽	pull	ø	ṭṣ	1
緩	slow	ø	x	1

2.2.2. Korean Reflexes Compared with Those in Cantonese

Just as the term Mandarin refers to the dialect of Peking City and sometimes to the whole dialect of the Mandarin-speaking region with local varieties, so Cantonese refers to the dialect of Canton City and the whole group of similar dialects.

All the cognates entered in Cantonese Dictionary have been compared with the reflexes in modern Sino-Korean.[18]

Identical Correspondences

The identical correspondences are found in the reflexes below.

Examples	Gloss	S.-K.	Cantonese	No. of Reflexes
半	half	p	p	55
皮	skin	p'	p'	29
目	eye	m	m	90
刀	knife	t	t	61
討	discuss	t'	t'	11
書	book	s	s	189
南	south	n	n	24
枝	branch	ts	ts	157
七	seven	ts'	ts'	48
九	nine	k	k	187
好	good	x	x	82

As shown above the large number of reflexes show the identical correspondences.

[18] Parker P. Huang, Cantonese Dictionary, (New Haven: Yale University Press, 1970).

Different Correspondences

Compared with the pairs of identical correspondences, a small number of pairs of different correspondences are found.

A. Aspirate

The pairs of correspondences below show that -aspirate in Sino-Korean corresponds to +aspirate in Cantonese.

Examples	Gloss	S.-K.	Cantonese	No. of Reflexes
樸	simple	p	p'	31
同	same	t	t'	26
全	whole	ts	ts'	48
强	strong	k	k'	48

The following examples are opposite to the above.

筆	pen	p'	p	31
特	special	t'	t	11
哲	wise	ts'	ts	48

B. Continuant

The feature -continuant in Sino-Korean corresponds to +continuant in Cantonese in the pairs of correspondences below.

法	law	p	f	58
肺	lung	p'	f	31
口	mouth	k	x	39
仇	enemy	k	s	2
寬	wide	k	f	8

The following pairs of correspondences show + continuant in Sino-Korean and -continuant in Cantonese.

Examples	Gloss	S.-K.	Cantonese	No. of Reflexes
寺	temple	s	ts	14
査	investigate	s	ts'	29
革	leather	x	k	9

C. Strident

The feature -strident in Sino-Korean corresponds to +strident in Cantonese in the pairs of correspondences that follow.

開	water-gate	k	ts	1
仇	enemy	k	s	2
寬	broad	k	f	8

The pairs of correspondences which are the reverse of the above are found in the following: +strident in Sino-Korean -strident in Cantonese.

地	earth	ts	t	31
趙	jump	ts	t'	10
遞	substitute	ts'	t	2
鐵	iron	ts'	t'	13

D. Nasal

The pairs below show that -nasal in Sino-Korean corresponds to +nasal in Cantonese.

Examples	Gloss	S.-K.	Cantonese	No. of Reflexes
劈	break	p	m	1
黏	glutinous	ts	n	1
嘔	vomit	k	ng	4

The feature +nasal in Cantonese corresponds to ∅ in Sino-Korean in the pairs that follow.

歪	crooked	∅	m	3
檸	lemon	∅	n	4
外	outside	∅	ng	33

Only one pair of correspondences shows that +nasal in Sino-Korean corresponds to -nasal in Cantonese.

喇	bugle	n	l	36

E. Loss of Segments

Some segments in Cantonese correspond to ∅ in Sino-Korean, as shown in the following pairs of correspondences.

欠	sigh	∅	f	1
利	profit	∅	l	54
鑲	inlay	∅	s	1
雄	male of birds	∅	x	1

2.2.3. Korean Reflexes Compared with Those in Taiwanese South Min

The dialects of Min (Hokkien or Fukkien) may be divided into two major subgroups: the Foochow dialect for the northern subgroup and the Amoy dialect for the southern subgroup. Taiwanese South Min belongs to Amoy Hokkien (Min), which is also called Southern Min or Southern Hokkien. Taiwanese South Min (T. Min) is defined as the South Min (Amoy Hokkien) dialect spoken in Taiwan.

There are very few materials available for the analysis of the Taiwanese South Min dialect. Only two source materials have been obtained from the publishers in Formosa:

Speak Taiwanese Hokkien,[19] and A South Min Dialect of Taiwan.[20]

All the reflexes found in both works have been compared with those in Sino-Korean.[21]

Identical Correspondences

Examples	Gloss	S.-K.	T. Min	No. of Reflexes
分	divide	p	p	62
判	judge	p'	p'	12
命	order	m	m	15

[19] Speak Taiwanese Hokkien, (Taipei: Taipei Language Institute, 1969).

[20] T.H. Tung, Y.L. Chao, and Y.S. Lan, A South Min Dialect of Taiwan, (Taipei: Academia Sinica, 1967).

[21] Some of the reflexes may have their dialectal variants, but only the reflexes established in Tung's A South Min Dialect of Taiwan are selected in this analysis.

Examples	Gloss	S.-K.	T. Min	No. of Reflexes
單	single	t	t	42
通	pass	t'	t'	10
三	three	s	s	89
年	year	n	n	4
子	child	ts	ts	74
靑	green	ts⁰	ts'	35
宮	palace	k	k	120
火	fire	x	x	42
快	merry	k'	k'	1

The pairs of identical correspondences are found in the above reflexes.

Different Correspondences

The pairs of different correspondences are also classified on the basis of distinctive features.

A. Aspirate

The pairs of correspondences below show that -aspirate in Sino-Korean corresponds to +aspirate in T. Min.

鼻	nose	p	p'	13
赤	red	ts	ts'	6
開	open	k	k'	36
頭	head	t	t'	4

The following pairs of correspondences show +aspirate in Sino-Korean and -aspirate in T. Min.

Examples	Gloss	S.-K.	T. Min	No. of Reflexes
平	flat	p'	p	19
特	special	t'	t	4
借	borrow	ts'	ts	9

B. Continuant

The feature -continuant in Sino-Korean corresponds to +continuant in T. Min in the following pairs.

粉	powder	p	x	26
風	wind	p'	x	2
紋	figures	m	x	1
適	proper	ts	s	1
校	school	k	x	4

The five pairs of correspondences below show that +continuant in Sino-Korean corresponds to -continuant in T. Min.

騸	geld a horse	s	p'	1
水	water	s	ts	10
星	star	s	ts'	17
寒	cold	x	k	6
確	definite	x	k'	1

C. Voice

This feature is one of the major characteristics of T. Min. In all the other dialects under study, except in Japanese, the feature voice lost its distinctiveness in the non-sonorants.

The three pairs of correspondences show that -voice in Sino-Korean corresponds to +voice in T. Min.

Examples	Gloss	S.-K.	T. Min	No. of Reflexes
避	avoid	p'	b	1
字	letter	ts	dz	2
遮	cover up	ts'	dz	1

D. Strident

The feature +strident in Sino-Korean corresponds to -strident in T. Min in the pairs below.

前刀	cut	ts	k	1
齒	teeth	ts'	k'	1

E. Nasal

The feature +nasal in Sino-Korean corresponds to -nasal in T. Min in the pairs of correspondences below. In other words, the nasal segments in Sino-Korean correspond to their homorganic orals in T. Min.

馬	horse	m	b	38
奴又	slave	n	l	11
尿	urine	n	dz	1

F. Loss of Segments

The two pairs of correspondences below show that some segments in Sino-Korean correspond to ∅ in T. Min.

Examples	Gloss	S.-K.	T. Min	No. of Reflexes
紅	red	x	∅	3
彎	bent	m	∅	1

The following pairs of correspondences are opposite to the above: some segments in T. Min correspond to ∅ in Sino-Korean.

獃	foolish	∅	t	1
蜼	spider monkey	∅	s	2
兩	both	∅	n	5
一	one	∅	ts	1
日	day	∅	dz	18
理	reason	∅	l	5
魚	fish	∅	x	4
五	five	∅	g	21

2.2.4. Korean Reflexes Compared with Those in Sino-Japanese

All the Sino-Japanese reflexes that have been examined in this analysis are those 1850 characters prescribed by the Japanese Ministry of Education and adopted by law as those most essential for common use and every day communication.[22] Of these a few characters of Japanese origin are excluded, since they are not cognates.

The Chinese loanwords in Japanese are from two different sources: Kan-on and Go-on. Kan-on words were imported from Northern China around the 7th and 8th centuries, while Go-on from South Eastern China in the 6th and 7th centuries. A considerable number of forms, i.e., sounds, are mixed so that Kan-on and Go-on sounds are identical in some reflexes, but other reflexes still maintain the distinction between Kan-on and Go-on sounds. This shows that there were considerable dialectal divergencies in Ancient Chinese.

2.2.4.1. Kan-on Reflexes

Identical Correspondences

Only three pairs of identical correspondences are found in Kan-on reflexes.

[22] Kan-on and Go-on sound forms are from Y. Abe's Obunsha Kanwa Jiten (Tokyo: Obunsha, 1970).

Examples	Gloss	S.-K.	Kan-on	No. of Reflexes
稲	rice plant	t	t	73
掃	sweep	s	s	76
啓	enlighten	k	k	263

Different Correspondences

Several types of pairs of correspondences show differences in Sino-Korean and Kan-on.

A. Voice

One pair of correspondences shows that the voiceless segment in Sino-Korean corresponds to the voiced segment in Kan-on.

需	demand	s	z	2

B. Aspirate

The feature +aspirate in Sino-Korean corresponds to -aspirate in Kan-on in the pairs below.

宅	dwelling	t'	t	31
墜	fall	ts'	ts	1

C. Continuant

The feature +continuant in Kan-on corresponds to -continuant in Sino-Korean in the pairs of correspondences that follow.

Examples	Gloss	S.-K.	Kan-on	No. of Reflexes
飛	fly	p	x	98
父	father	p	p	36
破	break	p'	x	51
風	wind	p'	p	3
罪	sin	ts	s	88
震	tremble	ts	ś	74
晴	clear	ts'	s	40
初	begin	ts'	ś	35

Only one pair of correspondences shows that +continuant in Sino-Korean corresponds to -continuant in Kan-on.

寒	cold	x	k	140

D. Strident

The pairs of correspondences below show that +strident in Sino-Korean corresponds to -strident in Kan-on.

庭	garden	ts	t	38
粘	be sticky	ts	d	1
逮	catch	ts'	t	17

E. Palatal

The -palatal feature in Sino-Korean corresponds to +palatal in Kan-on in the pairs below.

Examples	Gloss	S.-K.	Kan-on	No. of Reflexes
象	elephant	s	ś	125
潮	tide	ts	t͡ś	41
稚	infant	ts'	t͡ś	16

F. Nasal

The following pairs of correspondences show that the nasal segments in Sino-Korean correspond to the homorganic oral segments in Kan-on.

買	buy	m	b	77
暖	warm	n	d	15
濃	thick	n	d͡z	15

G. Loss of Segments

Some segments in Kan-on correspond to ∅ in Sino-Korean in the pairs of correspondences below.

熱	heat	∅	n	2
染	dye	∅	z	4
洋	ocean	∅	ś	2
弱	weak	∅	d͡z	27
泣	cry	∅	k	5
五	five	∅	g	51

2.2.4.2. Go-on Reflexes

Identical Correspondences

The similarities in the correspondences of Go-on and Sino-Korean are quite different from those in Kan-on and Sino-Korean.

Examples	Gloss	S.-K.	Go-on	No. of Reflexes
聞	listen	m	m	63
刀	knife	t	t	2
男	male	n	n	16
家	house	k	k	64

The nasals in Go-on reflexes are reflected as their homorganic orals in the reflexes of Kan-on.

Different Correspondences

Pairs of different correspondences in Go-on and Sino-Korean show much more divergent aspects than those in Kan-on and Sino-Korean.

A. Voice

The following pairs of correspondences show that the -voice feature in Sino-Korean corresponds to +voice in Go-on.

百	hundred	p	b	42
乏	short	p'	b	7
働	work	t	d	20

Examples	Gloss	S.-K.	Go-on	No. of Reflexes
彈	bullet	t'	d	7
善	good	s	z	13
徐	slowly	s	ʑ	46
弟	younger brother	ts	d	10
持	hold	ts	ʑ	26
財	wealth	ts	z	20
治	govern	ts'	ʑ	4
草	grass	ts'	z	2
遞	substitute	ts'	d	1
強	strong	k	g	24
賢	wise	x	g	34

B. Aspirate

The feature +aspirate in Sino-Korean corresponds to -aspirate in Go-on in the pairs below.

乏	short	p'	b	7
彈	bullet	t'	d	7
通	pass	t'	ts	2
打	hit	t'	ʦ	1
滯	stagnate	ts'	t	2
遞	substitute	ts'	d	1
聽	listen	ts'	ʦ	18
墜	fall	ts'	ts	1
快	pleasant	k'	k	1

C. Strident

The pairs of correspondences below show that -strident in Sino-Korean corresponds to +strident in Go-on

Examples	Gloss	S.-K.	Go-on	No. of Reflexes
都	capital	t	ts	3
通	pass	t'	ts	2
打	hit	t'	ʦ	1

The following pairs of correspondences are opposite to the above: +strident in Sino-Korean and -strident in Go-on.

弟	younger brother	ts	d	10
堤	bank	ts	t	2
遞	substitute	ts'	d	1
替	exchange	ts'	t	2

D. Continuant

The -continuant feature in Sino-Korean corresponds to +continuant in Go-on in the following pairs.

峰	peak	p	ɸ	7
福	good fortune	p	x	9
八	eight	p'	x	2
布	cloth	p'	ɸ	2
徒	companion	t	z	4

Examples	Gloss	S.-K.	Go-on	No. of Reflexes
終	end	ts	s	18
礎	foundation	ts'	s	3
草	grass	ts'	z	4
倉	warehouse	ts''	ś	6

The two pairs of correspondences below show that +continuant in Sino-Korean corresponds to -continuant in Go-on.

兄	elder brother	x	k	13
河	river	x	g	34

E. Palatal

The +palatal feature in Go-on corresponds to -palatal in Sino-Korean in the pairs of correspondences below.

