

Graphonomic structure and the origins of the Sumatra-Sulawesi-Philippine scripts

Presented at the Southeast Asian Linguistic Society (SEALS) meeting,
Bangkok, May 2011

(standalone version)

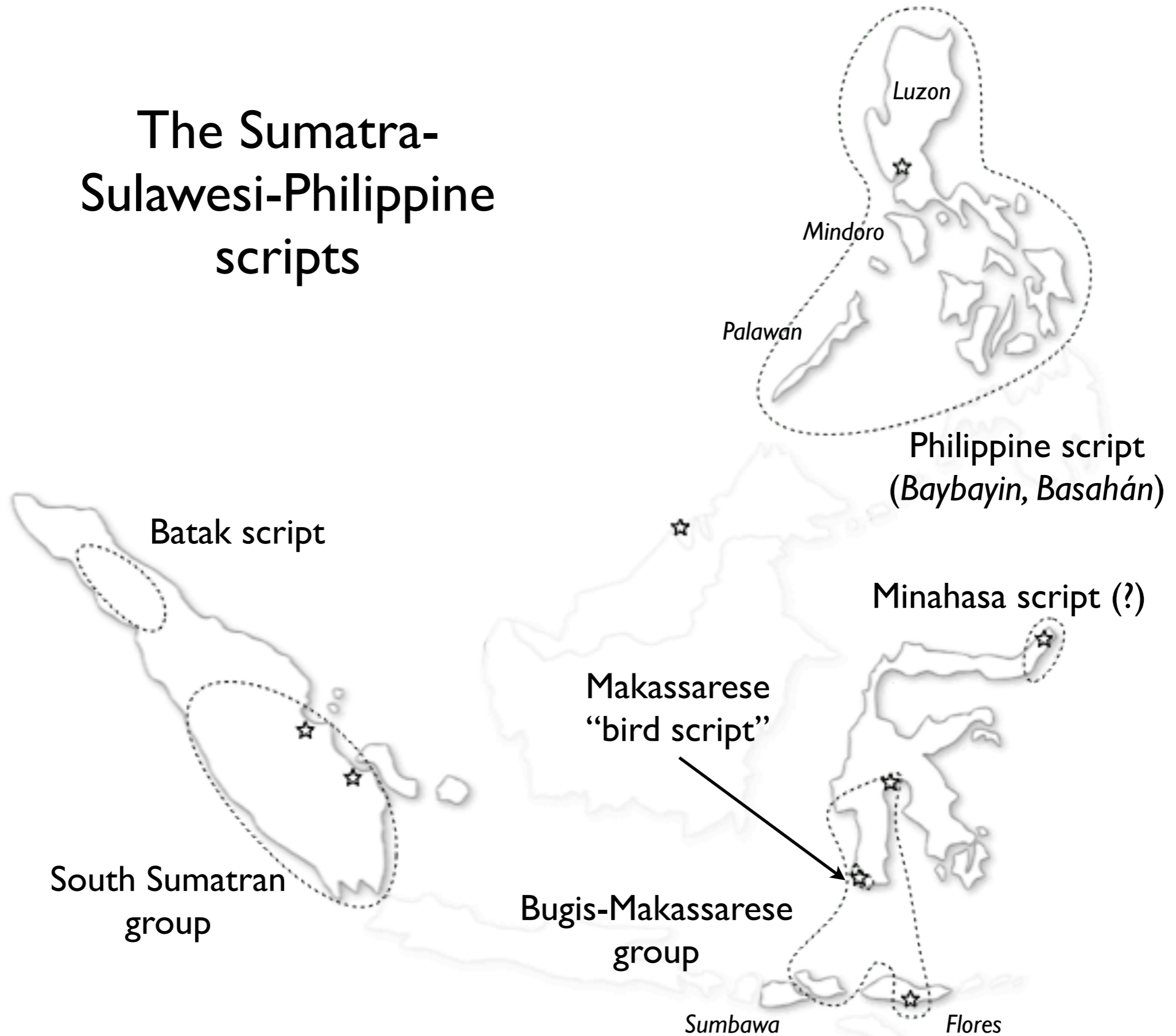
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The Sumatra-Sulawesi-Philippine scripts

- The scripts:
 - North Sumatra: Batak group scripts
 - South Sumatra: Rejang-Central Malay, Kerinci and Lampung
 - South Sulawesi and nearby islands: Lôntara' or Bugis-Makassarese script and its adaptations to Bimanese on Sumbawa and Ende on Flores
 - South Sulawesi: Makassarese “Bird script”
 - North Sulawesi: an as yet unconfirmed script in the northeastern Minahasa region
 - The Philippines: the Baybayin script, also known in the Bikol region as “Basahán”

The Sumatra-Sulawesi-Philippine scripts



- Records of these scripts lack the time depth of other SE Asian scripts: few if any stone inscriptions exist in these scripts and the oldest known exemplars date typically from the 17th century; the late 16th century at the earliest.
- They are different from other mainland and insular SE Asian scripts in two major ways:
 - Their character inventory is typically smaller and does not include letters for Sanskrit sounds not present in the phonologies of the respective languages.
 - Their letter shapes tend overall to be more angular and diagonal than the more vertical shapes of most SE Asian scripts.
- The following table (Taylor, 1883) compares (often inaccurate) reproductions of the SSP scripts (red rectangle) with other scripts of the region.

VERNACULAR ALPHABETS OF

FURTHER INDIA AND THE ISLANDS.

	Gutturals.	Palatale.	Cerebrals.	Dentals.	Labials.	Semivowels.	Sibilants.	Vowels.	
10	k kh g gh ñ	ch chh j jh ñ	t th d dh n	t th d dh n	p ph b bh m	y r l v	ʃ sh s h	a i u o ā	Klousa.
25	ကခဂဃင	စထဇည	ဧဒုဗလ	တထဒဝန	ပဖဗဘဗ	ယရလဝ	ဂဗဃဟ	အိဉုဓအ	Burmese.
26	ကခဂဃင	စထဇည	ဧဒုဗလ	တထဒဝန	ပဖဗဘဗ	ယရလဝ	ဂဗဃဟ	အိဉုဓအ	Square Pall.
27	කඛගඝඛ	චඡඣඤඞ	ඵඹඳඳඤ	තඵඳඳත	පඵඵභඵ	යරලව	ශඵසහ	අඉඋඵආ	Singalese.
28	က ච උ	ඟ ජ		තඟ ජ	ඵඵ	යරලව	භඟ		Pegu.
29	ක ජ ඣ	ඟ ජ		තඟ ජ	ඵඵ	යරලව	භඟ		Ahom.
30	ᳵ ᳶ ᳷	᳸ ᳹ ᳺ		᳻ ᳼ ᳾	᳽ ᳾ ᳿	᳾ ᳿ ᳺ ᳻	᳼ ᳾		Batak (Old.)
31	ᳶ ᳷ ᳸	᳹ ᳺ ᳻		᳼ ᳾ ᳿	᳽ ᳾ ᳿	᳾ ᳿ ᳺ ᳻	᳼ ᳾		Batak (New.)
32	ᳶ ᳷ ᳸	᳹ ᳺ ᳻		᳼ ᳾ ᳿	᳽ ᳾ ᳿	᳾ ᳿ ᳺ ᳻	᳼ ᳾		Rejang.
33	ᳶ ᳷ ᳸	᳹ ᳺ ᳻		᳼ ᳾ ᳿	᳽ ᳾ ᳿	᳾ ᳿ ᳺ ᳻	᳼ ᳾		Lamong.
34	ᳶ ᳷ ᳸	᳹ ᳺ ᳻		᳼ ᳾ ᳿	᳽ ᳾ ᳿	᳾ ᳿ ᳺ ᳻	᳼ ᳾		Tagala.
35	ᳶ ᳷ ᳸	᳹ ᳺ ᳻		᳼ ᳾ ᳿	᳽ ᳾ ᳿	᳾ ᳿ ᳺ ᳻	᳼ ᳾		Bisaya.
36	ᳶ ᳷ ᳸	᳹ ᳺ ᳻		᳼ ᳾ ᳿	᳽ ᳾ ᳿	᳾ ᳿ ᳺ ᳻	᳼ ᳾		Macassar.
37	ᳶ ᳷ ᳸	᳹ ᳺ ᳻		᳼ ᳾ ᳿	᳽ ᳾ ᳿	᳾ ᳿ ᳺ ᳻	᳼ ᳾		Bugi.

(340)

(341)

- One of the most influential hypotheses has been for a relationship with the Old Javanese or Kawi script, which is geographically the closest (Holle, 1882 and Kern, 1882).
- The following table compares letters in Kawi script with counterparts in three of its descendants and four major SSP scripts.
- As with the other SE Asian scripts, we can see superficial similarities in some cases but no clear overall relationship that would confirm a Kawi origin for the SSP scripts.
- Even any overall relationships between the SSP scripts themselves do not leap out at the eye.

	10C Kawi	14C Sumatran	17-20C Java-Bali	Sundanese Older 20C	Batak variants	South Sumatran	Old Philippine	Bugis- Makassarese
a	𑄀	𑄁	𑄂	𑄃		𑄄 𑄅	𑄆	𑄇
i	𑄈	𑄉	𑄊	𑄋	𑄌		𑄍	
u	𑄎	𑄏	𑄐	𑄑	𑄒		𑄓	
k	𑄔	𑄕	𑄖	𑄗	𑄘 𑄙	𑄚	𑄛	𑄜
g	𑄝	𑄞	𑄟	𑄠	𑄡	𑄢	𑄣	𑄤
ng	𑄥	𑄦	𑄧	𑄨	𑄩	𑄪 𑄫 𑄬	𑄭	𑄮
c	𑄯	𑄰	𑄱	𑄲	𑄳	𑄴 𑄵	𑄶	𑄷
j	𑄸	𑄹	𑄺	𑄻	𑄼	𑄽 𑄾		𑄿
ny	𑅀	𑅁	𑅂	𑅃	𑅄	𑅅		𑅆
t	𑅇	𑅈	𑅉	𑅊	𑅋	𑅌 𑅍	𑅎	𑅏
d	𑅐	𑅑	𑅒	𑅓	𑅔	𑅕	𑅖	𑅗
n	𑅘	𑅙	𑅚	𑅛	𑅜	𑅝	𑅞	𑅟
n̄	𑅠	𑅡	𑅢	𑅣	𑅤	𑅥	𑅦	𑅧
p	𑅨	𑅩	𑅪	𑅫	𑅬	𑅭	𑅮	𑅯
b	𑅰	𑅱	𑅲	𑅳	𑅴	𑅵	𑅶	𑅷
m	𑅸	𑅹	𑅺	𑅻	𑅼	𑅽 𑅾 𑅿	𑆀	𑆁
y	𑆂	𑆃	𑆄	𑆅	𑆆	𑆇	𑆈	𑆉
r	𑆊	𑆋	𑆌	𑆍	𑆎	𑆏	𑆐	𑆑
l	𑆒	𑆓	𑆔	𑆕	𑆖	𑆗	𑆘	𑆙
w	𑆚	𑆛	𑆜	𑆝	𑆞	𑆟 𑆠 𑆡	𑆢	𑆣
s	𑆤	𑆥	𑆦	𑆧	𑆨	𑆩 𑆪 𑆫	𑆬	𑆭
h	𑆮	𑆯	𑆰	𑆱	𑆲	𑆳 𑆴 𑆵	𑆶	𑆷

- Several attempts have been made to show a relationship with scripts in India, but with insufficient data.
- The following example of this approach is from Diringer (1948): only a small subset of the inventory of each script is examined.
- With the relatively small character inventory of most phonographic scripts, comparing scripts is analogous in complexity and difficulty to comparing phonemic inventories across languages.
- A further difficulty with all attempts to establish relationships with other scripts is the lack of any principled basis for comparison: letter shapes are compared globally, impressionistically, without reference to any structural features analogous to the distinctive features of spoken language phonology.

inscriptions in the South and by the Assam inscription in the North.¹ Thus in the Tagala, which may be taken as the type of the Eastern Malay alphabets, we have the following correspondencies.² The resemblance between the Assam and Tagala forms is singularly close.

	g	k	ng	l	m	h	u
Kistna,	𑂔	𑂕	𑂖	𑂗	𑂘	𑂙	
Assam,	𑂔	𑂕	𑂖	𑂗	𑂘	𑂙	𑂚
Tagala,	𑂔	𑂕	𑂖	𑂗	𑂘	𑂙	𑂚


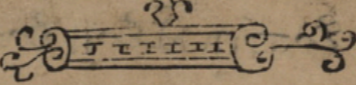
The Tagala alphabet must have been obtained from the Eastern Coast of Bengal at some time prior to the 8th century A.D. That it was conveyed by mariners who ventured on distant voyages is indicated by the fact that the oldest forms of the Malay letters are found in the islands which are most remote from the Indian shores. A glance at the Table on p. 340 will











- The oldest verifiably dated exemplar of one of the SSP scripts is the *Doctrina Christiana, en lengua española y tagala*, published in Manila in 1593. It is the first book published in a Philippine language and one of the first two books printed in the Philippines.
- The *Doctrina Christiana* was printed using the woodblock technique, with the Spanish Latin script and Tagalog Philippine script texts first written as calligraphy on sheets of paper, which were then glued to wooden blocks as templates for the printer to carve the letters into the wood.
- The text in the old Philippine script is most likely the oldest we know, and beyond doubt the most extensive old text known in any variety of old Philippine handwriting.


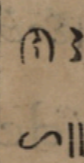
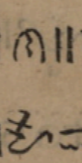
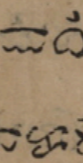
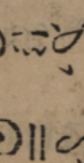
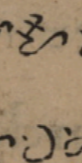
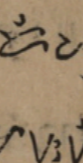
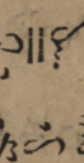
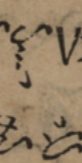
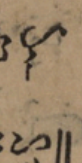












Doctrina Christiana, en
lengua española ytagala, co-
regida por los Religiosos de las
ordenes Impressa con licencia, en
S. gabriel, de la orden de S. Domingo
En Aldamila. 1593. ¶











lalo salahat. Angycalua ybig
in mo naman ang capova mo tavo
parang ang catauan mo. Amen.











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









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









         











         











         

- Although the calligraphy of the *Doctrina Christiana* was almost certainly based on examples taken from ordinary handwriting, there is much more variation in the handwriting of the time than appears in this particular text.
- The following table illustrates the range of variation within the *Doctrina Christiana* in comparison with the range of variants found in 17th century handwriting, Mangyan script variants from Mindoro and Tagbanuwa variants from Palawan. The last six variants at lower left are variants of ⟨a⟩ found in different Tagbanuwa hands illustrated in Francisco (1975).

a i u k g ng t d n p b m s h l y w

Doctrina Christiana
1593

Handwriting: 17th
century

Handwritten examples of the letters a, i, u, k, g, ng, t, d, n, p, b, m, s, h, l, y, w in the Doctrina Christiana script, showing various forms and combinations.

Mangyan: 19th
& 20th centuries

Handwritten examples of the letters a, i, u, k, g, ng, t, d, n, p, b, m, s, h, l, y, w in the Mangyan script, including some with diacritics like /ki/ and (F).

Tagbanuwa: 19th
& 20th centuries

Handwritten examples of the letters a, i, u, k, g, ng, t, d, n, p, b, m, s, h, l, y, w in the Tagbanuwa script, including a circled 'i' and a circled 'h'.

Similarities to Gujarati and Devanagari scripts

- There is little evidence that a relationship with Devanagari script, let alone with Gujarati, has ever been seriously entertained in the literature, however comparing the range of old Philippine lettershapes with early examples of the former as they appear in manuscripts from the 17th-19th centuries (Meherji Rana Library and Bombay University Library) and the 21st century (handwriting samples from Indian Type Foundry) reveals striking correspondences.
- This discovery is unexpected, but it is known that Gujarati traders were active in Sumatra in the 14th-16th centuries and traded cloth as far east as Sulawesi and the Moluccas.
- The following table compares old Devanagari lettershapes, early Gujarati shapes as they developed out of Devanagari, and Philippine lettershapes.*
- Certain Sumatran lettershapes were added for comparison to illustrate relationships that would not be apparent without Gujarati shapes as plausible antecedents.
- A set of hypothetical intermediate proto-script shapes are illustrated, continuing the plausible evolution of lettershapes from informal Devanagari, without the further developments typical of the Philippine script itself.