打	hit	t'	t́ś	1
星	star	s	ś	21
拾	pick up	s	d́ź	46
頂	summit	ts	t́ś	6
赤	red	ts	ś	26
靜	quiet	ts	d́ź	18
倉	warehouse	ts'	ś	6
請	beg	ts'	ź	2
聽	listen	ts'	t́ś	18

F. Loss of Segments

The consonant segments in Go-on correspond to ∅ in Sino-Korean in the pairs of correspondences that follow.

Examples	Gloss	S.-K.	Go-on	No. of Reflexes
軟	soft	∅	n	21
月	moon	∅	g	17

Identical Correspondences in the Reflexes of the Five Dialects

Identical correspondences in the reflexes of the five dialects examined here are tabulated as follows:

Sino-Korean	Mandarin	Cantonese	T. Min	Kan-on	Go-on
p	p	p	p		
p'	p'	p'	p'		
m	m	m	m		m
t	t	t	t	t	t
t'	t'	t'	t'		
s	s	s	s	s	
ts	ts	ts	ts		
ts'	ts'	ts'	ts'		
k	k	k	k	k	k
x	x	x	x		

Different Correspondences in the Reflexes of the Five Dialects

The different correspondences are also classified on the basis of distinctive features.

(i) Voice

Sino-Korean	Mandarin	Cantonese	T. Min	Kan-on	Go-on
p			b		b
p'					b
t					d
t'					d
s				z	ʒ́,z
ts			dz		ʒ́,z,d
ts'			dz		dz,z,d
k					g
x					g

As shown above, the feature +voice is characteristic of T. Min and Go-on.

(ii) Aspirate

The +aspirate feature in some of the reflexes of Mandarin, Cantonese and T. Min corresponds -aspirate in Sino-Korean, while the opposite phenomenon is exhibited by other reflexes. In Sino-Japanese, the feature aspirate is not distinctive at all.

Sino-Korean	Mandarin	Cantonese	T. Min	Kan-on	Go-on
p	p'	p'	p'		
p'	p	p	p		b
t	t'	t'	t'		
t'	t	t	t	t	d,ts,ʨ
ts	ts',tʂ'	ts'	ts'		
ts'	tʂ, ts	ts	ts	ts	d,t,ts,ʨ
k	k',ts'	k'	k'		

(iii) Continuant

Sino-Korean	Mandarin	Cantonese	T. Min	Kan-on	Go-on
p	f	f	x	x,ɸ	x,ɸ
p'	f	f	x	x,ɸ	x,ɸ
m			x		
t					z
s	ts',tʂ' ts,t,t'	ts,ts'	ts,ts'		
ts	s,ʂ		s	s,ɕ	s,z
ts'	s,ʂ			s,ɕ	s,z,ɕ,ʥ
k	s,ɕ,x	x,s,f	x		
x	k,k'	k	k,k'	k	k,g

The presence and absence of the feature +continuant varies according to the dialects, showing much complicated aspects in

the different correspondences of the reflexes.

The feature -continuant in Sino-Korean stops and affricates corresponds to +continuant in the other dialects, while +continuant in Sino-Korean fricatives corresponds to -continuant in the reflexes of the other dialects.

(iv) Strident

Sino-Korean	Mandarin	Cantonese	T. Min	Kan-on	Go-on
t	ʈʂ				ts
t'	ʈʂ				
ts	t,t'	t,t'	k	t,d	t,d
ts'	t,t'	t,t'	k	t	t,d
k	ʈʂ,ʈʂ' ʈʂ,ʈʂ' ʂ,ʂ	ts,s,f			

The feature -strident in Sino-Korean stops corresponds to +strident in the reflexes of the other dialects, and the feature +strident in Sino-Korean affricates corresponds to -strident in the reflexes of the others.

(v) Palatal

The feature +palatal in Mandarin and Sino-Japanese reflexes corresponds to -palatal in Sino-Korean.

Sino-Korean	Mandarin	Cantonese	T. Min	Kan-on	Go-on
s	ś			ś	ś,dź
t'					t́ś
ts	t́ś,t́ś'			t́ś	t́ś,ś,dź
ts'	t́ś,t́ś'			t́ś	t́ś,ś,ź
k	t́ś,t́ś', ś				

(vi) Retroflex

Sino-Korean	Mandarin	Cantonese	T. Min	Kan-on	Go-on
t'	ṭṣ				
s	ṣ,ṭṣ				
ts	ṭṣ,ṭṣ',ṣ				
ts'	ṭṣ,ṭṣ',ṣ				
k	ṭṣ,ṣ				

The -retroflex in Sino-Korean corresponds to +retroflex in Mandarin, where the retroflex feature plays a distinctive role in its sound system.

(vii) Nasal

Some reflexes show that the +nasal feature in Sino-Korean corresponds to -nasal in the other dialects, and, on the other hand, -nasal corresponds to +nasal in other reflexes.

Sino-Korean	Mandarin	Cantonese	T. Min	Kan-on	Go-on
m	x		b	b	
n	l	l	dz,l	ʣ,d	
p	m	m			
ts	n	n			
k		ng			
x	n				

(viii) Loss of Segments

Sino-Korean	Mandarin	Cantonese	T. Min	Kan-on	Go-on
m	ø		ø	ø	
ts'		ø			
k	ø	ø			
x	ø	ø	ø		ø
ø		f			
ø		m			
ø	t		t	t	
ø	t'		t'		
ø		s	s		
ø			ts		
ø	n	n	n	n	n
ø	l	l	l		

Sino-Korean	Mandarin	Cantonese	T. Min	Kan-on	Go-on
∅	k			k	
∅	x	x	x		
∅		ng			
∅			d	d	
∅			dz		
∅			g	g	g
∅				ś	
∅	r				

Some segments in Sino-Korean correspond to ∅ in the other dialects in the four pairs of correspondences. It is noted that the velar fricative x corresponds to ∅ in the other dialects except in Go-on.

The opposite phenomena are also found in many segments. Some segments in the other dialects correspond to ∅ in Sino-Korean.

3. Historical Comparison of the Modern Dialects with Ancient Chinese

The cognates of Ancient Chinese are compared with those of its daughter languages: Mandarin, Cantonese, Taiwanese South Min, Sino-Japanese and Sino-Korean.

The history of Chinese has been divided into five periods:[23] Proto-Chinese, Archaic Chinese, Ancient Chinese, Middle Chinese, and the modern language. The phonetic features of Ancient Chinese are summed up in the Ts'ie-yun.[24] All the dialects under investigation are assumed to have branched off from the Ancient Chinese.

The sources of the cognates examined here are the entries of Karlgren's Analytic Dictionary of Chinese and Sino-Japanese,[25] which contains the reflexes of Mandarin, Cantonese and Sino-Japanese as well as the underlying forms of Ancient Chinese.

No historical sources in the study of Taiwanese South Min have been available, since nobody has touched the historical aspects of Taiwanese South Min cognates. The reflexes in Tung's A South Min Dialect of Taiwan[26] are compared directly with the cognates of

[23] R.A.D. Forrest, The Chinese Language (London:Faber & Faber, 1965), p.48.

[24] A pronoucing dictionary, by Lu Fa-yen, of the language as spoken at the center of the empire (Late Han, Sui, T'ang), Ch'ang-an, where the book was published in A.D. 601.

[25] Bernhard Karlgren (1923).

[26] Tung (1967).

Ancient Chinese in Karlgren's Etudes sur la phonologie chinoise.[27]

The Korean reflexes are all chosen from the list of Chinese characters prescribed by the Korean Ministry of Education for general use. These are also compared directly with the cognages entered in Karlgren's Analytic Dictionary of Chinese and Sino-Japanese and Etudes sur la phonologie chinoise.

The comparative study of the cognates in each dialect under consideration leads to establishing identical and different correspondences. The different correspondences are thoroughly examined so that phonological processes underlying the differences of the correspondences are classified in terms of distinctive features. And finally, this study examines how the consonant segments of Ancient Chinese are reflected in the consonant system of modern Sino-Korean, compared with the consonant systems of the other dialects.

Before any comparison is undertaken, the consonant system of Ancient Chinese should be examined and the classificatory features defined.

The consonant segments of Ancient Chinese[28] are tabulated

[27]Karlgren (1968).

[28]Karlgren (1923), p. 9.
Karlgren (1966), p. 16.

according to the positions and manners of articulation as follows:

		Labials	Dentals	Retroflexes	Palatals	Velars	Glottals
Stops							
Vl.	Unasp.	p	t		ť	k	ʔ
	Asp.	p'	t'		ť'	k'	
Vd.		b'	d'		ď'	g'	
Fricatives							
Vl.			s	ṣ	ś	x	
Vd.			z		ź	ɣ	
					j		ɦ
Affricates							
Vl.	Unasp.		ts	ṭṣ	ť́s		
	Asp.		ts'	ṭṣ'	ť́s'		
Vd.			dz'	ḍẓ'	ď́ź'		
					ńź		
Nasals		m	n		ń	ng	
Liquids			l				

These segments are the consonants reconsturcted by Bernhard Karlgren in his Etudes sur la phonologie chinoise. It is noted that all the voiced noh-sonorants are aspirated. This consonant system of Karlgren's includes two mysterious segments: "j" and "ɦ". The symbol j is interpreted by Karlgren as "sonant prepalatal fricative,"[29] and ɦ as "smooth vocalic ingress."[30]

[29]Karlgren (1923), p. 6.

[30]Karlgren (1966), p. 16.

Distinctive feature composition of the Ancient Chinese consonant segments is as follows:

	Cor.	Ant.	Voice	Strid.	Cont.	Asp.	Nasal	Retr.	High	Lat.	(Pal.)
k	−	−	−		−	−			+		
k'	−	−	−		−	+					
g'	−	−	+		−		−				
x	−	−	−			+			+		
ɣ	−	−	+		+						
ng	−	−	+		−		+				
ʔ	−	−	−		−	−			−		
h	−	−	+		+				−		
ʻt	+	−	−	−		−					(+)
ʻt'	+	−	−	−		+					(+)
ʻd'	+	−	+	−	−		−				(+)
ʻs	+	−	−	+	+			−			(+)
ʻz	+	−	+	+	+						(+)
ʻtʻs	+	−	−	+	−	−		−			(+)
ʻtʻs'	+	−	−	+	−	+		−			(+)
ʻdʻz'	+	−	+	+	−		−	−			(+)
ʻnʻz	+	−	+	+	−		−				(+)
ʻn	+	−	+	−	−		+				(+)
j	+	−	+	−	+						(+)
ʂ	+	−	−	+	+			+			(−)
tʂ	+	−	−	+	−	−		+			(−)
tʂ'	+	−	−	+	−	+		+			(−)
dʐ'	+	−	+	+	−		−	+			(−)
t	+	+	−	−		−					
t'	+	+	−	−		+					
d'	+	+	+	−			−			−	
s	+	+	−	+	+						
z	+	+	+	+	+						
ts	+	+	−	+	−	−					
ts'	+	+	−	+	−	+					
dz'	+	+	+	+	−						
n	+	+	+	−			+				
l	+	+	+	−			−			+	
p	−	+	−			−					
p'	−	+	−			+					
b'	−	+	−				−				
m	−	+	−				+				

3.1. Comparison of Mandarin Reflexes with the Underlying Forms of Ancient Chinese

The phonetic development of Mandarin has been well analyzed by Karlgren in his Etudes sur la phonologie chinoise. Most of the sound changes that occurred between Ancient Chinese and Modern Chinese separate Mandarin from the Min and Wu dialects,[31] and some of these sound changes are assumed to have been established before the end of T'ang dynasty.[32]

The cognates in the Analytic Dictionary of Chinese and Sino-Japanese are examined, and the reflexes of Mandarin are compared with their underlying forms.

Identical Correspondences

Identical correspondences are found in the following pairs.

	Examples	Gloss	ACh.	Mandarin	No. of Reflexes
1)	半	half	p	p	66
2)	破	break	p'	p'	20
3)	母	mother	m	m	84
4)	冬	winter	t	t	56
5)	聽	listen	t'	t'	38

[31] One major characteristic of the Wu dialect is the retention of the voiced stops of Ancient Chinese, i.e., the tripartite division of initial consonants. Y.R. Chao, "Contrastive Aspects of the Wu Dialect," Language, XLIII (1967), 92-101.

[32] Forrest (1965), pp. 189-90.

	Examples	Gloss	ACh.	Mandarin	No. of Reflexes
6)	算	reckon	s	s	81
7)	左	left	ts	ts	59
8)	村	village	ts'	ts'	38
9)	南	south	n	n	28
10)	來	come	l	l	99
11)	砂	sand	ṣ	ṣ	26
12)	債	debt	ṭṣ	ṭṣ	6
13)	創	to found	ṭṣ'	ṭṣ'	9
14)	雲	cloud	j	j	7
15)	高	high	k	k	75
16)	口	mouth	k'	k'	30
17)	海	sea	x	x	28

Different Correspondences

The different correspondences are classified on the basis of distinctive features.

A. Voice

All the voiced non-sonorants in Ancient Chinese are changed into voiceless segments in modern Mandarin, as shown in the following pairs of correspondences.

	Examples	Gloss	ACh.	Mandarin	No. of Reflexes
1)	敗	defeat	b'	p	23
2)	皮	skin	b'	p'	19
3)	道	road	d'	t	42
4)	糖	sugar	d'	t'	40
5)	松	pine	z	s	31
6)	辭	speech	z	ts'	1
7)	賊	thief	dz'	ts	27
8)	泉	spring	dz'	ts'	23
9)	暫	briefly	dz'	ʦ	1
10)	助	aid	ʣ'	ʦ	2
11)	崇	worship	ʣ'	ʦ'	7
12)	秩	order	ʥ'	ʦ	16
13)	石	stone	ʑ	ʂ	30
14)	植	plant	ʑ	ʦ	1
15)	誠	sincere	ʑ	ʦ'	12
16)	神	god	ʥʑ'	ʂ	13
17)	船	ship	ʥʑ'	ʦ'	2
18)	共	share	g'	k	1
19)	狂	mad	g'	k'	1
20)	近	near	g'	ʨ	15
21)	橋	bridge	g'	ʨ'	16
22)	孩	child	ɣ	x	77
23)	夏	summer	ɣ	s	32
24)	艦	war-junk	ɣ	ʨ	1

It is noted that some stops and affricates have become aspirated, and others unaspirated.