* The fact that the Devanagari and developing Gujarati lettershapes come from manuscripts dating to no earlier than the 17th century may lead one to believe that they are a poor source of comparative data for pre-15th century informal Devanagari. However, since these lettershapes were considered appropriate enough to appear in the formal context of the Avestan scriptures, this can be taken as a clue that they would likely have existed for a considerable length of time as marginal and then low prestige informal variants before they moved into the mainstream, displacing the older variants. It is quite conceivable that it would have taken at least couple of centuries for this to happen, which would place early informal variants in the appropriate timeframe (late 14th to early 15th centuries).

	a	p	y	m	s	w	b	k	d	h	ng	g	t	l	n	i	u
𑀓	𑀧	𑀧𑀸	𑀧𑀻	𑀧𑀼	𑀧𑀽	𑀧𑀾	𑀧𑀿	𑀧𑀺	𑀧𑀻	𑀧𑀼	𑀧𑀽	𑀧𑀾	𑀧𑀿	𑀧𑀺	𑀧𑀻	𑀧𑀼	𑀧𑀽
𑀓	𑀧𑀻	𑀧𑀼	𑀧𑀽	𑀧𑀾	𑀧𑀿	𑀧𑀺	𑀧𑀻	𑀧𑀼	𑀧𑀽	𑀧𑀾	𑀧𑀿	𑀧𑀺	𑀧𑀻	𑀧𑀼	𑀧𑀽	𑀧𑀾	𑀧𑀿
𑀓	𑀧𑀻	𑀧𑀼	𑀧𑀽	𑀧𑀾	𑀧𑀿	𑀧𑀺	𑀧𑀻	𑀧𑀼	𑀧𑀽	𑀧𑀾	𑀧𑀿	𑀧𑀺	𑀧𑀻	𑀧𑀼	𑀧𑀽	𑀧𑀾	𑀧𑀿
𑀓	𑀧𑀻	𑀧𑀼	𑀧𑀽	𑀧𑀾	𑀧𑀿	𑀧𑀺	𑀧𑀻	𑀧𑀼	𑀧𑀽	𑀧𑀾	𑀧𑀿	𑀧𑀺	𑀧𑀻	𑀧𑀼	𑀧𑀽	𑀧𑀾	𑀧𑀿
𑀓	𑀧𑀻	𑀧𑀼	𑀧𑀽	𑀧𑀾	𑀧𑀿	𑀧𑀺	𑀧𑀻	𑀧𑀼	𑀧𑀽	𑀧𑀾	𑀧𑀿	𑀧𑀺	𑀧𑀻	𑀧𑀼	𑀧𑀽	𑀧𑀾	𑀧𑀿
𑀓	𑀧𑀻	𑀧𑀼	𑀧𑀽	𑀧𑀾	𑀧𑀿	𑀧𑀺	𑀧𑀻	𑀧𑀼	𑀧𑀽	𑀧𑀾	𑀧𑀿	𑀧𑀺	𑀧𑀻	𑀧𑀼	𑀧𑀽	𑀧𑀾	𑀧𑀿
𑀓	𑀧𑀻	𑀧𑀼	𑀧𑀽	𑀧𑀾	𑀧𑀿	𑀧𑀺	𑀧𑀻	𑀧𑀼	𑀧𑀽	𑀧𑀾	𑀧𑀿	𑀧𑀺	𑀧𑀻	𑀧𑀼	𑀧𑀽	𑀧𑀾	𑀧𑀿
𑀓	𑀧𑀻	𑀧𑀼	𑀧𑀽	𑀧𑀾	𑀧𑀿	𑀧𑀺	𑀧𑀻	𑀧𑀼	𑀧𑀽	𑀧𑀾	𑀧𑀿	𑀧𑀺	𑀧𑀻	𑀧𑀼	𑀧𑀽	𑀧𑀾	𑀧𑀿
𑀓	𑀧𑀻	𑀧𑀼	𑀧𑀽	𑀧𑀾	𑀧𑀿	𑀧𑀺	𑀧𑀻	𑀧𑀼	𑀧𑀽	𑀧𑀾	𑀧𑀿	𑀧𑀺	𑀧𑀻	𑀧𑀼	𑀧𑀽	𑀧𑀾	𑀧𑀿
𑀓	𑀧𑀻	𑀧𑀼	𑀧𑀽	𑀧𑀾	𑀧𑀿	𑀧𑀺	𑀧𑀻	𑀧𑀼	𑀧𑀽	𑀧𑀾	𑀧𑀿	𑀧𑀺	𑀧𑀻	𑀧𑀼	𑀧𑀽	𑀧𑀾	𑀧𑀿
𑀓	𑀧𑀻	𑀧𑀼	𑀧𑀽	𑀧𑀾	𑀧𑀿	𑀧𑀺	𑀧𑀻	𑀧𑀼	𑀧𑀽	𑀧𑀾	𑀧𑀿	𑀧𑀺	𑀧𑀻	𑀧𑀼	𑀧𑀽	𑀧𑀾	𑀧𑀿
𑀓	𑀧𑀻	𑀧𑀼	𑀧𑀽	𑀧𑀾	𑀧𑀿	𑀧𑀺	𑀧𑀻	𑀧𑀼	𑀧𑀽	𑀧𑀾	𑀧𑀿	𑀧𑀺	𑀧𑀻	𑀧𑀼	𑀧𑀽	𑀧𑀾	𑀧𑀿
𑀓	𑀧𑀻	𑀧𑀼	𑀧𑀽	𑀧𑀾	𑀧𑀿	𑀧𑀺	𑀧𑀻	𑀧𑀼	𑀧𑀽	𑀧𑀾	𑀧𑀿	𑀧𑀺	𑀧𑀻	𑀧𑀼	𑀧𑀽	𑀧𑀾	𑀧𑀿
𑀓	𑀧𑀻	𑀧𑀼	𑀧𑀽	𑀧𑀾	𑀧𑀿	𑀧𑀺	𑀧𑀻	𑀧𑀼	𑀧𑀽	𑀧𑀾	𑀧𑀿	𑀧𑀺	𑀧𑀻	𑀧𑀼	𑀧𑀽	𑀧𑀾	𑀧𑀿

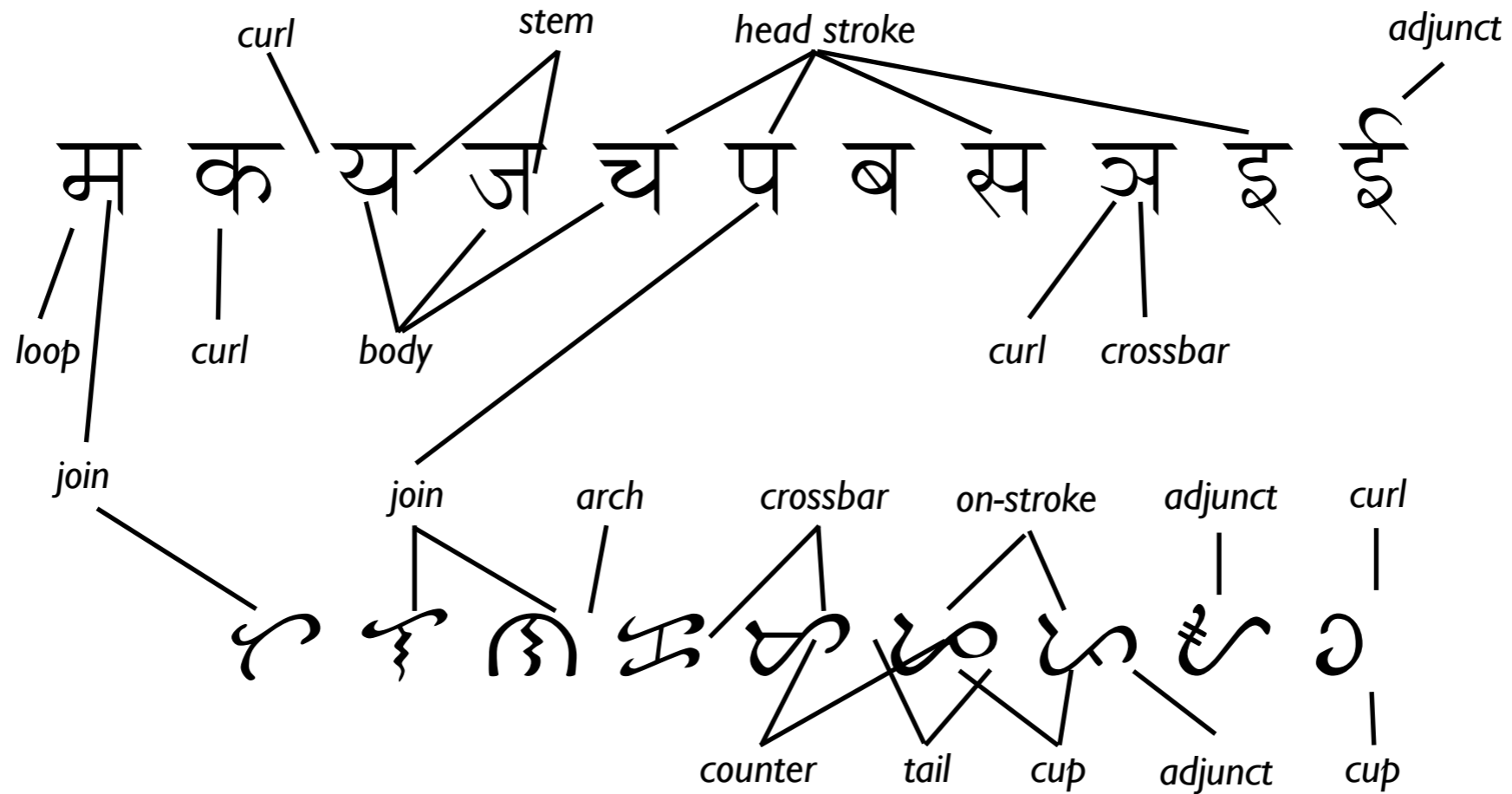
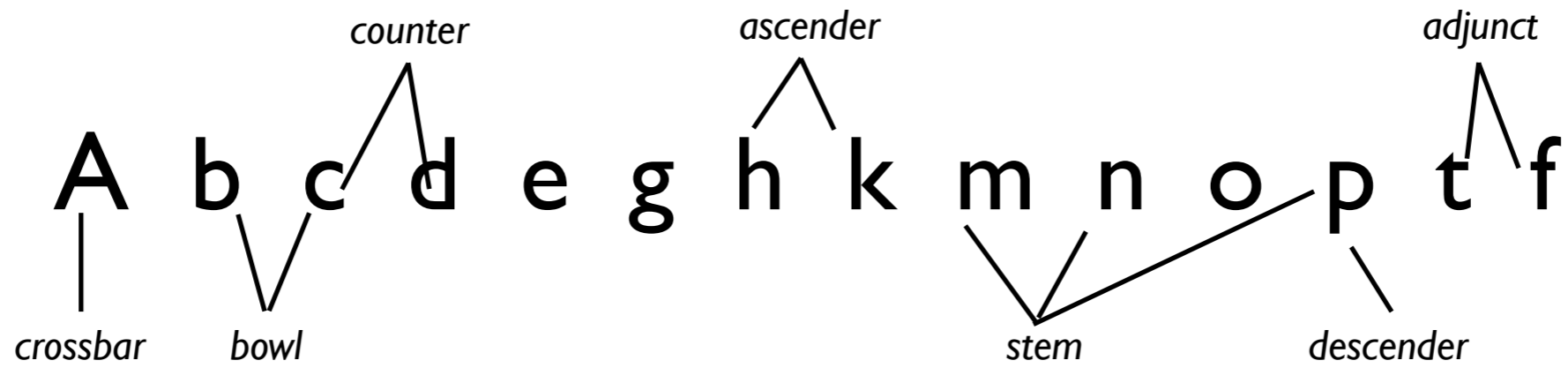
A principled approach to script comparison

- Although the resemblances between the old Philippine script (as well as Sumatran equivalents) and the informal Devanagari from which modern Gujarati script developed are striking, the comparisons drawn remain just as global and impressionistic as in earlier attempts to find an origin for these scripts.
- There is no principled basis to be found in available literature for evaluating the Early Gujarati Script hypothesis as superior to any of the others that have been proposed.
- What is needed to support the Gujarati origin hypothesis is a set of well-motivated, case-independent theoretical postulates, including a well-defined (if basic) model of character structure, to provide a framework for applying the comparative method to script pairs on a principled basis comparable to the standards applied to phonological comparisons between language pairs.
- The following three slides illustrate elements of a descriptive language that will allow us to isolate features of character structure that can be compared point for point between letter pairs in different scripts and script varieties.
- This analysis of character structure and change will make it possible to state precisely how the Philippine, Sumatran and informal Devanagari lettershapes relate to each other by systematic, regular changes.

Some elements of character structure

- Characters in a given script are basic strokes or combinations of basic strokes making up elements of structure we can call “graphomes” (with an ‘o’, cf. “genome”).
- Graphomes, depending on the script, can take different forms including the body of a letter, a vertical stem to which the body attaches, a headstroke as in formal Devanagari and other North Indian scripts, and simple elements such as dots and diacritics.
- Some terms are standard in typography: counter – the negative space enclosed inside a bowl; ascender, descender, join, stem.
- Others are neologisms: arch and its counterpart cup; curl, adjunct – a graphome adjoined after the main body of the character has been formed.
- The following slide illustrates various graphomes typical of three different scripts.

Elements of character structure



Stereotypes

- One of the defining features of individual scripts is the presence of stereotypical structural elements that repeat themselves across a large proportion of a script's character inventory.
- These develop in the process of change from parent scripts, through a process of reanalysis of often unrelated earlier stroke combinations.
- The development of stereotypes may function to simplify the overall task of learning the character inventory of a script by providing easily learned basic shapes to which other graphemes are added.

Stereotypes

Latin script: bowl + stem

a b c d e f h j k l m n o p q r

Devanagari: headstroke + body + stem

म क य ज च प ब स अ इ ई

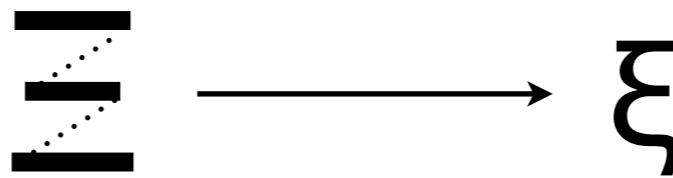
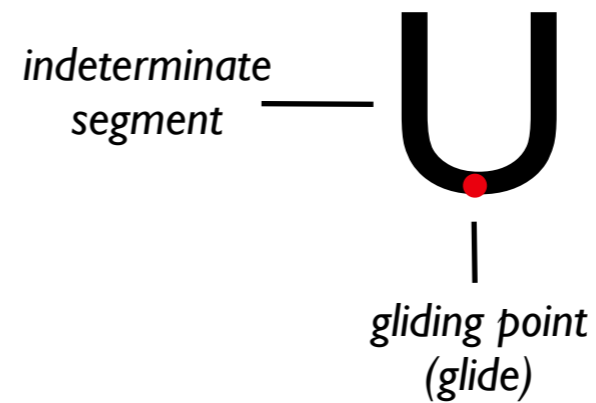
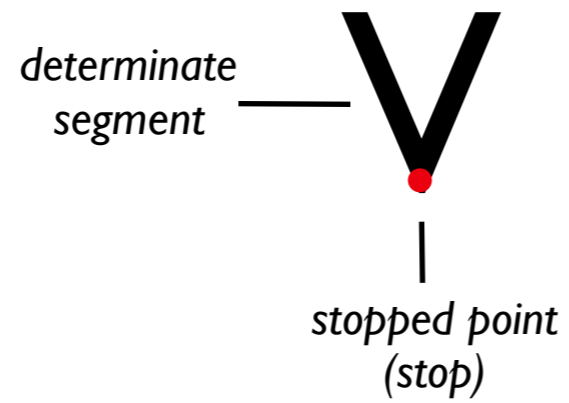
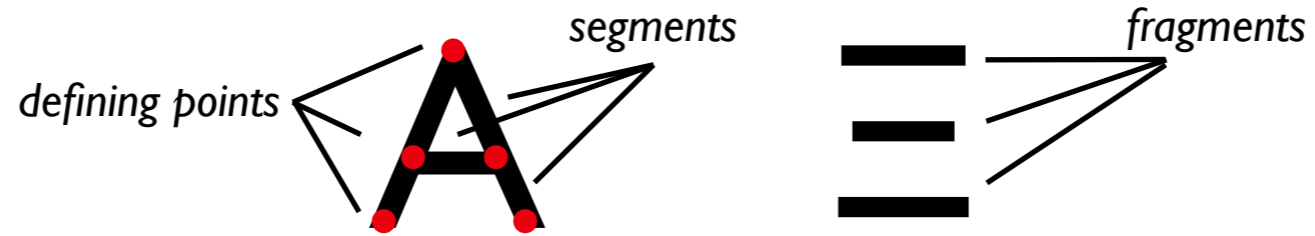
Old Philippine script: cup/curl + tail