B. Aspirate

In the two pairs of correspondences below, the -aspirate feature in Ancient Chinese corresponds to + aspirate in modern Mandarin.

	Examples	Gloss	ACh.	Mandarin	No. of Reflexes
1)	塔	pagoda	t	t'	1
2)	括	include	k	k'	2

As noted in the examples of devoicing, the voiced stops and affricates of Ancient Chinese have become aspirated or unaspirated segments with the -voice feature in modern Mandarin. It is agreed that the conditioning factor of aspiration is the selection of tones. Voiced stops and affricates of Ancient Chinese have become aspirated[33] in Mandarin, if they had the even (p'ing) tone in Ancient Chinese,[34] or unaspirated elsewhere.

C. Continuant

The three pairs of correspondences below show that a +continuant segment in Mandarin corresponds to a -continuant segment in Ancient Chinese.

[33]Karlgren (1966), p. 45.

[34]Ancient Chinese had eight tones: high even (high p'ing), low even (low p'ing), high rising(high sang), low rising(low sang), high falling(high k'ü), low falling(low k'ü), high entering (high ju), and low entering(low ju). Karlgren (1923), p. 7.

	Examples	Gloss	ACh.	Mandarin	No. of Reflexes
1)	販	peddle	p	f	32
2)	忿	anger	p'	f	13
3)	縫	sew	b'	f	31
4)	射	shoot	ʑ	ʂ	15

The feature-changing process opposite to the above is also found in the following pairs of correspondences.

5)	植	plant	ʑ	tʂ	1
6)	誠	sincere	ʑ	tʂ'	12

D. Strident

The pairs of correspondences below show that +strident in Mandarin reflexes corresponds to -strident in Ancient Chinese.

1)	知	know	ʈ	tʂ	30
2)	徹	penetrate	ʈ	tʂ'	1
3)	痴	foolish	ʈ'	tʂ'	8
4)	秩	order	ɖ'	tʂ	16
5)	治	govern	ɖ'	tʂ'	19
6)	教	teach	k	ʧ	84
7)	犬	dog	k'	ʧ'	31
8)	近	near	g'	ʧ	15
9)	橋	bridge	g'	ʧ'	16

	Examples	Gloss	ACh.	Mandarin	No. of Reflexes
10)	休	rest	x	ś	29
11)	夏	summer	ɣ	ś	32
12)	艦	war-junk	ɣ	ʈ́ʂ	1

E. Palatal

The +palatal segments of Ancient Chinese are shifted into the +retroflex segments in Mandarin, as shown in the following examples.

1)	中	middle	t́	ʈʂ	30
2)	徹	penetrate	t́'	ʈʂ'	1
3)	秩	order	d́'	ʈʂ	16
4)	始	begin	ś	ʂ	66
5)	視	look	ź	ʂ	30
6)	瑞	jade	ź·	ɻ	1
7)	植	plant	ź	ʈʂ	1
8)	誠	sincere	ź	ʈʂ'	12
9)	診	examine	ʈ́ʂ	ʈʂ	61
10)	赤	red	ʈ́ʂ'	ʈʂ'	2
11)	吹	blow	ʈ́ʂ'	ʈʂ'	16
12)	射	shoot	ʈ́ʐ'	ʂ	15
13)	船	ship	ʈ́ʐ'	ʈʂ'	2
14)	弱	weak	ńź	ɻ	31

F. Nasal

The nasal segments of Ancient Chinese are lost in Mandarin in the pairs of correspondences below.

	Examples	Gloss	ACh.	Mandarin	No. of Reflexes
1)	五	five	ŋ	ø	56
2)	忘	forget	m	ø	21

The following pair of correspondences shows that the +nasal feature of Ancient Chinese is lost in Mandarin reflexes, and that the segment without the +nasal feature is turned into the retroflex r in Mandarin.

3)	日	day	nz	r	31

G. Loss of Segments

Some segments of Ancient Chinese are lost in Mandarin in the pairs of correspondences that follow.

1)	音	sound	ʔ	ø	63
2)	友	friend	j	ø	29
3)	羊	sheep	ɦ	ø	47

Ancient Chinese has undergone various sound changes in its sound system in the development of the Mandarin consonant system.

Devoicing has made the voiced segments of the non-sonorants of Ancient Chinese merge with the voiceless, homorganic consonants. These voiced non-sonorants are changed into aspirated or unaspirated segments, in the process of devoicing, conditioned by the presence or absence of even tone (p'ing tone) of Ancient Chinese.

Spirantization is one of the main characteristics of Mandarin, which produced the labio-dental fricative f, as in (1)-(3) of C. This fricative was not found in the segment inventories of Ancient Chinese. And some palatal voiced affricates merged with the retroflex voiceless fricative ʂ, as in (4) of C.

Affrication has occurred to all the palatal stops of Ancient Chinese, with the retroflexing of the stops accompanied, as in (1)-(5) of D.

Palatalization of some velar stops or fricatives of Ancient Chinese is noted in (6)-(12) of D.

All the palatals of Ancient Chinese, exclusive of the palatal nasal, merged with the retroflexes. The retroflexes of modern Mandarin have come from two different sources of Ancient Chinese: the original retroflexes and the palatals of Ancient Chinese. The nasal palatal affricate ńź underwent denasalization and then became retroflexed. This process of retroflexing led to the establishment

of the new segment peculiar to modern Mandarin, the retroflex r, which had been unknown to the Ancient Chinese consonant system.

The velar nasal, the glottal stop, the "smooth vocalic ingress," and some of the "sonant prepalatal fricatives" and the labial nasals are lost in Mandarin, as in F and G.

3.2. Comparison of Cantonese Reflexes with the Underlying Forms of Ancient Chinese

The cognates entered in the Analytic Dictionary of Chinese and Sino-Japanese are compared.

Identical Correspondences

A smaller number of identical correspondences is found in Cantonese than in Mandarin. The pairs of identical correspondences in Cantonese reflexes are as follows:

	Examples	Gloss	ACh.	Cantonese	No. of Reflexes
1)	半	half	p	p	66
2)	判	judge	p'	p'	16
3)	母	mother	m	m	84
4)	刀	knife	t	t	57
5)	聽	listen	t'	t'	36
6)	三	three	s	s	76
7)	左	left	ts	ts	60
8)	草	grass	ts'	ts'	38
9)	南	south	n	n	24
10)	老	old	l	l	99
11)	國	state	k	k	158
12)	抗	protest	k'	k'	15
13)	海	sea	x	x	17
14)	我	I	ng	ng	34

Only four segments that are found as identical correspondences in the pairs of Ancient Chinese and Mandarin are not found in the cognates of Ancient Chinese and Cantonese: s̤, t̤s̤, t̤s̤', and j. Cantonese seems to preserve the essential traits of Ancient Chinese and to share several types sound changes with Mandarin.

Different Correspondences

The differences of the correspondences are observed and the phonological processes are classified.

A. Voice

The +voice segments of Ancient Chinese corresponds to -voice consonants in Cantonese in the pairs of correspondences that follow.

	Examples	Gloss	ACh.	Cantonese	No. of Reflexes
1)	白	white	b'	p	37
2)	朋	friend	b'	p'	4
3)	父	father	b'	f	31
4)	毒	poison	d'	t	42
5)	庭	garden	d'	t'	39
6)	遂	follow	z	s	6
7)	席	seat	z	ts	12
8)	松	pine	z	ts'	14
9)	就	complete	dz'	t	1

	Examples	Gloss	ACh.	Cantonese	No. of Reflexes
10)	暫	briefly	dz'	ts	24
11)	賊	thief	dz'	ts'	26
12)	助	aid	ʑ'	ts	7
13)	愁	sad	ʑ'	s	2
14)	秩	order	ɖ'	t	1
15)	住	reside	ɖ'	ts	16
16)	治	govern	ɖ'	ts'	18
17)	誠	sincere	ʐ	s	42
18)	植	plant	ʐ	ts	2
19)	船	ship	ɖʐ'	s	15
20)	忌	avoid	g'	k	17
21)	橋	bridge	g'	k'	18
22)	孩	child	ɣ	x	59

B. Aspirate

The following pairs of correspondences show that the +aspirate segments of Ancient Chinese correspond to -aspirate segments in Cantonese.

1)	浦	river bank	p'	p	3
2)	踏	tread on	t'	t	2

The sound changes opposite to the above process are shown in the pairs of correspondences below: -aspirate in Ancient Chinese and +aspirate in Cantonese.

	Examples	Gloss	ACh.	Cantonese	No. of Reflexes
3)	卓	stand high	ť	ts'	1
4)	赤	red	ťś	ts'	3
5)	括	include	k	k'	6

The voiced stops and affricates of Ancient Chinese are changed into aspirated or unaspirated segments in Cantonese, as shown in the examples of devoicing ((1) and (2), (4) and (5), (10) and (11), (15) and (16), (20) and (21) of A). The presence of the +aspirate feature was conditioned by tones.[35] The voiced stops and affricates of Ancient Chinese became aspirated, if they had even or rising tone, or unaspirated elsewhere, in spoken Cantonese. The conditioning factor of aspiration in Literary Cantonese was the presence of even tone, just as in Mandarin.[36]

C. Continuant

The -continuant segments of Ancient Chinese correspond to +continuant segments in Cantonese in the pairs below.

1)	法	law	p	f	33
2)	念	anger	p'	f	14
3)	縫	sew	b'	f	31
4)	窟	cave	k'	f	8

[35] O. Y. Hashimoto, Studies in Yue Dialects: Phonology of Cantonese, (Cambridge University Press, 1972), p. 623.

[36] Karlgren (1923), p. 7.

	Examples	Gloss	ACh.	Cantonese	No. of Reflexes
5)	空	air	k'	x	35
6)	崇	worship	dẓ'	s	2
7)	神	god	ʑ'	s	15

The sound changes from +continuant to -continuant segments are shown in the following pairs of correspondences.

8)	席	seat	z	ts	12
9)	松	pine	z	ts'	14
10)	始	begin	ʃ	ts'	4
11)	植	plant	ʒ	ts	2
12)	轟	rumble	x	k	1
13)	吸	breathe	x	k'	1
14)	艦	war-junk	ɣ	1	1

D. Strident

The -strident feature of Ancient Chinese corresponds to +strident in Cantonese in the pairs below.

1)	朝	morning	ʈ	ts	1
2)	痴	foolish	ʈ'	ts'	8
3)	住	reside	ɖ'	ts	16
4)	治	govern	ɖ'	ts'	18

E. Palatal

The +palatal segments of Ancient Chinese lost the palatal feature in Cantonese, where the feature is not distinctive at all, in the pairs of correspondences below.

	Examples	Gloss	ACh.	Cantonese	No. of Reflexes
1)	知口	know	ˊt	ts	30
2)	卓	stand high	ˊt	ts'	1
3)	抽	pull out	ˊt'	ts'	8
4)	秩	order	ˊd'	t	1
5)	住	reside	ˊd'	ts	16
6)	治	govern	ˊd'	ts'	18
7)	書	book	ˊs	s	62
8)	設	establish	ˊs	ts'	4
9)	誠	sincere	ˊz	s	42
10)	植	plant	ˊz	ts	2
11)	終	end	ˊˊts	ts	60
12)	赤	red	ˊˊts	ts'	3
13)	春	spring	ˊˊts'	ts'	16
14)	船	ship	ˊˊdz'	s	15
15)	女	female	ˊn	n	2

F. Retroflex

The feature retroflex is lost in the Cantonese sound system. All the +retroflex segments of Ancient Chinese merged with their

homorganic segments in Cantonese, as shown in the pairs of correspondences below.

	Examples	Gloss	ACh.	Cantonese	No. of Reflexes
1)	砂	sand	ʂ	s	30
2)	責	responsible	ʈʂ	ts	7
3)	插	insert	ʈʂ'	ts'	12
4)	愁	sad	ɖʐ'	s	2
5)	助	aid	ɖʐ'	ts	7

G. Loss of Segments

All the nasal palatal affricates, the "sonant prepalatal fricatives", the glottal stops and the "smooth vocalic ingress" of Ancient Chinese are lost in the sound system of Cantonese, as shown in the following pairs of correspondences.

1)	日	day	ɲʑ	ø	36
2)	雲	cloud	j	ø	32
3)	惡	evil	ʔ	ø	54
4)	藥	medicine	ɦ	ø	49

The pairs of correspondences below also show the loss of certain other segments of Ancient Chinese in Cantonese.

5)	賢	wise	ɣ	ø	43
6)	業	business	ng	ø	1
7)	泣	weep	k'	ø	3
8)	謔	jest	x	ø	5

Devoicing has occurred to all the voiced non-sonorants of Ancient Chinese in Cantonese. All the voiced non-sonorants merged with their voiceless, homorganic segments, as in A.

Aspiration or deaspiration of Ancient Chinese stops and affricates was conditioned by the presence of even and rising tones in spoken Cantonese or by the presence of even tone in Literary Cantonese.

Spirantization of certain bilabial stops and velar stops has produced the labio-dental fricative f, which was not contained in the segment inventories of Ancient Chinese. A large number of the aspirated velar stops is changed into the voiceless velar fricatives in Cantonese. The voiced retroflex and palatal affricates merged with the voiceless dental fricatives, as shown in (6)-(7) of C.

Affrication has occurred to the palatal stops of Ancient Chinese, as shown in D. These stops merged with the dental affricates.

Retroflex and palatal features are not distinctive in the consonant system of Cantonese, so that deretroflexing of all the retroflexes and depalatalization of the palatals of Ancient Chinese occurred, as in E and F.

Such segments of Ancient Chinese as ńź, ʔ , j, ɦ, are lost in Cantonese.

3.3. Comparison of Taiwanese South Min Reflexes with the Underlying Forms of Ancient Chinese

The source materials for the historical study of Taiwanese South Min are very few, but the main phonological processes that have occurred in T. Min since Ancient Chinese are worked out by historical comparison of T. Min cognates with the underlying forms of Ancient Chinese established by Karlgren in his Analytic Dictionary of Chinese and Sino-Japanese and Etudes sur la phonologie chinoise.[37]

Identical Correspondences

Identical correspondences are found in the pairs of corespondences that follow.