~ 𑀓 𑀔 𑀕 𑀖 𑀗 𑀘 𑀙 𑀚 𑀛 𑀜 𑀝 𑀞

Stroke structure

- Graphemes form one level of character structure, often comparable but just as often dissimilar across scripts.
- At a finer level of detail, individual basic strokes can be described in terms of defining points through which the writing hand moves; this is an extension of the analysis of movement structure in sign languages in Miller (1997).
- A stroke segment is defined by its bounding points; segments that are not connected to other segments in the same character are defined as fragments.
- There are two basic bounding point types:
 - Stops: when it ends or changes direction abruptly at a stop, a segment is “determinate”.
 - Glides: when it gradually changes direction into the next segment, gliding through a non-discrete bounding point, a segment is “indeterminate”.
- Stops (and to some extent glides) are loci of instability:
 - Segments may become disconnected at these points to form fragments.
 - Direction changes may replace stops with glide points, cf. V > U.
- Conversely, fragments may again become joined by processes of transitional stroke insertion where the writing instrument is no longer lifted from the surface; typically this involves the insertion of glide points rather than stops.

Stroke structure



Processes: transition insertion and gliding

A structure-based comparison with informal Devanagari

- With the concepts outlined in the previous slides, it is now possible to describe correspondences between the old Philippine script (and Sumatran equivalents) and informal Devanagari in precise formal terms.
- The Devanagari letters have been grouped into form classes sharing similar structural features: some correspondences/changes are sensitive to letter form.
- Systematic correspondences:
 1. The stopped join between the body and stem in Devanagari gradually develops into a raised, gliding join in early Gujarati, which corresponds (with few exceptions) to the gliding join in the Philippine script.
 2. The stem of Devanagari and early Gujarati corresponds in most cases to a short downward tail in the Philippine script.
 3. Where the Devanagari/early Gujarati letter begins with a pronounced counterclockwise curl from the right rather than a segment descending straight down from the left side of the headstroke, the Philippine letter ends with a curl up to the left rather than with the expected downward tail. The Tagbanuwa ⟨w⟩ (at the bottom of the Philippine column) and the Sumatran ⟨w⟩ show the expected downward tail, though, and the Bugis-Makassarese ⟨b⟩ (not illustrated in this table) does as well.

A structure-based comparison (2)

- The Devanagari headstroke generally abbreviates to a short on-stroke at the top left of the corresponding early Gujarati letter. In early Gujarati, a headline was often drawn across the page in imitation of the Devanagari headstroke and the new Gujarati letters (including the short on-stroke) were “hung” from that line.
- In later Gujarati and in the Philippine and Sumatran scripts, it behaves in different ways depending on form class:
 4. Where the body of the letter begins with a more or less vertical descent from the headstroke, this short tick remains in Gujarati and the Philippine script.
 5. Where the body of the letter begins with a counterclockwise curl (⟨w⟩, ⟨b⟩), the beginning is raised to the headstroke (regressive location assimilation) and the headstroke is reduced to a variable short on-dash, which disappears in the modern script. This variable dash also appears on ⟨w⟩ in the Philippine and North Sumatran Batak script ⟨w⟩ as well as ⟨d⟩ in the Philippine and North and South Sumatran scripts.
 6. Where the initial stroke curls down and to the left (Devanagari ⟨ny⟩>⟨ng⟩ and ⟨g⟩), the reduced headstroke is incorporated bodily into the beginning of the curl.

A structure-based comparison (2)

7. Where the body of the letter begins with a clockwise curl moving upward from the lower portion of the letter space toward the stem, the headstroke disappears in Gujarati except for ⟨l⟩, where the initial curl detaches from the rest of the letter and the fragment descends from the headstroke, incorporating a variable short on-stroke which is lost in the modern script.

In the Philippine script, the full headstroke is present in the three letters in this class, transitioning directly into the short downstroke that corresponds to the Devanagari stem. The body of the letter descends directly from the remnant of the headstroke, moved slightly left from the original join with the stem/tail. This structure persists in ⟨t⟩ in the Sumatran scripts.

In the Philippines, both ⟨t⟩ and ⟨l⟩ add a short initial counterclockwise curl (except in Kapampangan variants, not illustrated here).

8. Overall, the letter bodies keep their shape in the Philippine script, with slight reanalysis of stroke orders and positions most notably in ⟨a⟩, ⟨m⟩, ⟨k⟩ and ⟨i⟩, which modify the body of the letter to conform to the stereotype shape found in ⟨a⟩, ⟨p⟩ or ⟨y⟩. In ⟨m⟩, the reanalysis preserves the closed counter of the Devanagari and Gujarati letter; the loop remains in early variants of the Sumatran letters. In Philippine ⟨a⟩, the triple stroke adjunct of Devanagari is best reflected in the Tagbanuwa variants of the letter, but is displaced upward on the body of the letter in the Luzon variants.

Batak ⟨i⟩ and ⟨u⟩ are both notably fragmented versions of their Philippine counterparts.

a p y m s w b k d h ng g t l n i u

अ	अ	अ	अ	अ
अ	अ	अ	अ	अ
अ	अ	अ	अ	अ
अ	अ	अ	अ	अ
अ	अ	अ	अ	अ

व	व	व	व	व
व	व	व	व	व
व	व	व	व	व
व	व	व	व	व
व	व	व	व	व

द	द	द	द	द
द	द	द	द	द
द	द	द	द	द
द	द	द	द	द
द	द	द	द	द

ज	ज	ज	ज	ज
ज	ज	ज	ज	ज
ज	ज	ज	ज	ज
ज	ज	ज	ज	ज
ज	ज	ज	ज	ज

न	न	न	न	न
न	न	न	न	न
न	न	न	न	न
न	न	न	न	न
न	न	न	न	न

ॐ	ॐ	ॐ	ॐ	ॐ
ॐ	ॐ	ॐ	ॐ	ॐ
ॐ	ॐ	ॐ	ॐ	ॐ
ॐ	ॐ	ॐ	ॐ	ॐ
ॐ	ॐ	ॐ	ॐ	ॐ

Intermediate origin of Old Philippine script?

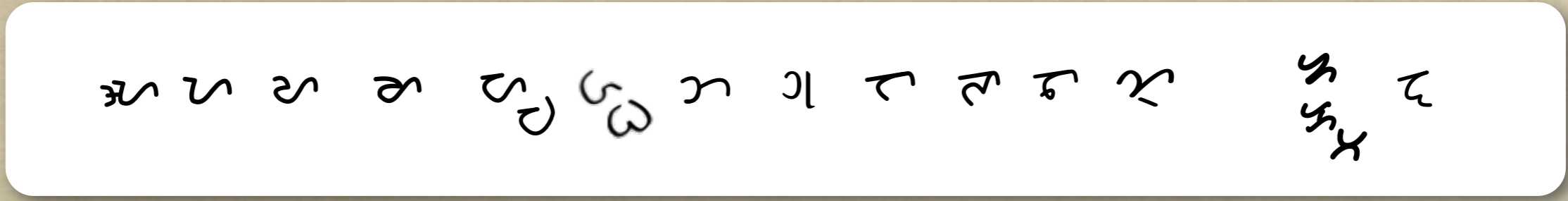
- There are clear, systematic and regular correspondences between the Philippine letter shapes and their informal Devanagari/early Gujarati counterparts. These are a robust indication that the Philippine script (and by extension the Sumatran scripts) originate in early informal Devanagari script introduced by Gujaratis.
- Historical evidence:
 - Gujarati traders traded in Sumatra in the 14th-16th centuries.
 - They traded cloth to Sulawesi and Moluccas, but there is no evidence of them being present in the Philippines.
- The script was likely introduced indirectly via speakers of Bugis or Makassarese from South Sulawesi:
 - Old Philippine script did not spell coda Cs: it had a $\langle C^{(V)} \rangle$ syllabographic template.
 - This is the same as Bugis-Makassarese script, which also uses a $\langle C^{(V)} \rangle$ syllabographic template. This is natural for these languages because the range of syllable-final consonants is limited and relatively predictable ($-N_{\text{homorganic}} / -\eta$, $-C_{\text{homorganic}} / -?$).
 - According to the Fox-Conklin hypothesis (Scott, 1984), the script could only have this feature if it were adopted from Sulawesi users: in Tagalog and other Philippine languages, there is a wide range of syllable-final consonants and it is difficult to guess which one should appear in a given case; there would be no plausible functional motivation for not spelling these out overtly if the script already allowed for that.
- Apart from this orthographic peculiarity, the Philippine and South Sulawesi scripts also share a particular abbreviation: two syllables with same consonant were often spelled with a single consonant letter bearing two vowel marks.

Structural relationships between Bugis-Makassarese, Philippine script and the intermediate proto-script

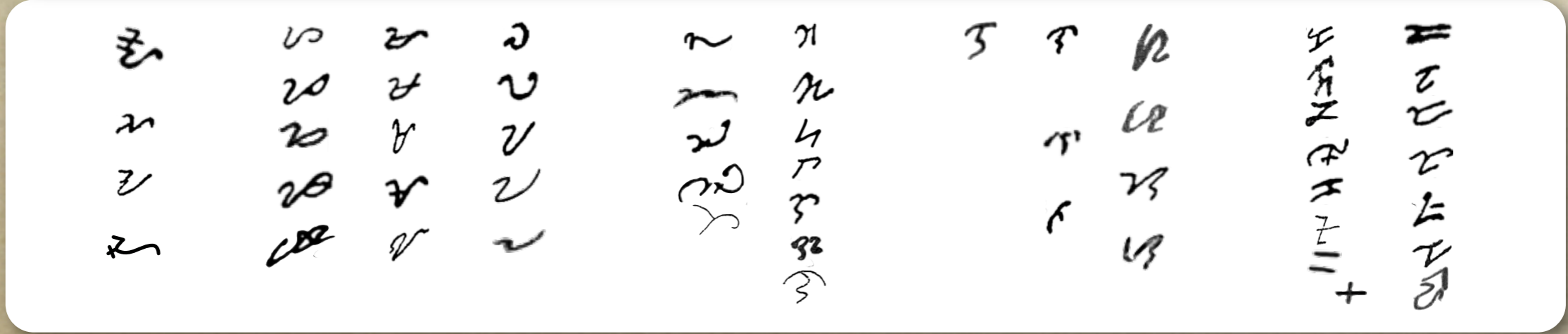
- Despite the macrostructural evidence, the hypothesis of an intermediate South Sulawesi origin has met with skepticism: the Bugis-Makassarese shapes are so much simpler (simple arches, cups and dots) that it seems unlikely that the more complex old Philippine shapes could derive from them.
- However, this observation fails to take into account the fact that the old Philippine script is the oldest documented script in the SSP group and that records for Bugis-Makassarese script date at the very earliest to at least a century later. This would give time for the appearance of B-M script to have changed significantly from how it may have looked in preceding centuries.
- Hypothesis: the old Philippine shape variants (and likely the reconstructed intermediate proto-script shapes preceding them) reflect earlier Bugis-Makassarese shapes and the B-M shapes we see in surviving documents are a simplification of earlier shapes.
- The following table shows how early modern B-M shapes (Noorduyn, 1993) and modern shapes correspond directly to variants in the reconstructed proto-script and early Philippine script:
 - The proto-script and Philippine variant shapes are systematically reinterpreted as simplified arch and cup shapes whose defining points correspond directly to the defining points of their more complex counterparts, although stops often change to glides and vice versa. One of the most extreme examples, the development of <w> from the first variant illustrated, is the near mirror image of the development of Greek lower case ω from Ω .
 - Where the proto-script or Philippine letter has an adjunct stroke in a given position, this corresponds to a dot in the same position in early B-M shapes, except for <t> and <m>, where the expected dot would have led to a loss of contrast with <n> and <d>.

a p y m w b ng g t l n s h k d

Post-Gujarati shapes



Extra variant shapes – Philippines



Intermediate shapes



Bugis-Makassarese



Bugis-Makassarese letters with no Philippine cognates

- One Bugis-Makassarese letter in the preceding table is unrelated to its Philippine functional counterpart: ⟨h⟩ is derived from the Arabic letter ه adopted to represent Arabic /h/ and /ħ/ phonemes not present in Bugis and Makassarese; the table shows that early variants were indistinguishable from Arabic shapes before their double closed counter shapes underwent reanalysis to conform to B-M script's arch/cup stereotypes. The likelihood that B-M script had no ⟨h⟩ letter prior to borrowing the Arabic shape is only superficially an argument that the Philippine script could not have gotten its own ⟨h⟩ via Sulawesi: since Malay was the trade language of the archipelago, it is likely that any Bugis or Makassarese traders would have known some Malay and have been at least passively aware that this letter represented /h/ in Malay, even if they did not use it for their own language.
- The following table illustrates three B-M letters with no Philippine script counterparts. These – independent of the Philippine connection – show direct structural correspondences with early informal Devanagari and Gujarati shapes:
 - ⟨c⟩ is a fragmented counterpart of the Gujarati letter with a rising tail that behaves similarly to Philippine ⟨w⟩.
 - ⟨j⟩ is an arch with a final clockwise closing curl: it likely developed from the early Gujarati shape in a way similar to the modern Gujarati letter itself.
 - ⟨r⟩ is a simple fragmented counterpart of the Gujarati letter.
- The fact that these three letters relate directly to their Gujarati equivalents is independent evidence for the hypothesis that early B-M script was closely related in form to the early informal Devanagari of Gujarati merchants. These structural correspondences reinforce the hypothesis that early modern and modern B-M lettershapes are just systematic simplifications of earlier more complex shapes closer to those in early Gujarati and Philippine scripts.
 - Letters used only in Bugis (and its Bimanese offshoot) to represent homorganic NC clusters are not dealt with here; they were optional in Bugis spelling (Noorduyn, 1993) and appear to be later borrowings from a South Sumatran script variety.