	Examples	Gloss	ACh.	T.Min	No. of Reflexes
1)	分	divide	p	p	36
2)	配	distribute	p'	p'	8
3)	命	order	m	m	15
4)	釘	nail	t	t	29
5)	聽	listen	t'	t'	11
6)	三	three	s	s	33
7)	精	refined	ts	ts	20

[37] T. Min cognates entered in Tung's A South Min Dialect of Taiwan (1967).

	Examples	Gloss	ACh.	T.Min	No. of Reflexes
8)	請	ask	ts'	ts'	27
9)	工	artisan	k	k	78
10)	開	open	k'	k'	23
11)	花	flower	x	x	17
12)	年	year	n	n	4
13)	來	come	l	l	30

Different Correspondences

A. Voice

The +voice feature of Ancient Chinese corresponds to -voice in the pairs of correspondences below.

1)	白	white	b'	p	19
2)	同	same	d'	t	24
3)	謝	thank	z	s	3
4)	斜	slanting	z	ts'	1
5)	財	wealth	dz'	ts	16
6)	船	ship	ʑ'	ts	7
7)	場	place	ɖ'	t	11
8)	常	ordinary	ʐ	s	12
9)	十	ten	ʐ	ts	4
10)	樹	tree	ʐ	ts'	2

	Examples	Gloss	ACh.	T.Min	No. of Reflexes
11)	強	strong	g'	k	10
12)	儉	thrifty	g'	k'	3
13)	皇	emperor	ɣ	x	12
14)	寒	cold	ɣ	k	4

B. Aspirate

It has been agreed that tone of Ancient Chinese is the conditioning factor in the presence and absence of aspiration in the process of devoicing the voiced stops and affricates of Ancient Chinese in modern dialects, such as Mandarin and Cantonese. The rule is that the voiced stops and affricates of Ancient Chinese lost voicing, becoming +aspirate, if the cognates have the even tone of Ancient Chinese, and -aspirate otherwise.[38]

Evidence, however, shows that, as far as Taiwanese South Min is concerned, tone is not the factor conditioning aspiration and deaspiration.

The tones of Ancient Chinese cognates have been carefully examined to determine how they are reflected in the reflexes of Taiwanese South Min .

[38]Karlgren (1966), p.45. Hashimoto (1972), p. 623.

	Ancient Chinese				T. Min
	Even Tone	Rising Tone	Falling Tone	Entering Tone	
b'	10	2	5	2	p
b'	2	1	2	1	p'
b'	4	3		4	x
d'	10	4	8	1	t
d'	5				t'
d'	1		1		l
dz'	10	3	2	1	ts
dz'	2				ts
d'	5	1	3	2	t
g'	5	6	1	1	k
g'		3			k'

Irregularity in the selection of the feature aspirate is demonstrated by the above table. Therefore, it is very clear that the presence of aspiration in the phonological process of devoicing the voiced stops and affricates of Ancient Chinese to form the consonant system of Taiwanese South Min is not conditioned by the tones of Ancient Chinese.

C. Continuant

Some -continuant segments of Ancient Chinese correspond to +continuant segments in T. Min, as shown below.

	Examples	Gloss	ACh.	T.Min	No. of Reflexes
1)	粉	powder	p	x	10
2)	豐	abundant	p'	x	3
3)	犯	transgress	b'	x	11
4)	事	affair	dz'	s	7

The pairs of correspondences below are opposite to the above: +continuant in Ancient Chinese and -continuant in T. Min.

5)	書	book	ś	ts	4
6)	星	star	s	ts'	3
7)	上	above	z	ts	4
8)	樹	tree	ź	ts'	2
9)	汗	perspiration	ɣ	k	4

D. Strident

The pairs of correspondences below show that +strident in Ancient Chinese corresponds to -strident in T. Min.

1)	前刀	cut	ts	k	1
2)	齒	tooth	ʦ'	k'	1

E. Palatal

The +palatal feature of Ancient Chinese is lost in the reflexes of T. Min, where the palatal feature is not distinctive.

	Examples	Gloss	ACh.	T.Min	No. of Reflexes
1)	中	middle	ˊt	t	9
2)	趁	follow	ˊt'	t'	3
3)	治	govern	ˊd'	t	12
4)	輸	transport	ˊs	s	12
5)	水	water	ˊs	ts	4
6)	深	deep	ˊs	ts'	3
7)	受	receive	ˊz	s	12
8)	十	ten	ˊz	ts	4
9)	市	market	ˊz	ts'	2
10)	針	needle	ˊˊs	ts	19
11)	車	cart	ˊˊs'	ts'	19
12)	燭	candle	ˊˊs'	ts	2
13)	齒	tooth	ˊˊs'	k'	1
14)	娘	girl	ˊn	n	1

F. Retroflex

The feature retroflex of Ancient Chinese is lost in the reflexes of T. Min, where the retroflex feature is not distinctive.

	Examples	Gloss	ACh.	T.Min	No. of Reflexes
1)	山	mountain	ʂ	s	7
2)	爭	quarrel	ʈʂ	ts	4
3)	初	begin	ʈʂ'	ts'	5
4)	士	officer	ɖʐ'	s	7

G. Nasal

The pairs of correspondences below show that the +nasal feature of Ancient Chinese is lost in some reflexes of T. Min.

1)	米	rice	m	b	37
2)	納	receive	n	l	9
3)	日	day	ȵʑ	dz	8
4)	語	words	ng	g	19
5)	紋	figures	m	x	1
6)	然	burn	ȵʑ	l	1

The opposite phenomenon to the above occurs in one pair of correspondences.

7)	糧	food	l	n	8

H. Loss of Segments

The "sonant prepalatal fricative", the "smooth vocalic ingress", and the glottal stop of Ancient Chinese are lost in the sound system of Taiwanese South Min.

	Examples	Gloss	ACh.	T.Min	No. of Reflexes
1)	友	friend	j	ø	25
2)	油	oil	ɦ	ø	14
3)	音	sound	ʔ	ø	28

Devoicing has occurred to all the voiced non-sonorants of Ancient Chinese with two exceptions. The voiced dental affricate dz' retains its voicing in one reflex of T. Min and the dental voiced stop d' is reflected as the lateral in two reflexes of T. Min.

In the process of devoicing, the voiced stops and affricates of Ancient Chinese are changed into aspirated or unaspirated segments in T. Min. Aspiration is not conditioned by the presence of a certain tone, unlike Mandarin and Cantonese.

Spirantization is very characteristic of T. Min, replacing some bilabial stops with the velar fricatives, as in (1)-(3) of C.

Depalatalization has occurred to all the palatals of Ancient Chinese, as in E, and deretroflexing has made all the retroflexes of Ancient Chinese merge with the dentals, as in F.

Denasalization seems to be the most outstanding characteristic of T. Min. This process has transformed most of the nasals of Ancient Chinese into their homorganic orals in T. Min, as in G.

Such segments of Ancient Chinese as j, ɦ, ʔ , are lost in the consonant system of Taiwanese South Min.

3.4. Comparison of Sino-Japanese Reflexes with the Underlying Forms of Ancient Chinese

The cognates of Ancient Chinese and Sino-Japanese entered in Karlgren's Analytic Dictionary of Chinese and Sino-Japanese are fully examined and compared. The reflexes in Sino-Japanese have shown more differences in the correspondences than the reflexes of the other dialects under study.

Identical Correspondences

Identical correspondences are found in the pairs of correspondences that follow.[39]

	Examples	Gloss	ACh.	S.-J.	No. of Reflexes
1)	鼻	nose	b'	b	14
2)	名	name	m	m	34
3)	塔	pagoda	t	t	54
4)	勤	move	d'	d	25
5)	星	star	s	s	55
6)	遖	follow	z	z	3
7)	南	south	n	n	11
8)	室	room	ś	ś	48
9)	注	pour into	ʦ́	ʦ́	1
10)	乘	get on	ʣ́'	ʣ́	7

[39]The feature aspirate in Ancient Chinese is disregarded.

	Examples	Gloss	ACh.	S.-J.	No. of Reflexes
11)	高	high	k	k	159
12)	技	skill	g'	g	3

The original segments of Ancient Chinese are well preserved in such consonants of Sino-Japanese as the voiceless stops(t,k), the voiceless fricatives (s,ś), and the nasals (m,n). These nasals are regarded as originating from Go-on.

The original voiced non-sonorants of Ancient Chinese have undergone devoicing in all the dialects other than the Wu dialect and Sino-Japanese, which retain the voiced non-sonorants of Ancient Chinese, if aspiration is disregarded in Sino-Japanese. This is a major characteristic of Sino-Japanese.

Another characteristic of Sino-Japanese is the retention of such palatals of Ancient Chinese as ś, t͡ś, d͡ź. No other dialect under investigation has those palatals in its consonant system.

Different Correspondences

The differences of correspondences reveal some complicated aspects of the phonological changes that occurred in Sino-Japanese.

A. Voice

The +voice segments of Ancient Chinese correspond to -voice segments in Sino-Japanese in the pairs of correspondences that follow.

	Examples	Gloss	ACh.	S.-J.	No. of Reflexes
1)	朋	friend	b'	x	46
2)	浮	float	b'	ɸ	12
3)	糖	sugar	d'	t	51
4)	地	earth	d'	ʦ	3
5)	席	seat	z	s	8
6)	松	pine	z	ɕ	11
7)	泉	spring	dz'	s	11
8)	就	complete	dz'	ɕ	7
9)	治	govern	ʑ'	ʨ	22
10)	傳	pass on	ʑ'	t	5
11)	植	plant	ʑ	ɕ	19
12)	誠	sincere	ʑ	s	8
13)	食	eat	ʥ	ɕ	6
14)	船	ship	ʥ'	s	1
15)	忌	avoid	g'	k	32
16)	紅	red	ɣ	k	76
17)	債	wages	n	ʨ	1
18)	僞	false	ng	k	6

The phonological process opposite to the above devoicing has occurred in Sino-Japanese. The following pairs of correspondences show that the -voice segments of Ancient Chinese correspond to + voice segments in Sino-Japanese

	Examples	Gloss	ACh.	S.-J.	No. of Reflexes
19)	貝	shell	p	b	3
20)	錠	anchor	t	d́z	1
21)	脫	peel off	t'	d	1
22)	增	add	ts	z	2
23)	稅	tax	ś	z	1
24)	恕	forgive	ś	d́z	4
25)	蒸	distil	t́s	d́z	3
26)	充	fill up	t́s'	d́z	2
27)	謔	jest	x	g	1

B. Aspirate

The feature aspirate is not distinctive in the sound system of Japanese. All the +aspirate segments of Ancient Chinese lost the +aspirate feature in the reflexes of Sino-Japanese, as shown below.

1)	聽	listen	t'	t	33
2)	通	pass	t'	ts	2
3)	脫	peel off	t'	d	1
4)	抽	pull out	t'	ts	8
5)	充	fill up	ts'	dz	2
6)	空	air	k'	k	60

C. Continuant

The following pairs of correspondences show that the -continuant feature of Ancient Chinese corresponds to +continuant in Sino-Japanese.

	Examples	Gloss	ACh.	S.-J.	No. of Reflexes
1)	半	half	p	x	67
2)	訪	visit	p'	x	26
3)	敗	defeat	b'	x	46
4)	富	rich	p	p	18
5)	忿	anger	p'	p	7
6)	腐	rotten	b'	p	12
7)	再	again	ts	s	41
8)	子	child	ts	ś	16
9)	增	add	ts	z	2
10)	青	green	ts'	s	25
11)	秋	autumn	ts'	ś	13
12)	泉	spring	dz'	s	27
13)	暫	briefly	dz'	z	14
14)	就	complete	dz'	ś	7
15)	查	investigate	ʣ'	s	4
16)	愁	sad	ʣ'	ś	2
17)	赤	red	ʦ́	s	14
18)	終	end	ʦ́	ś	44

	Examples	Gloss	ACh.	S.-J.	No. of Reflexes
19)	戰	fight	ʻtsʻ	s	3
20)	唱	sing	ʻtsʻ	ś	11
21)	舶	ship	ʻdzʻ	s	1
22)	食	eat	ʻdzʻ	ś	6
23)	舌	tongue	ʻdzʻ	z	1
24)	染	dye	ʻnz	z	4

The pairs of correspondences below are opposite to the above: +continuant in Ancient Chinese and -continuant in Sino-Japanese.

25)	需	need	s	ʻdz	2
26)	寺	temple	z	ʻdz	10
27)	恕	forgive	ś	ʻdz	4
28)	時	time	ź	ʻdz	14
29)	好	good	x	k	51
30)	寒	cold	ɣ	k	76
31)	孩	child	ɣ	g	24

D. Strident

The -strident feature of Ancient Chinese corresponds to +strident in Sino-Japanese in the pairs of correspondences that follow.

1)	鳥	bird	t	ʻts	3
2)	錠	anchor	t	ʻdz	1

	Examples	Gloss	ACh.	S.-J.	No. of Reflexes
3)	通	pass	t'	ts	2
4)	廳	hall	t'	ʦ	2
5)	茶	tea	d'	ʦ	3
6)	條	branch	d'	ʣ'	2
7)	朝	morning	ʧ	ʦ	19
8)	追	pursue	ʧ	ts	1
9)	抽	pull out	ʧ'	ʦ	8
10)	治	govern	ʤ'	ʦ	22
11)	場	place	ʤ'	ʣ	6

E. Palatal

The following pairs of correspondences show that the -palatal segments of Ancient Chinese correspond to +palatal segments in Sino-Japanese.

1)	鳥	bird	t	ʦ	3
2)	錠	anchor	t	ʣ	1
3)	廳	hall	t'	ʦ	2
4)	茶	tea	d'	ʦ	3
5)	條	branch	d'	ʣ	2
6)	心	heart	s	ɕ	24
7)	寺	temple	z	ʣ	10
8)	俊	talented	ts	ɕ	16
9)	雀	sparrow	ts	ʣ	1

	Examples	Gloss	ACh.	S.-J.	No. of Reflexes
10)	秋	autumn	ts'	ś	13
11)	就	complete	dz'	ś	7
12)	磁	magnet	dz'	ź	3
13)	賃	wages	n	ź	1
14)	你	you	n	ź	1

The pairs of correspondences below are opposite to the above: +palatal in Ancient Chinese and -palatal in Sino-Japanese.