Bugis-Makassarese

Later Gujarati shapes

Nagari, Gujarati
shapes

ꣳ ꣴ ꣵ

ꣶ

ꣷ ꣸ ꣹ ꣺

c

ꣻ ꣼

ꣽ

ꣾ

ꣿ ꣺ ꣻ ꣼

ꣽ ꣾ

j

ꣿ ꣺ ꣻ ꣼

ꣽ

ꣾ

ꣿ ꣺ ꣻ ꣼

ꣽ ꣾ

r

Batak letter shapes and their relation to the proto-script (I)

- Comparisons with northern Sumatran Batak lettershapes in preceding tables bring out correspondences to old Philippine and informal Devanagari/early Gujarati scripts. Although there are similarities, there are also significant differences.
- Few records of Batak script can be dated, so we have little idea how old these texts are.
- As with Bugis-Makassarese script, Batak shapes can be understood as the result of evolution toward certain stereotypes:
 - Straight lines: horizontal, rising and falling
 - Shallow arches
 - Short down-curls at the ends of letters
 - Long final clockwise down-curls
- The following table compares Batak letter variants with their informal Devanagari and early Gujarati counterparts as well as some Philippine equivalents. Letters are grouped into three main form classes (red rectangles) based on shared features in Batak letters:
 - short final tails, short final downstrokes or no final downstrokes
 - Final tail or large clockwise downstroke
 - Fragmented stroke segments
- Two secondary groupings are shown enclosed in dashed rectangles:
 - Letters with a short straight down-stroke corresponding to a clockwise curl from upper left in Gujarati (green dashed rectangle)
 - Letters sharing structure with the body of the Gujarati letter but missing an extra stroke in the Gujarati letter (mauve dashed rectangle)

Batak letter shapes and their relation to the proto-script (2)

- In the first two groupings, the structure preceding the downward tail of a letter (or part of a letter) in the intermediate proto-script is a regular predictor of how the final stroke of the corresponding letter appears in Batak.
- Batak ⟨p⟩ is illustrated with three variants. The straight line is by far the most common; the other two are rarer variants. The reverse tilde shaped variant is the most plausibly related to the Gujarati shape (and to the South Sumatran shape; see below). It is a fair assumption that this is an archaic variant that underwent simplification to an arc and then a straight line.
- ⟨t⟩ has two main variants. The “folding table” shape is most common in southern and eastern varieties while the “lazy S with a line above” shape is most common in northern and western ones. The relation between the two modern variants is not obvious without further information. However, the shape illustrated just above the “folding table” shape provides a clue to their relationship. This “7 with a curving cross-stroke” shape, observed in a document with other apparently older lettershapes illustrated in Kozok (1996), provides a structural bridge to the reconstructed proto-script shape. The adjunct counterclockwise curl of the proto-script letter appears to have detached and become more shallow, and has moved right to intersect with the tail of the letter. The other Batak variant can also be related directly to the proto-script shape. Here, the counterclockwise curl appears to have been extended so that it reaches and contacts the headstroke: we see this clearly in one variant (above the modern shape) that is found in numerous manuscripts. In the modern shape, the join point has become a locus of fragmentation where the headstroke has split into two separate fragments connected by the elaborated reflex of the original counterclockwise curl in the proto-script letter.
- The third grouping (letters with fragmented strokes) includes two letters ⟨r⟩, ⟨u⟩ whose Gujarati counterparts have large clockwise curls, and ⟨i⟩, plausibly related to an intermediate shape found in the Philippines that has three strong horizontal strokes.

Batak letter shapes and their relation to the proto-script (3)

- ⟨m⟩, ⟨ng⟩ and ⟨s⟩, enclosed in dashed green rectangles, all begin with a large clockwise loop in Gujarati script. Although the remaining portions of the corresponding letter Batak shapes relate systematically to the Gujarati letters as expected, the loop is missing. Overall, Batak appears to eschew initial loops, and these loops have been replaced by simplified canonical Batak stroke types. This may also be part of the reason for the fragmentation of the strokes in ⟨r⟩ and ⟨u⟩, as well as the shallow detached arch in one variant of ⟨y⟩ that corresponds to the clockwise initial curl of the Devanagari and Gujarati counterpart.

This avoidance of an initial loop also affects the shape of some other characters not illustrated here. The zero vowel mark *pangolat*, a short downward dash in most varieties, corresponds to a large counterclockwise loop in old Javanese Kawi script, in which it most likely originates (see below). A similar observation applies to the ⟨-e⟩ vowel sign, *hatadingan*, which appears as a plain horizontal dash over the left side of the base letter in Batak but whose Balinese-Javanese script counterpart *taling* has an overall clockwise loop shape preceding the base letter.

- ⟨h/a⟩, ⟨g⟩ and ⟨l⟩, enclosed in dashed mauve rectangles, all have shapes that correspond closely to the main body of the Gujarati/proto-script shapes, but are lacking an extra stroke that appears in the latter. In ⟨h⟩, this is a diagonal line below the main body of the Gujarati letter; in ⟨g⟩ it is the detached stem fragment, and in ⟨l⟩, the headstroke plus short tail.
- ⟨d⟩ relates to the Gujarati and proto-script shape by the disappearance of the final tail-like segment, a feature also found in one Philippine handwritten variant. The downward sloping straight line observed in most Batak manuscripts corresponds to a shallow counterclockwise curl found in an apparently relatively early manuscript illustrated in Kozok (1996).

Batak letter shapes and their relation to the proto-script (4)

- ⟨k⟩ is a special case. The Batak letter has two closely related variants; one is similar to a “3” on its side, and the other is similar to ⟨g⟩ with an adjunct diagonal stroke below the body. Neither variant relates obviously to the Philippine/Sulawesi shapes, nor to the early Gujarati shapes from which these derive.

However, the related Kaithi and Mahajani scripts of North India have shapes that are further developments of the early Gujarati shape (the six grey and black variants below the brown early Gujarati variants). In the first line, the glide point at the bottom of the initial curl has changed to a stop, and the stopped join with the diagonal stroke on the right has changed to a glide. In the next two variants the initial straight downstroke reduces to a short tick. These variants occur in Northeast Indian Kaithi, some older Gujarati texts, and even in some very informal Devanagari handwriting, cf. Palmer (1886).

In the final two variants, from Mahajani script, the initial tick has fallen away. Although this specific shape occurs in no Gujarati manuscript I have seen, it is quite plausibly an early variant in the most informal mercantile varieties of the script. On the plausible assumption that this shape was part of the Gujarati repertoire introduced to Sumatra, it is the likely direct antecedent of the “lazy 3” Batak variant.

- There is a set of letters (⟨h/a⟩ to ⟨n⟩) that show quite convincing similarities in shape to Kawi letters, here illustrated with 14th century *Malayu* shapes from the Tanjung Tanah Code of Law (Kozok, 2004a, b). These Sumatran lettershapes (with their South Sumatran counterparts) are the most convincing arguments for the theory that the SSP scripts are latter-day descendants of Kawi or perhaps an earlier script such as Pallava. However, other letters in these scripts resemble Kawi shapes much less convincingly and roundabout explanations are needed.

With the Gujarati hypothesis, however, direct and systematic structural relationships can be detected for nearly all letters, including these ones. However, the possibility of sub- or adstrate influence from the *Malayu* post-Kawi script used in the same region helps to explain certain features such as the apparent deletion of extra strokes in ⟨h⟩, ⟨g⟩ and ⟨l⟩, and possibly the particular shapes chosen for ⟨k⟩ and ⟨n⟩.

Derivation of Batak letterforms

Candidate intermediate shapes
 Batak variants
 Gujarati-Kaithi-Mahajani: 17th-20th centuries
 Devanagari: 17th to 19th centuries

<j> ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ
ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ
ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ
ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ
ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ
ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ
ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ
ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ	ॐ