15)	徹	penetrate	ť	t	10
16)	追	pursue	ť	ts	1
17)	傳	pass on	ď	t	5
18)	設	establish	ś	s	13
19)	稅	tax	ś	z	1
20)	瑞	jade	ź	z	3
21)	誠	sincere	ź	s	8
22)	赤	red	ť	s	14
23)	祇	spirit of earth	ť	k	1
24)	戰	fight	ť	s	3
25)	舶	ship	ď	s	1
26)	舌	tongue	ď	z	1
27)	粘	paste	ń	n	1
28)	染	dye	ńz	z	4
29)	肉	meat	ńz	n	7

F. Retroflex

The +retroflex feature of Ancient Chinese is lost in the reflexes of Sino-Japanese below.

	Examples	Gloss	ACh.	S.-J.	No. of Reflexes
1)	砂	sand	ʂ	s	21
2)	史	history	ʂ	ś	9
3)	債	debt	tʂ	s	9
4)	初	begin	tʂʻ	ś	2
5)	創	found	tʂʻ	s	10
6)	査	investigate	dʐʻ	s	4
7)	愁	sad	dʐʻ	ś	2
8)	事	affair	dʐʻ	ź	3

G. Nasal

The pairs of correspondences below show that the +nasal segments of Ancient Chinese correspond to -nasal segments in Sino-Japanese.

1)	買	buy	m	b	51
2)	怒	anger	n	d	12
3)	潤	enrich	ńź	ź	25
4)	五	five	ng	g	62
5)	賃	wages	n	ts	1
6)	你	you	n	ź	1
7)	染	dye	ńź	z	4

H. Lateral

The laterals of Ancient Chinese are reflected as the flap r in the reflexes of Sino-Japanese, as shown below.

	Examples	Gloss	ACh.	S.-J.	No. of Reflexes
1)	利	profit	l	r	99

I. Loss of Segments

The glottal stop, the "sonant prepalatal fricative", and the "smooth vocalic ingress" of Ancient Chinese are lost in Sino-Japanese , as shown in the pairs of correspondences below.

1)	悪	evil	ʔ	ø	62
2)	雲	cloud	j	ø	32
3)	夜	night	ɦ	ø	56

The following pair of correspondences below also shows the loss of some voiced velar fricatives of Ancient Chinese in Sino-Japanese.

4)	話	speech	ɣ	ø	4

The consonant system of Sino-Japanese has undergone more complicated sound changes than the other dialects under study, showing dual aspects of phonological changes, since the reflexes of Sino-Japanese originated from the two different sources of Ancient Chinese, Kan-on and Go-on, and underwent phonological processes peculiar to Sino-Japanese.

The reflexes of Kan-on origin are devoiced, while the reflexes from Go-on retain the +voice feature of Ancient Chinese. Besides this, voicing occurs in some of the original voiceless consonants of Ancient Chinese, as in (19)-(27) of C.

Some -continuant consonants of Ancient Chinese become +continuant, as in (1)-(24) of C. Nearly all of the bilabial stops and affricates underwent spirantization: bilabial stops of Ancient Chinese are changed into velar fricatives or bilabial fricatives, and affricates changed into fricatives. A small number of voiceless stops and affricates of Ancient Chinese are reflected as their voiced counterparts, as in (19)-(27) of A.

The same is true of palatalization. Palatalization occurs in the -palatal segments of Ancient Chinese, as in (19)-(14) of E, and the palatals of Ancient Chinese underwent depalatalization, as in (15)-(29) of E.

The nasals of Kan-on origin were denasalized. They are changed into their homorganic oral segments in Sino-Japanese, as in G. On the other hand, the nasals of Go-on origin remain unchanged.

As far as deaspiration is concerned, the reflexes of both origins are deaspirated owing to the loss of the distinctive feature aspirate in the Japanese sound system.

Affrication has occurred in some dental and palatal fricatives of Ancient Chinese, as in (25)-(28) of C, and in certain dental and palatal stops of Ancient Chinese, as in D.

All the retroflexes of Ancient Chinese have undergone deretroflexing, as in F. The retroflex feature is not distinctive in the Japanese sound system.

Another characteristic of Sino-Japanese is that the velar fricatives change their feature +continuant of Ancient Chinese into -continuant, as in (29)-(31) of C.

Such segments of Ancient Chinese as ʔ , j, ɦ, are lost in the reflexes of Sino-Japanese.

3.5. Comparison of Sino-Korean Reflexes with the Underlying Forms of Ancient Chinese

The reflexes entered in the list of Chinese characters for general use selected by the Korean Ministry of Education are compared with the cognates of Ancient Chinese in Karlgren's Analytic Dictionary of Chinese and Sino-Japanese and Etudes sur la phonologie chinoise.[40]

Identical Correspondences

Identical correspondences are found in the pairs of Ancient Chinese and Sino-Korean.

	Examples	Gloss	ACh.	S.-K.	No. of Reflexes
1)	半	half	p	p	65
2)	破	break	p'	p'	16
3)	母	mother	m	m	84
4)	多	many	t	t	33
5)	湯	soup	t'	t'	25
6)	雪	snow	s	s	79
7)	增	add	ts	ts	46
8)	請	beg	ts'	ts'	34
9)	高	high	k	k	162

[40]Supplement to Shin Ja Hae(Seoul: Min Jung Seo Gwan, 1971).

	Examples	Gloss	ACh.	S.-K.	No. of Reflexes
10)	快	merry	k'	k'	1
11)	海	sea	x	x	56
12)	南	south	n	n	18

Different Correspondences

Different correspondences in the cognates of Ancient Chinese and Sino-Korean are also classified on the basis of distinctive features.

A. Voice

The +voice segments of Ancient Chinese correspond to -voice segments in the pairs of correspondences that follow.

1)	鼻	nose	b'	p	55
2)	捕	seize	b'	p'	17
3)	大	big	d'	t	49
4)	特	special	d'	t'	9
5)	敵	enemy	d'	ts	18
6)	諜	spy upon	d'	ts'	6
7)	寺	temple	z	s	31
8)	磁	magnet	dz'	ts	30
9)	就	complete	dz'	ts'	8
10)	助	aid	dẓ'	ts	2
11)	愁	sad	dẓ'	s	7

	Examples	Gloss	ACh.	S.-K.	No. of Reflexes
12)	濁	muddy	d'	t'	3
13)	召	summon	d'	s	2
14)	住	reside	d'	ts	26
15)	治	govern	d'	ts'	7
16)	誠	sincere	z	s	43
17)	食	eat	dz'	s	15
18)	忌	avoid	g'	k	35
19)	係	bind	ɣ	k	8
20)	寒	cold	ɣ	x	95

B. Aspirate

The +aspirate segments of Ancient Chinese correspond to -aspirate segments in Sino-Korean in the pairs of correspondences below.

1)	念	anger	p'	p	21
2)	突	stick out	t'	t	3
3)	刺	thorn	ts'	ts	4
4)	口	mouth	k'	k	73

The pairs of correspondences below are opposite to the above: -aspirate in Ancient Chinese and +aspirate in Sino-Korean.

5)	板	board	p	p'	29
6)	塔	pagada	t	t'	5

	Examples	Gloss	ACh.	S.-K.	No. of Reflexes
7)	則	law	ts	ts'	14
8)	責	responsible	ʦ	ts'	5
9)	卓	stand high	ʨ	t'	1
10)	徹	penetrate	ʨ	ts'	9
11)	祝	congratulate	ʧ	ts'	7

The voiced stops and affricates of Ancient Chinese are reflected as aspirated or unaspirated segments, as shown in the pairs of correspondences below.

12)	敗	defeat	b'	p'	17
	父	father	b'	p	55
13)	妬	jealous	d'	t'	9
	動	move	d'	t	49
	遞	substitute	d'	ts'	6
	弟	brother	d'	ts	18
14)	最	most	dʐ'	ts'	8
	賊	thief	dz'	ts	30
15)	濁	muddy	ʥ'	t'	3
	逐	drive out	ʥ'	ts'	7
	秩	order	ʥ'	ts	26
16)	共	common	g'	k	35

In Mandarin and Cantonese, tones have played a decisive role in the presence or absence of aspiration in the initial stops and affricates. In T. Min, tones do not seem to be a conditioning factor of aspiration or deaspiration, even though the tone system of Ancient Chinese has been fully preserved in the reflexes of T. Min.

Ancient Chinese					Sino-Korean
	Even Tone	Rising Tone	Falling Tone	Entering Tone	
b'	20	13	8	14	p
b'	9	1	5	3	p'
d'	23	7	14	5	t
d'	2	4	1	2	t'
d'	10	1	6	1	ts
d'	2		2	2	ts'
dz'	17	5	9	11	ts
dz'	6		2	1	ts'
ɖ'	15	5	4	2	ts
ɖ'	4		1	3	ts'
ɖ'				4	t'
p	21	11	12	17	p
p'	9	3	11	7	p'
p'	7	5	7	2	p
p'	5	4	6	1	p'
t	13	8	6	7	t
t	3	8	6	2	t'
t'		3	1	1	t
t'	8	4	11	2	t'
ts	9	13	13	11	ts
ts	5	1	5	3	ts'
ts'	2	1	1		ts
ts'	12	8	5	8	ts'

In the above table, the pairs of correspondences in the reflexes of Sino-Korean are classified on the basis of the four

tones of Ancient Chinese with the distinction of high and low tones disregarded.

The distribution of aspirated and unaspirated stops and affricates in Sino-Korean is too irregular to find a conditioning factor in the tones of Ancient Chinese. It is concluded that the tones of Ancient Chinese are irrelevant to the presence and absence of aspiration in the reflexes of Sino-Korean.

C. Continuant

The -continuant segments of Ancient Chinese correspond to +continuant consonants in Sino-Korean in the pairs below.

	Examples	Gloss	ACh.	S.-K.	No. of Reflexes
1)	查	investigate	dz̤'	s	7
2)	船	ship	d̤z̤'	s	15
3)	插	insert	ts̤'	s	1
4)	港	port	k	x	6
5)	抗	protest	k'	x	2

The following pairs of correspondences are opposite to the above: +continuant in Ancient Chinese and -continuant in Sino-Korean.

6)	燥	dry up	s̤	ts	1
7)	縮	shrink	s̤	ts'	1

	Examples	Gloss	ACh.	S.-K.	No. of Reflexes
8)	轟	rumble	x	k	1
9)	係	bind	ɣ	k	8

D. Strident

The pairs of correspondences below show that the -strident segments in Ancient Chinese correspond to +strident segments in Sino-Korean.

1)	店	store	t	ts	19
2)	添	add	t'	ts'	8
3)	弟	brother	d'	ts	18
4)	逮	catch up	d'	ts'	6
5)	鎮	town	ť.	ts	18
6)	徹	penetrate	ť	ts'	9
7)	抽	pull out	ť'	ts'	8
8)	住	reside	ď'	ts	26
9)	治	govern	ď'	ts'	7

E. Palatal

The +palatal feature of Ancient Chinese is lost in the Sino-Korean sound system. The feature is not distinctive in Sino-Korean.

1)	卓	stand high	ť	t'	1

	Examples	Gloss	ACh.	S.-K.	No. of Reflexes
2)	鎮	town	ʻt	ts	18
3)	徹	penetrate	ʻt	ts'	9
4)	抽	pull out	ʻt'	ts'	8
5)	濁	muddy	ʻd'	t'	3
6)	召	summon	ʻd'	s	2
7)	場	place	ʻd'	ts	26
8)	治	govern	ʻd'	ts'	7
9)	書	book	ʻś	s	66
10)	石	stone	ʻź	s	43
11)	終	end	ʻtś	ts	57
12)	針	needle	ʻtś	ts'	7
13)	車	cart	ʻtś'	ts'	16
14)	舌	tongue	ʻdź'	s	15

F. Retroflex

The following pairs of correspondences show the loss of the retroflex feature of Ancient Chinese in Sino-Korean.

1)	山	mountain	ʂ	s	29
2)	縮	shrink	ʂ	ts'	1
3)	爭	quarrel	ʈʂ	ts	3
4)	責	responsible	ʈʂ	ts'	5
5)	初	begin	ʈʂ'	ts'	11

	Examples	Gloss	ACh.	S.-K.	No. of Reflexes
6)	插	insert	ṭṣ'	s	1
7)	助	aid	ḍẓ'	ts	7
8)	查	investigate	ḍẓ'	s	2

G. Nasal

The nasal segments of Ancient Chinese are lost in Sino-Korean in the pairs of correspondences below.

1)	五	five	ng	ø	60
2)	二	two	ńź	ø	76
3)	女	female	ń	ø	1
4)	溺	drown	n	ø	8

H. Lateral

The pairs of correspondences below show that the laterals of Ancient Chinese are nasalized or lost before the y glide or the vowel i in Sino-Korean.[41]

1)	論	discuss	l	n	38
2)	利	profit	l	ø	61

[41] Chin-Wu Kim, "The Vowel System of Korean," Language, XLIV (1968), 516-27. Kim's definition of glides and vowels based on distinctive features is accepted in this analysis.

I. Loss of Segments

The three pairs of correspondences below show that the "sonant prepalatal fricative," the glottal stop, and the "smooth vocalic ingress" of Ancient Chinese are lost in Sino-Korean.

	Examples	Gloss	ACh.	S.-K.	No. of Reflexes
1)	雲	cloud	j	∅	34
2)	一	one	ʔ	∅	55
3)	夜	night	ɦ	∅	60

Devoicing has occurred in all the voiced non-sonorants of Ancient Chinese in Sino-Korean, as in A.

Aspiration and deaspiration have occurred in the stops and affricates of Ancient Chinese, as in B. But the conditioning factor of aspiration in Sino-Korean is not the tones of Ancient Chinese.

The voiced retroflex and palatal affricates of Ancient Chinese are fricativized in Sino-Korean, as in (1)-(2) of C. Spirantization has also occurred in some velar stops of Ancient Chinese, as in (4)-(5) of C. On the other hand, some voiced velar fricatives of Ancient Chinese are changed into the velar stops in Sino-Korean, as in (9) of C.

Affrication has operated on many of the dental and palatal stops of Ancient Chinese, as in D.

All the palatals of Ancient Chinese have undergone depalatalization, as in E, and all the retroflexes deretroflexing, as in F.

The velar nasals, the nasal palatal affricates, the "sonant prepalatal fricatives," the glottal stops and the "smooth vocalic ingress" are lost in Sino-Korean. The dental nasals and the laterals are also lost, if they occur before the y glide or the vowel i.

The laterals that do not occur before the y glide or the vowel i are changed into the dental nasals in Sino-Korean.

Some of the phonological processes that have occurred to the Sino-Korean sound system are shared with the other dialects, while other processes peculiar to the individual dialects have also operated on the segments of Ancient Chinese.

Devoicing has occurred in all the five dialects under study, but particularly in Sino-Japanese, some segments of Ancient Chinese have undergone voicing, as in A(19)-(27), 3.4., even though it seems to be sporadic.

Aspiration of the stops and affricates of Ancient Chinese is irregularly reflected in Sino-Korean. The conditioning factor of aspiration remains to be studied. Tones of Ancient Chinese are irrelevant to aspiration. The aspiration system of Ancient Chinese seems to be fully preserved in the voiceless stops and affricates in Mandarin, Cantonese and T. Min. The voiced stops and affricates of Ancient Chinese are aspirated or unaspirated according to the selection of tones of Ancient Chinese in Mandarin and Cantonese. But the tones of Ancient Chinese are not the conditioning factor of aspiration of voiced stops and affricates of Ancient Chinese in T. Min, as is also the case in Sino-Korean.

Spirantization varies according to an individual dialect.

(i) Some bilabial stops are changed into the labio-dental fricatives in Mandarin (C(1)-(3), 3.1.) and in Cantonese (C (1)-(3), 3.2.).

(ii) Some bilabial stops have become velar fricatives in Sino-Japanese (C(1)-(3), 3.4) and T. Min (C(1)-(2), 3.3.).

(iii) Some bilabial stops have become bilabial fricatives in Sino-Japanese (C(4)-(6), 3.4.).

(iv) Some velar stops have shifted to velar fricatives in Cantonese (C(5), 3.2.) and Sino-Korean (C(4)-(5), 3.5.).

(v) Most of the voiced retroflex and palatal affricates of Ancient Chinese are changed into dental fricatives in Mandarin (A(16), 3.1.), Cantonese (C(6)-(7), 3.2.), T. Min (C(4), 3.3.) and Sino-Korean (C(1)-(2), 3.5.).

(vi) Some affricates of Ancient Chinese have become dental or palatal fricatives in Sino-Japanese (C(7)-(24), 3.4.).

Contrary to spirantization, some velar fricatives of Ancient Chinese are changed into velar stops in Cantonese (C(12)-(13), 3.2.), T. Min (C(9), 3.4.), Sino-Japanese (C(29)-(30), 3.4.), and Sino-Korean (C(8)-(9), 3.5.).

Affrication of some dental or palatal stops of Ancient Chinese has occurred in Cantonese (D, 3.2.), Sino-Japanese (D, 3.4.), and Sino-Korean (D, 3.5.). Some dental or palatal fricatives of Ancient Chinese are changed into affricates in Mandarin (C(5)-(6), 3.1.), Cantonese (C(8)-(11), 3.2.) and T. Min (C(5)-(8), 3.3.).

Palatalization of some velar stops and fricatives of Ancient Chinese has occurred only in Mandarin (D (6)-(12), 3.1.), while some dental fricatives and affricates have become palatals in Sino-Japanese (E(6)-(12), 3.4.). Depalatalization of most of the palatals of Ancient Chinese has occurred in Cantonese (E, 3.2.), T. Min (E, 3.3.), Sino-Japanese (E(15)-(29), 3.4.) and Sino-Korean (E, 3.5.).

Retroflexing of all the palatals of Ancient Chinese has occurred only in Mandarin (E, 3.1.), while deretroflexing of Ancient Chinese retroflexes has occurred in Cantonese (F, 3. .), T. Min (F, 3.3.), Sino-Japanese (F, 3.4.) and Sino-Korean (F, 3.5.).

Denasalization has made the nasals of Ancient Chinese become their homorganic oral segments in T. Min (G, 3.3.) and Sino-Japanese of Kan-on origin (G, 3.4.). The velar nasals are lost in Mandarin (F(1), 3.1.) and Sino-Korean (G(1), 3.5.), but preserved in Cantonese (14, 3.2.). The nasal palatal affricates are lost in Cantonese (F(1), 3.2.) and Sino-Korean (G(2), 3.5.), but reflected as the retroflex r in Manadarin (F(3), 3.1.). Some labial nasals are lost in Mandarin (F(2), 3.1.). The dental nasals before the y glide or the vowel i are lost in Sino-Korean(G(4), 3.5.).

The laterals of Ancient Chinese are well preserved in Mandarin (10, 3.1.), Cantonese (10, 3.2.), and T. Min (13, 3.3.), but they are reflected as the flap r in Sino-Japanese (I(1), 3.4.). In Sino-Korean, the laterals are lost before the y glide or the vowel i, or changed into dental nasals elsewhere(I(1), 3.5.).

The glottal stops, the "sonant prepalatal aricatives" and the "smooth vocalic ingress" are lost in all the five dialects except Mandarin, in which some of the "sonant prepalatal fricatives" are retained.

The identical correspondences in the reflexes of the five dialects are tabulated below.

ACh.	Mandarin	Cantonese	T. Min	S.-J.	S.-K.
p	p	p	p		p
p'	p'	p'	p'		p'
b'					
m	m	m	m	m	m
t	t	t	t	t	t
t'	t'	t'	t'		t'
d'				d	
s	s	s	s	s	s
z				z	
ts	ts	ts	ts		ts
ts'	ts'	ts'	ts'		ts'
dz'					
n	n	n	n	n	n
l	l	l	l		
ʂ	ʂ				
tʂ	tʂ				
tʂ'	tʂ'				
dʐ'	dʐ'				
ʨ					
ʨ'					
ʥ'					
ɕ				ɕ	
ʑ					
ʨɕ				ʨɕ	
ʨɕ'					
ʥʑ'				ʥʑ	
ȵʑ					
ȵ					
k	k	k	k	k	k
k'	k'	k'	k'		k'
g'				g	
x	x	x	x		x
ng		ng			
j	j				
ɲ					
ʔ					

The different correspondences in the reflexes of the five dialects are as follows.

ACh.	Mandarin	Cantonese	T. Min	S. - J.	S. - K.
p	f	f	x	x,ɸ,b	p'
p'	f	p,f	x	x,ɸ	p
b'	p.p(.f	p,p',f	p,p',x	x,ɸ	p.p'
m	ø		b	b	
t	t'			ʨ,ʥ	t',ts
t'		t		t,ts,ʨ,d	t,ts'
d'	t,t'	t,t'	t,t',l	t,ʥ, ts	t,t',ts,ts'
s		ts'	x,ts'	ɕ,ʥ	ts
z	s,ɕ,ʨ	s,ts,ts'	s,ts,ts'	s,ɕ,ʥ	ts
ts			dz,k	ɕ,s,z,ʥ	s
ts'				s,ɕ	ts
dz'	ts,ts',ʦ'	ts,ts',t	ts	s,z,ɕ,ʥ	ts,ts'
n			l	d,ʨ,ʥ	ø
l			n	r	n,ø
ʂ		s	s	s,ɕ	s,ts'
ʈʂ		ts	ts	s	ts,ts'
ʈʂ'		ts'	ts'	s,ɕ	s,ts'
ɖʐ'		ts,ts'	ts,s	s,ɕ, ʥ	s,ts
ʨ	ʈʂ,ʈʂ'	ts,ts'	t	ʨ,t,d,ts	ts,ts', t'
ʨ'	ʈʂ'	ts'	t'	ʨ	ts'
ʥ'	ʈʂ,ʈʂ'	ts,ts',t	t	ʨ,ʥ,t,s	ts,ts',t',s
ɕ	ʂ	s,ts'	s,ts,ts'	s,ɕ,ʥ,z	s
ʑ	ʂ,ʈʂ,ʈʂ',r	s,ts	s,ts,ts'	s,ɕ,ʥ,z	s
ʨɕ	ʈʂ,ʈʂ'	ts,ts'	ts	s,ɕ,ʥ	ts,ts'
ʨɕ'	ʈʂ'	ts'	ts,ts',k'	s,ɕ,ʥ	ts'
ʥʑ'	ʂ,ʈʂ'	s	ts	ɕ,ʥ,s,z	s
ɲʑ	r	ø	dz,l	ʥ,n,z	ø
ɲ	n	n	n	n	ø
k	ʨɕ,k'	k'			k',x
k'	ʨɕ'	x,f,ø		k	k,x
g'	k,k',ʨɕ, ʨɕ'	k,k'	k,k'	k	k
x	ɕ	k,k',ø	s	g	k
ɣ	x,ɕ,ʨɕ	x,ø,l	k,x	g,k,ø	x,k
ng	ø		g	g,k	ø
ʔ	ø	ø	ø	ø	ø
j	ø	ø	ø	ø	ø
ɲ	ø	ø	ø	ø	ø

4. A Comparative Study of the Consonant System of Sino-Korean in the Tongguk Chongun

The Tongguk Chongun (right rhymes of Korea) was compiled in a series of six volumes by King Sejong's Royal Academy in 1447.[42]

The pronunciation of Sino-Korean was believed by the King to be confused and vulgarized. It was his intention to correct the misguided pronunciation of his contemporary Sino-Korean with the publication of the Tongguk Chongun, which is a pronouncing dictionary of Sino-Korean.

Sino-Korean in the Tongguk Chongun was transcribed by means of the Korean phonetic alphabet, Hangul, devised by the King and his Royal Academy. The Korean alphabet has been widely used in Korea as well as Sino-Korean. Therefore, the Tongguk Chongun (TC) is one of the most important source materials for the study of Sino-Korean and the sound system of Middle Korean.

Little is known about the intermediate stage between Ancient Chinese and modern Sino-Korean. The study of this stage has lagged behind other areas in Korean studies.

Some linguists have inferred phonetic values of Middle Sino-Korean from those in modern Korean. Others have thought that Sino-Japanese retained the old forms of Chinese initials, so that it was compared with Sino-Korean.[43]

[42] K.W. Nam, A Study on Tongguk Chongun Style Transcription of Sino-Korean, The Korean Studies Series, Vol. 6 (Seoul: Korean Research Center, 1966).

[43] Ibid., p. 319.

No comparative work has been done with Ancient Chinese. This is why the phonetic values of the Korean alphabet in Hun-Min-Jeong-Eum are not fully interpreted. Hun-Min-Jeong-Eum was the official document proclaiming the Korean alphabet to the Korean people, in which the phonetic values of the new alphabet, Hangul, were described by means of phoneitc values of Sino-Korean.[44] Therefore, the phonetic values of Hangul in Hun-Min-Jeong-Eum can not be fully interpreted without knowing the phonetic values of Sino-Korean.

Sino-Korean is tentatively divided into three stages as follows:[45]

(1) TC 1st period: the consonant system of TC is retained (- 1488).

(2) TC 2nd period: the consonant system of TC is disrupted, but the nasal palatal affricate of Ancient Chinese is retained (1488 - 1592).

(3) Modern period: the sound system of modern Sino-Korean is established (1592 -).

The cognates entered in TC, which correspond to the reflexes in the TC 1st period, are carefully examined and compared with (1) the underlying forms of Ancient Chinese reconstructed by Karlgren and (2) the reflexes in the TC 2nd period, which are also compared with (3) the reflexes in the modern period.

[44] H.K. Kim, Introduction to Korean Linguistics (Seoul: Il-cho-kak, 1970), pp. 183-84.

[45] Nam (1966), pp. 1-5.

My fundamental assumption is that each symbol used in TC uniquely and consistently is related to a phonetic value in TC.

This analysis will lead to the establishment of identical and different correspondences in Ancient Chinese and Sino-Korean in each period. The phonological processes underlying the different correspondences are examined, so that the phonetic values of the initial consonant segments in TC and Hun-Min-Jeong-Eum are identified. The consonant system of Sino-Korean in TC is proposed.

4.1. Comparison of the Reflexes in the TC 1st Period with the Underlying Forms of Ancient Chinese

Compared with the reflexes in modern Sino-Korean, only a few phonological changes are observed in the reflexes of the TC 1st period.

Identical Correspondences

Identical correspondences are found in the pairs of correspondences below.

	Examples	Gloss	ACh.	TC	Korean Alphabet	No. of Reflexes
1)	國	state	k	k		201
2)	空	sky	k'	k'		59
3)	求	ask	g'	g		41
4)	我	I	ng	ng		54
5)	虎	tiger	x	x		53
6)	寒	cold	ɣ	ɣ		100
7)	愛	love	ʔ	ʔ		62
8)	藥	medicine	ɦ	ɦ		55
9)	中	middle	ʈ	ʈ		16
10)	超	excel	ʈ'	ʈ'		5
11)	住	reside	ɖ'	ɖ		35
12)	正	right	ʈʂ	ʈʂ	ㅈ	60
13)	車	cart	ʈʂ'	ʈʂ'	ㅊ	25
14)	聖	holy	ʂ	ʂ	ㅅ	54

	Examples	Gloss	ACh.	TC	Korean Alphabet	No. of Reflexes
15)	石	stone	ź	ź	ㅅㅅ	43
16)	二	two	ńź	ńź	ㅇ	39
17)	女	female	ń	ń		2
18)	南	south	n	n		21
19)	東	east	t	t		46
20)	湯	hot water	t'	t'		46
21)	敵	enemy	d'	d		94
22)	足	foot	ts	ts	ㅈ	60
23)	千	thousand	ts'	ts'	ㅊ	39
24)	賊	thief	dz'	dz	ㅉㅈ	51
25)	利	profit	l	l		194
26)	私	private	s	s		78
27)	寺	temple	z	z		32
28)	法	law	p	p		81
29)	蜂	bee	p'	p'		34
30)	白	white	b'	b		76
31)	母	mother	m	m		143

Identical correspondences are found in most of the pairs of correspondences in the reflexes examined in TC. Of the thirty-six initial consonants set up by Karlgren, only

six segments of Ancient Chinese initials are not found in the reflexes of TC: j, ʑ, ʂ, ʈʂ, ʈʂʻ, ɖʐ.

A careful examination of different correspondences shows that several sound changes have occurred to the consonant system of Ancient Chinese in the TC system: deretroflexing, spirantization, merging of j with the velar nasal, and palatalization.

Different Correspondences

Different correspondences are also classified on the basis of distinctive features, which will eventually explain the phonological changes underlying the different correspondences.

A. Voice

Only four pairs of correspondences show that the voiced non-sonorants of Ancient Chinese are changed into the voiceless counterparts.

	Examples	Gloss	ACh.	TC	No. of Reflexes
1)	貶文	defeat	b'	p	2
2)	最	most	dz'	ts	1
3)	蝎	grub	ɣ	x	1
4)	穗	ear of grain	z	s	1

These seem to show that devoicing began in the TC 1st period, even though it was sporadic.

B. Aspirate

The two pairs of correspondences show that the +aspirate segments of Ancient Chinese are reflected as -aspirate consonants in the TC reflexes.

	Examples	Gloss	ACh.	TC	No. of Reflexes
1)	敗	defeat	b'	p	2
2)	最	most	dz'	ts	1

The feature aspirate is disntictive in the sound system of Korean. Most of the original aspirated consonants of Ancient Chinese are fully preserved in the TC reflexes as well as unaspirated segments. But all the voiced non-sonorants are transcribed without any indication of aspiration.

Karlgren reconstructed the voiced stops and affricates as aspirated segments. His treatment of these segments is suspect. The above evidence in Sino-Korean seems to show that the voiced stops and affricates were originally unaspirated. This may support Maspero's assumption that the voiced non-sonorants were not aspirated, though they became so early in the T'ang dynasty.[46] Forrest also doubted the reality of Karlgren's voiced stops and affricates, and concluded that Maspero's assumption was probably justified.[47] And Pulleyblank also claims that "there is no phonemic distinction in Chinese between aspirated and nonaspirated stops and the mark of

[46]Forrest(1965), p. 167.

[47]Ibid.

aspiration included in Karlgren's transcription is superfluous."[48]

On the other hand, three pairs of correspondences show that the original unaspirated segments have become aspirated in the TC reflexes.

	Examples	Gloss	ACh.	TC	No. of Reflexes
3)	蜀	hay	ʦ	ʦ'	1
4)	哲	wise	t	t'	1
5)	肺	lungs	p	p'	1

C. Continuant

The voiced retroflex and palatal affricates are changed into the voiced fricatives in the pairs of correspondences below.

1)	愁	sad	dz	z	6
2)	船	ship	ʥ	ʑ	14

This process shows the unique behavior of the two affricates in phonological processes: they become voiced fricatives, and then are changed into voiceless fricatives, as in Mandarin, Cantonese, Sino-Japanese and Sino-Korean. In these four dialects, the palatal voiced affricates of Ancient Chinese are reflected as voiceless fricatives.

[48] E.G. Pulleyblank, "The Consonantal System of Old Chinese," Asia Major, IX(1962-63), 66.

D. Retroflex

Deretroflexing is the most outstanding sound change in the TC reflexes. All the retroflex segments of Ancient Chinese have lost the feature retroflex. The whole set of retroflexes merged with the dental fricatives or affricates.

	Examples	Gloss	ACh.	TC	No. of Reflexes
1)	色	color	s̤	s	27
2)	債	debt	ts̤	ts	8
3)	芻	hay	ts̤	ts'	1
4)	初	begin	ts̤'	ts'	9
5)	愁	sad	dz̤'	z	6
6)	助	help	dz̤'	dz	1

E. Nasal

It is assumed that Karlgren's j has become nasalized, or that the +nasal feature has been originally included in the segment.[49] All the reflexes with the initial j show that it has merged with the velar nasal.

1)	友	friend	j	ng	29
2)	我	I	ng	ng	54

[49] Pulleyblank reconstructed a velar nasal fricative, but the "phonemic" status of the segment remains to be studied. Pulleyblank (1962-63), 92-93.

The same symbol ŋ was employed for the j as well as the velar nasal in TC. This fact may lead to the alternative assumptions:

(1) that the velar nasal has lost the nasal feature, or

(2) that Karlgren's j has become nasalized.

Evidence shows that the velar nasal occurs finally in a large number of reflexes in TC. The same symbol was used for the initial and final velar nasal. The final velar nasal has never undergone any sound change and has retained the constant phonetic value as a velar nasal. Therefore, the initial velar nasal must have retained the nasal feature as well as the final velar nasal, although the nasal feature may be assumed to have been considerably weakened initially in the TC reflexes.

It is natural to assume that there was something in common between the velar nasal and Karlren's j. Karlgren's j must have been similar or near to the velars and nasals. But Karlgren reconstructed the j as "sonant prepalatal fricative."

The merging of Karlgren's j with the velar nasal seems to support Yen's proposition that Karlgren's j should be amended as "palatalized voiced velar fricative" ɣʲ.[50] Yen reconstructed ɣʲ for Karlgren's j and his own j for Karlgren's "smooth vocalic ingress."

[50] S.L. Yen, "Notes on the Initials Ying and Yü in Ancient Chinese," T'oung Pao , LII(1965-66), 254-260.

Examples	Gloss	Karlgren	Yen
羊	sheep	j(sonant prepalatal fricative)	ɣj(palatalized voiced velar fricative)
云	say	ɦ(smooth vocalic ingress)	j(voiced prepalatal fricative)

Yen's ɣj seems to be more similar to the velars than Karlgren's j. Yen claims that his own j merged with the ɣj fairly early in the history of Chinese, but contrary to his assumption, his ɣj merged with the velar nasal in the TC reflexes.

F. Palatal

The reflexes in TC show that nearly all the dental consonants that occurred before the y glide or the vowel i merged with the palatal counterparts. The same symbols were used for the dentals before y or i and the palatals of Ancient Chinese.

Two alternative assumptions may be derived from this phenomenon:

(1) that the palatals of Ancient Chinese have lost the palatal feature in the TC reflexes, or

(2) that the dentals before the y glide or the vowel i have become palatalized.

Palatalization of dentals before the y glide and the vowel i occurs in Korean.[51] This may lead to reject the first assumption. Then,it is assumed that palatalization has operated on the dental segments of Ancient Chinese in the TC reflexes.

The following pairs of correspondences show that the dentals of Ancient Chinese correspond to the palatal segments in the TC reflexes, all of which occur before the vowel i or the y glide.

	Examples	Gloss	ACh.	TC	No. of Reflexes
1)	鳥	bird	t	ć	16
2)	天	heaven	t'	ć'	6
3)	敵	enemy	d	ć	27
4)	年	year	n	ń	5
5)	洗	wash	s	ś	35
6)	席	seat	z	ź	23
7)	足	foot	ts	ćś	35
8)	青	blue	ts'	ćś'	25
9)	前	front	dz	ćź	25

[51]Kim (1968), 517.

4.2. Comparison of the Reflexes in the TC 1st Period with the Reflexes in the TC 2nd Period

It is noted that some striking sound changes took place during the period of about one hundred years (1489-1592).

A. Voice

Devoicing occurred regularly to all the voiced non-sonorants of Ancient Chinese in the reflexes in the TC 2nd period.

	Examples	Gloss	TC 1st	TC 2nd	No. of Reflexes
1)	近	near	g	k	42
2)	寒	cold	ɣ	x	91
3)	匣	casket	ɣ	k	6
4)	池	pond	ʑd	ʑt	30
5)	治	govern	ʑd	ʑt'	4
6)	時	time	ʑz	ʑs	56
7)	蜀	caterpillar	ʑz	ʑʑs'	1
8)	承	inherit	ʑz	ʑz	3
9)	嗜	have a taste	ʑz	k	1
10)	豆	bean	d	t	78
11)	特	special	d	t'	23
12)	字	letter	dz	ts	43
13)	泉	fountain	dz	ts'	12

	Examples	Gloss	TC 1st	TC 2nd	No. of Reflexes
14)	豺	ravenous beast	dz	s	1
15)	夕	evening	z	s	38
16)	父	father	b	p	59
17)	平	even	b	p'	17

Some of the voiced stops and affricates of Ancient Chinese became unaspirated, and others became aspirated.

B. Aspirate

Both aspiration and deaspiration took place in this period. The process made the consonant system of Sino-Korean much confused, as far as aspiration is concerned. No conditioning factor of the process has been found. The process seems to have occurred irregularly or not purely linguistically. It might be caused by some socio-linguistic factors. But one thing is clear: the tones of Ancient Chinese are irrelevant to presence and absence of aspiration.

1)	乞	beg	k'	k	57
2)	赤	red	ts'	ts	3
3)	獺	otter	t'	t	1
4)	刺	pierce	ts'	t	4
5)	配	distribute	p'	p	21
6)	忠	loyal	ʻt	ʻt'	2
7)	祝	congratulate	ʻʻts	ʻʻts'	8

	Examples	Gloss	TC 1st	TC 2nd	No. of Reflexes
8)	打	hit	ˊt	ˊt'	2
9)	借	borrow	ts	ts'	12
10)	筆	pen	p	p'	17
11)	近	near	g	k	42
12)	住	reside	ˊd	ˊt	30
13)	讀	read	d	t	77
14)	賊	thief	dz	ts	42
15)	父	father	b	p	59
16)	宅	dwelling	d	t'	4
17)	投	throw	d	t'	17
18)	賤	low	dz	ts'	12
19)	平	even	b	p'	17

The aspirated and unaspirated stops and affricates of Ancient Chinese were well preserved in the TC reflexes, but it was in the TC 2nd period that the aspiration system of TC was disrupted. In other words, the aspiration system of ACh. was disrupted in the TC 2nd period, after it had been fully preserved in Sino-Korean for a long time.

C. Continuant

Some pairs of correspondences show that fricatives became

stops or affricates, while others show that stops or affricates became fricatives.

	Examples	Gloss	TC 1st	TC 2nd	No. of Reflexes
1)	械	shackle	ɣ	k	6
2)	蜀	caterpillar	ź	ʑ	1
3)	嗜	have a taste	ź	k	1
4)	縮	shrink	s	ʑ	1
5)	噪	noisy	s	ts	1
6)	該	the said	k	x	5
7)	昭	bright	ts	s	1
8)	詐	deceive	ʦ	s	1
9)	豺	revenous beast	dz	s	1

D. Nasal

Some of the laterals underwent nasalization in the TC 2nd period, and others had two variants, a dental nasal and a lateral, for the lateral of Ancient Chinese.

1)	洛	name of a river	l	n	9
2)	力	power	l	{n, l}	11

Most of the laterals of Ancient Chinese remained unchanged in the reflexes of the TC 2nd period.

3)	來	come	l	l	171

E. Palatal

The three pairs of correspondences below show that some palatal segments of Ancient Chinese lost the feature palatal in the reflexes of the TC 2nd period.

	Examples	Gloss	TC 1st	TC 2nd	No. of Reflexes
1)	蒸	steam	ʻʻtś	ts	1
2)	乘	ride	ʻź	s	3
3)	瞬	wink	ʻś	s	3

F. Loss of Segments

All of the velar nasals, the glottal stops and the voiced prepalatal fricatives are lost in the reflexes of the TC 2nd period.

1)	銀	silver	ng	ø	83
2)	惡	evil	ʔ	ø	62
3)	夜	night	j	ø	55

On the other hand, some of the nasal palatal affricates were lost and others retained the original segments in the TC 2nd period.

1)	兒	child	ʻnź	ø	7
2)	乳	milk	ʻnź	ʻnź	13
3)	耳	ear	ʻnź	ø / ʻnź	19

The epoch-making process of devoicing occurred in the TC 2nd period, accompanied by aspiration and deaspiration, nasalization of the Ancient Chinese laterals, and loss of the velar nasals, the glottal stops and the voiced prepalatal fricatives which correspond to Karlgren's "smooth vocalic ingress."

4.3. Comparison of the Reflexes in the TC 2nd Period with the Reflexes in Modern Sino-Korean

Affrication of the palatal stops, loss of the palatal feature of Ancient Chinese and nasalization of the laterals are characteristic of this period.

A. Strident

The pairs of correspondences belwo show that the palatal stops in the reflexes of the TC 2nd period correspond to the affricates in modern Sino-Korean.

	Examples	Gloss	TC 2nd	Modern	No. of Reflexes
1)	竹	bamboo	ć	ts	44
2)	鳥	bird	ć (ACh. t)	ts	48
3)	超	excel	ć'	ts'	11
4)	聽	listen	ć' (ACh. t')	ts'	10

B. Palatal

The whole set of palatals in the reflexes of the TC 2nd period lost the feature +palatal in the consonant system of modern Sino-Korean, as shown in the pairs of correspondences below.

	Examples	Gloss	TC 2nd	Modern	No. of Reflexes
1)	竹	bamboo	´t	ts	92
2)	超	excel	´t'	ts'	21
3)	終	end	´´ts	ts	50
4)	春	spring	´´ts'	ts	9
5)	首	head	´s	s	63
6)	濃	dense	´n	n	17

C. Nasal

The pair of correspondences below shows that the -nasal feature in the reflexes of the TC 2nd period corresponds to the +nasal feature in the reflexes of modern Sino-Korean.

1)	論	speak of	l	n	79

The laterals in the above examples were those which didn't occur before the vowel i or the y glide.

D. Loss of Segments

The following pairs of correspondences show that all the nasal palatal affricates, some of the laterals and the palatal

nasals were lost in the reflexes of modern Sino-Korean. All these laterals occurred before the vowel i or the y glide.

	Examples	Gloss	TC 2nd	Modern	No. of Reflexes
1)	耳	ear	ńź	ø	32
2)	利	profit	l	ø	96
3)	年	year	ń	ø	17

All of the sound changes that occurred in modern Sino-Korean seem to be connected with the presence of the vowel i and the y glide. Affrication of the palatal stops and depalatalization of the remaining palatals occurred with the following y glide lost or the following vowel i present. The loss of the palatal nasal affricates, the laterals and the palatal nasals seems to be caused by the presence of the y glide or the vowel i.[52]

[52]The loss of the y glide and its presence seem to be one of the most important aspects in the historical developments of Sino-Korean, connected with the vowel system of Sino-Korean. But little is known about the Sino-Korean vowel system.

The consonant system of Ancient Chinese in Sino-Korean has undergone not a few phonological processes in its history of development.

(1) TC 1st Period (- 1488)

Deretroflexing , merging of ɣj with the velar nasal, spirantization and palatalization are characteristic of this period.

The first major phonological change that took place in Sino-Korean seems to have been deretroflexing. Retroflex sounds seem to be too strange to be adjusted to the articulatory patterns of Korean. Evidence has been evinced that the retroflexes of Ancient Chinese were removed from the sound patterns of Sino-Korean before any other sound change. As far as the retroflexes of Ancient Chinese are concerned, nothing could be traced in the TC reflexes.

No other major phonological change is found in the reflexes of TC. In other words, the consonant system of Ancient Chinese reconstructed by Karlgren was farily well preserved in the TC reflexes, except the retroflexes, the palatalized voiced velar fricatives and the voiced palatal affricates.

The conclusion seems to reasonably drawn that the consonant system of TC that is derived from the underlying

consonant system of Ancient Chinese consists of thirty-one segments. These segments are tabulated according to the positions and manners of articulation:

p	t	ť	k	ʔ
p'	t'	ť'	k'	
b	d	ď	d	
	s	ś	x	
	z	ź	ɣ	
		j		
	ts	ťś		
	ts	ťś'		
	dz			
		ńź		
m	n	ń	ng	
	l			

(2) TC 2nd Period (1488 - 1592)

Devoicing is the most outstanding phonological change in this period, accompanied by disruption of the aspiration system of Ancient Chinese, denasalization, loss of the glottal stops and the voiced prepalatal fricatives. Having undergone these sound changes , the consonant system of TC is changed into the consonant system of the TC 2nd period that consists of the following segments:

p	t	ť	k
p'	t'	ť'	k'
	s	ś	x
	ts	ťś	
	ts'	ťś'	
		ńź	
m	n	ń	
	l		

(3) <u>Modern Period</u> (1592 -)

Merging of the palatals of the TC 2nd period with the dentals, affrication of the stops, nasalization of the laterals, and loss of the nasal palatal affricates, the laterals before y or i and the palatal nasals occurred in this period. These phonological changes have resulted in the consonant system of modern Sino-Korean which includes the following segments:[53]

p	t	k
p'	t'	k'
	s.	x
	ts	
	ts'	
m	n	

[53]Velar nasals and laterals occur only finally or intervocally. An exception is the glottal fricative sʔ , which is found in only one reflex of Sino-Korean: 雙 .

4.4. The Consonant System of Sino-Korean in Hun-Min-Jeong-Eum

The initial consonant segments of Sino-Korean in Hun-Min-Jeong-Eum correspond to the segments in the consonant system of TC without exception, as far as the initial consonants are concerned[54] This establishes that the consonant system of Ancient Chinese, as is reconstructed by Karlgren with unaspirated voiced stops and affricates[55] and the palatalized voiced velar fricative modified,[56] is reflected in the consonant system of Sino-Korean in Hun-Min-Jeong-Eum, just as in the TC consonant system.[57]

The initial consonants of Sino-Korean in Hun-Min-Jeong-Eum are compared with those of TC and Ancient Chinese.

Hun - Min - Jeong - Eum

	Examples	Korean Alphabet	Phonetic Values	TC	ACh.	Sources of Examples
1)	君	ㄱ	k	k	k	Karlgren(1923), p.507
2)	快	ㅋ	k'	k'	k'	Karlgren(1968), p.66
3)	虯	ㄲ	g	g	g	Nam(1966), p.158
4)	業	ㆁ	ng	ng	ng	Karlgren(1923), p.229

[54]King Sejong's proclamation of the new Korean alphabet in 1446.

[55]See above, 4.1.(B).

[56]See above, 4.1.(E).

[57]See above, TC 1st Period.

Hun - Min - Jeong - Eum

	Examples	Korean Alphabet	Phonetic Values	TC	ACh.	Sources of Examples
5)	斗	ㄷ	t	t	t	Karlgren(1968), p.79
6)	呑	ㅌ	t'	t'	t'	Karlgren(1968), p.80
7)	覃	ㄸ	d	d	d	Nam(1966), p.160
8)	彆	ㅂ	p	p	p	[58]
9)	漂	ㅍ	p'	p'	p'	Karlgren(1968), p.85
10)	步	ㅃ	b	b	b	Karlgren(1968), p.86
11)	彌	ㅁ	m	m	m	Karlgren(1968), p.87
12)	那	ㄴ	n	n	n	Karlgren(1968), p.77
13)	即	ㅈ	ts	ts	ts	Karlgren(1968), p.81
14)	侵	ㅊ	ts'	ts'	ts'	Karlgren(1968), p.82
15)	慈	ㅉ	dz	dz	dz	Karlgren(1968), p.82
16)	戌	ㅅ	s	s	s	Karlgren(1968), p.83
17)	邪	ㅆ	z	z	z	Karlgren(1968), p.83
18)	挹	ㆆ	ʔ	ʔ	ʔ	Karlgren(1923), 194
19)	虛	ㅎ	x	x	x	Karlgren(1968), p.68
20)	洪	ㅎㅎ	ɣ	ɣ	ɣ	Karlgren(1968), p.69
21)	欲	ㅇ	j	j	j	Karlgren(1923), 425
22)	穰	ㅿ	ɲʑ	ɲʑ	ɲʑ	Karlgren(1923), 788

[58] Only the examples of the voiceless labial stop and the set of palatals are not found. But the palatals of Ancient Chinese are easily identified before the vowel i or the y glide(See above, F, 4.1.).The labial unaspirated voiceless stop is reflected as the same segment in the TC reflexes(See above, 4.1.).

Only one example is presented in Hun-Min-Jeong-Eum for the purpose of describing the phonetic value of each symbol newly devised. As shown above, the phonetic values of all the examples in Hun-Min-Jeong-Eum correspond to those of the consonant segments in the TC sound system.

It is interpreted that King Sejong intended to have the reflexes of Ancient Chinese, i.e., Sino-Korean, transcribed by means of Hangul, the new alphabet, as well as the native consonant segments of Korean.

Two subjects have roused a great deal of controversy in interpreting the phonetic values of the consonants in Hun-Min-Jeong-Eum:

(1) the double letters (ㄲ , ㄸ , ㅃ , ㅆ , ㅉ, ㆅ)

(2) the nasal palatal affricate, ńź, (ㅿ).

Evidence shows that all the double letters correspond to the voiced non-sonorants of Ancient Chinese:[59]

Hun-Min-Jeong-Eum	Ancient Chinese
ㄲ	g
ㄸ	d
ㅃ	b
ㅉ	dz
ㅆ	z
ㆅ	ɣ

[59]See above, comparison of Hun-Min-Jeong-Eum with TC and Ancient Chinese.

This is connected with the transcription of the consonants in the TC sound system. The double letters in TC uniformly are the voiced segments of Ancient Chinese with a few exceptions,[60] and it has been clearly and irrefutably demonstrated that the voiced non-sonorants were fully preserved in the consonant system of TC, even though devoicing occurred in the TC 2nd period.

Prof. Kwang Woo Nam proposed the following:[61]

(1) "The (double) letters (ㄲ, ㄸ, ㅃ, ㅆ, ㅉ, ㆅ) are not transcriptions of actual pronunciation but probably orthoepic, corresponding to the actual ㄱ, ㄷ, ㅂ, ㅅ, ㅈ, or ㅋ, ㅌ, ㅍ, ㅊ, ㆆ (k,t,p,ts,s or k',t',p',ts',x).

(2) ...: the remaining uses of ㅋ are artificial. In other words, the actual pronunciation of most initial ㅋ is ㄱ.

(3) A portion of the initials transcribed with ㅋ appear to correspond to the actual pronuciation ㆆ. The transcription ㅋ in these cases is artificially orthoepic.

(4) As initials, the use of ㆁ is extremely artificial and ㆁ does not correspond to any real sound in the spoken language.

All these assumptions of his have proved false by my comparative analysis of the reflexes of Ancient Chinese in Sino-Korean.

(a) The double letters reflect the voiced non-sonorants of Ancient Chinese in Sino-Korean.

[60] Only five reflexes show exceptions. See above, A, 4.1.

[61] Nam(1966), p. 317.

(b) The aspirated velar stops are changed into unaspirated segments by the disruption of the Ancient Chinese aspiration system, after the aspirate feature of Ancient Chinese has been well preserved in the TC reflexes.

(c) The transcription ㅋ reflects the aspirated velar stop of Ancient Chinese in TC, but it is changed into its homorganic fricative in the later period, as in Cantonese.

(d) The same is trule of the velar nasal. It was preserved in the TC reflexes, but denasalization took place later. The glottal stop ㆆ also was a distinctive member in the TC consonant system, but it became lost in the TC 2nd period.

The phonetic values of modern Korean are the main criterion in his interpretation of the phonetic values of the TC consonants, and he seems not to assume any phonological changes in his treatment of the reflexes of Ancient Chinese in TC.

The second controversy is the interpretation of the palatal nasal affricate. Its phonetic value has not been agreed upon.

Cho proposes that the phonetic value of the symbol (ㅿ) must have been "either a ʐ (voiced retroflex fricative) or a fricative sound close to the Middle Chinese ʐ," and that the symbol ㅿ (ńź) stood for " a phoneme /ʂ/, a cacuminal voiceless fricative."

He speculates that "the Middle Chinese ʐ was heard as ʂ by the Korean transcriber of the Middle Korean period."[62]

First, he seems wrong in his comparison of the reflexes in Sino-Korean with those in Mandarin. The retroflexes are found only in Madarin. The reflexes of Sino-Korean can not be derived from Mandarin. Sino-Korean retains much older forms of Ancient Chinese than Mandarin. The two dialects have undergone different types of phonological changes: retroflexing in Mandarin and deretroflexing in Sino-Korean.

Second, it is not recognized by Cho that deretroflexing occurred before the TC period. All the retroflexes of Ancient Chinese disappeared before the TC period. The articulatory patterns of Korean seem to have been the main cause of deretroflexing.

Third, the symbol ㅿ (ńź) existed, after devoicing was completed in the TC 2nd period. No evidence of its devoicing has been found. It is assumed that it remained as a voiced segment. Therefore, the segment can not be interpreted as a voiceless "cacuminal (retroflex) fricative.

The nasal palatal affricate of Ancient Chinese is assumed to have undergone denasalization in the TC 2nd period when the velar nasal disappeared, becoming a voiced palatal fricative. The voiced palatal fricative seems to have been lost, when the palatals of Ancient Chinese origin disappeared from the sound system of modern Sino-Korean.

[62] S.B. Cho, A Phonological Study of Korean (Uppsala: Almqvist & Wiksells, 1967), p.222.

[63] See above, 4.3.

Conclusion

Sound changes have been treated as occurrences in a particular sound system of a language. The sound system of Ancient Chinese has been examined, compared with the sound systems of modern dialects. It was the main purpose to determine the phonological processes that made the modern dialects derive their present consonant systems from the underlying system of Ancient Chinese.

The modern dialects have been compared with Sino-Korean. The identical and different correspondences were set up on the basis of reflexes in Sino-Korean. These correspondences would help the consonant segments of Ancient Chinese to be reconstructed by comparative method. (But Karlgren has already reconstructed the consonants of Ancient Chinese.) The correspondences that have been set up in this analysis seem to show no more than the contrastive aspects of the correspondences and interdialectal relationships. The processes that have taken place behind the different correspondences are examined by historical comparison.

The historical comparison in this analysis has been carried out by accepting Karlgren's reconstruction of Ancient Chinese in the main as the underlying consonant system of Ancient Chinese, but reexamining some aspects established by Karlgren.

The reflexes in Sino-Korean seem to support Maspero and Forrest's assumption that the voiced stops and affricates of Ancient Chinese are unaspirated. And Yen's proposition also seems to be justified by Sino-Korean reflexes that Karlgren's "sonant prepalatal fricative" and "smooth vocalic ingress" should be amended as the palatalized voiced velar fricative ɣ j and the voiced prepalatal fricative j, respectively.

The conditioning factor of aspiration is tones of Ancient Chinese in Mandarin and Cantonese, but tones are irrelevant to the disruption of aspiration system of Ancient Chinese in Sino-Korean and Taiwanese South Min.

The major phonological processes that have made the consonant system of Ancient Chinese much diversified and the consonant systems of the five dialects established, as they are, are as follows:

devoicing and voicing,

aspiration and deaspiration,

spirantization,

affrication,

palatalization and depalatalization,

retroflexing and deretroflexing,

nasalization and denasalization, and

loss of the glottal stop, the voiced prepalatal fricative and the palatalized voiced velar fricative.

The intermediate stage between Ancient Chinese and modern Sino-Korean may be divided into three periods on the basis of the phonological processes that have taken place in Sino-Korean reflexes:

the deretroflexing period,

the devoicing period, and

the period of loss of the palatal feature.

The sound system of TC has resulted in the main from the loss of the retroflex feature of Ancient Chinese. The priority in phonological changes seems, in the case of loanwords, to be the feature quite strange to the articulatory patterns of a language. Thus, deretroflexing occurred in Sino-Korean before any other sound change.

Most of the major phonological changes that transformed the sound system of Ancient Chinese into the consonant system of modern Sino-Korean took place in the period of devoicing. It is inferred that devoicing may be the major cause of other sound changes.

All the phonological changes that occurred in the period of loss of the palatal feature seem to be conditioned by the presence and absence of the vowel i or the y glide. But more about the glide and the vowel system of Sino-Korean remains to be studied.

This comparison of the reflexes in Sino-Korean with those in the four modern sister dialects and the underlying forms of Ancient Chinese has led to producing a secondary result: the phonetic values of the initial consonants in Hun-Min-Jeong-Eum have proved clear. The double letters in Hun-Min-Jeong-Eum are the transcription of the voiced non-sonorants derived from the consonant system of Ancient Chinese.

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Eung Jin Baek

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