ॐ	ॐ	ॐ	ॐ
ॐ	ॐ	ॐ	ॐ
ॐ	ॐ	ॐ	ॐ
ॐ	ॐ	ॐ	ॐ
ॐ	ॐ	ॐ	ॐ
ॐ	ॐ	ॐ	ॐ
ॐ	ॐ	ॐ	ॐ
ॐ	ॐ	ॐ	ॐ

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ॐ	ॐ
ॐ	ॐ
ॐ	ॐ
ॐ	ॐ
ॐ	ॐ
ॐ	ॐ
ॐ	ॐ

ॐ	ॐ	ॐ	ॐ
ॐ	ॐ	ॐ	ॐ
ॐ	ॐ	ॐ	ॐ
ॐ	ॐ	ॐ	ॐ
ॐ	ॐ	ॐ	ॐ
ॐ	ॐ	ॐ	ॐ
ॐ	ॐ	ॐ	ॐ
ॐ	ॐ	ॐ	ॐ

Sumatran Malayu script

South Sumatran letter shapes and their relation to the proto-script

- Like the Batak scripts, texts in South Sumatran scripts cannot be dated with any confidence to more than a couple of centuries ago. The earliest known such text, in Lampung script, was acquired in 1630.
- Of the several varieties, Rejang-Central Malay has a very strict and limited set of stereotypes: a checkmark shape, a counterpart rotated 180°, a long rising diagonal stroke, a short falling diagonal tick, and a rare loop. Kerinci script has similar stereotypes, with the overall axis rotated to horizontal in one style, but its letter shapes seem to be simplifications of RCM shapes (some of them also found in RCM). Lampung shapes (and the apparently transitional Tanjung Tanah shapes) appear to be cursive reinterpretations of RCM-like shapes.
- The relationships of most South Sumatran shapes to proto-script variants are direct or similar to those in Batak and Bugis-Makassarese. In particular, ⟨k⟩, ⟨g⟩, ⟨h⟩ and ⟨l⟩ have the same specific features discussed above for Batak. Only a few others require further comment:
 - The rotated “Z” shape of ⟨ng⟩ relates directly to the Bugis-Makassarese shape and the hypothetical pre-Batak shape, but has an extra stroke in two variants: without this stroke, it would be easily confused with ⟨l⟩.
 - ⟨n⟩, ⟨c⟩, ⟨r⟩ and ⟨w⟩ show general similarities to their proto-script or Gujarati counterparts, but these are not clear enough to establish direct correspondences. Hypothetical intermediate forms are given outlined in green. It is plausible that ⟨n⟩ might have developed along lines somewhat similar to its counterpart in southern Mangyan (“Hanunóo”) script in the Philippines. For ⟨c⟩ and ⟨r⟩ a hypothetical intermediate stage may have developed a loop with closed counter as an elaboration of the stopped join at the bottom left corner of each letter. This is a not uncommon type of change, cf. the development of lower case Greek γ from upper case Γ, cursive ℒ / ℔ from L, or the looped shape taken by many lower case ascenders in connected cursive Latin script, cf. *l*, *h*, *k*, *l*. The starred form for ⟨w⟩ is a hypothetical first stage before rotation. An early form may in fact have been much more similar to ⟨d⟩ in shape, which would have led to its rotation to avoid the two being confused.
- Almost all South Sumatran scripts have the same shape for ⟨a⟩, which relates directly to one old Philippine variant simply by rotating the adjunct stroke on the left to conform to South Sumatran stereotypes. A second variant, outlined in red, is found only in the Tanjung Tanah Book of Laws (Kozok 2004a, b). Kozok proposes that it is a conventionalised ligature of ⟨h⟩ plus ⟨-Ø⟩ (the zero vowel/virama sign). This is unsurprising given that ⟨h⟩ serves as a null consonant initial vowel bearer in Batak and Kerinci scripts, likely reflecting a historical loss of aspiration.

	k	g	ng	t	d	n	p	b	m	c	j	ny	s	r	l	y	w	h	a
Devanagari-	क	ग	ज	त	द	न	प	ब	म	च	ज	स	र	ल			व	ह	अ
Gujarati-	ક	ગ	જ	ત	દ	ન	પ	બ	મ	ચ	જ	સ	ર	લ			વ	હ	અ
Kaithi-	क	ग	ज	त	द	न	प	ब	म	च	ज	स	र	ल			व	ह	अ
Mahajani	क	ग	ज	त	द	न	प	ब	म	च	ज	स	र	ल			व	ह	अ
shapes	क	ग	ज	त	द	न	प	ब	म	च	ज	स	र	ल			व	ह	अ
Intermediate	क	ग	ज	त	द	न	प	ब	म	च	ज	स	र	ल			व	ह	अ
shapes	क	ग	ज	त	द	न	प	ब	म	च	ज	स	र	ल			व	ह	अ
Rejang	क	ग	ज	त	द	न	प	ब	म	च	ज	स	र	ल			व	ह	अ
(corrected to <45°)	क	ग	ज	त	द	न	प	ब	म	च	ज	स	र	ल			व	ह	अ
After Marsden (1811)	क	ग	ज	त	द	न	प	ब	म	च	ज	स	र	ल			व	ह	अ
Tanjung Tanah	क	ग	ज	त	द	न	प	ब	म	च	ज	स	र	ल			व	ह	अ
(Kozok 1999)	क	ग	ज	त	द	न	प	ब	म	च	ज	स	र	ल			व	ह	अ
Kerinci	क	ग	ज	त	द	न	प	ब	म	च	ज	स	र	ल			व	ह	अ
(Westenenk 1922)	क	ग	ज	त	द	न	प	ब	म	च	ज	स	र	ल			व	ह	अ
Lampung	क	ग	ज	त	द	न	प	ब	म	च	ज	स	र	ल			व	ह	अ
(vd Tuuk 1868)	क	ग	ज	त	द	न	प	ब	म	च	ज	स	र	ल			व	ह	अ

The Makassarese *jangang-jangang* (“bird”) script

- Unlike the Bugis-Makassarese script of most historical texts from South Sulawesi, the *jangang-jangang* script is very little known and has received scant attention in the literature. The following image displays two pages from the *Chronicles of Gowa and Tallo’*, the oldest dated manuscript from South Sulawesi, and one of the few documents in this script. There is considerable variation in lettershapes over time as the dated entries proceed through the mid-1600s to the end of the century; these two pages are from 1667 and show the earliest lettershapes in the document.
- It has been assumed that due to its greater complexity, this script might have represented an earlier structural stage out of which B-M script developed. This hypothesis was never demonstrated and is incompatible with the arguments presented above that B-M script developed via a radical simplification of proto-script lettershapes derived from early informal Devanagari.
- It is notable though that a large proportion of *jangang-jangang* lettershapes are formed with high arches, the same stereotype grapheme preferred by B-M script; just such high arches are a signature stereotype of the archaic “palm leaf” style in contrast with the shallow arches of standard B-M script (Noorduyn, 1993). The script also uses the same vowel signs as B-M script and even shares the vowel doubling abbreviation with B-M and old Philippine script. The fact that *jangang-jangang* shares these features with B-M script needs to be accounted for.

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Handwritten text in Arabic script, likely a liturgical or historical document. The text is arranged in approximately 20 horizontal lines. Several lines feature larger, bolded characters in red and black, which are likely section markers or decorative initials. Notable markers include the number '29' at the top right, '250000' in the middle, and '30' further down. The script is dense and fills most of the page area.

Handwritten text in Arabic script, continuing from the left page. It also consists of approximately 20 horizontal lines of dense script. Similar to the left page, there are several lines with larger, bolded characters in red and black, serving as section markers. The overall layout and style are consistent with the left page, suggesting a single continuous text or a related document.

The Makassarese *jangang-jangang* (“bird”) script (2)

- Despite the presence of steep arches characteristic of B-M script in the shapes of *jangang-jangang* letters, structural similarities between the two scripts are only sporadic. However, the script shows systematic correspondences with South Sumatran scripts. For the most part, the lettershapes take on a more vertical orientation than is typical in the South Sumatran scripts, and the stroke structure is reinterpreted to a large extent to fit with the stereotypical arches of B-M script.
- The following image shows two examples of Rejang-Central Malay script written on a vertical axis rather than its characteristic 30-45° axis. The first is a description from de Sturler (1843) of *Gaja mukur*, one of several special styles in which the script could be written. The second is an inscribed seashell from the Bengkulu region on the southwest coast of Sumatra — known as “Bencoolen” while a British outpost from 1685 to 1824 — with the Malay inscription *kapada tuwan sakarman dari ahmad* “for Sir/Mister [Sackerman?] from Ahmad”.

5 Gadja-moekoer de N. T. M. J. N. W. N. N. X
 ee...ku...o pu...ku...n-dich e ja mu



KITLV Tropenmuseum

The Makassarese *jangang-jangang* (“bird”) script (3)

- From the evidence in the preceding images and the following table it seems that *jangang-jangang* letters indeed derived in large part from South Sumatran lettershapes written in a (largely) vertical orientation, with an arch stereotype superimposed.
- For the most part, the relationships between the South Sumatran and *jangang-jangang* shapes are straightforward enough, keeping in mind the evidence used for other script pairs above, to require no elaboration. There are however a few letters that require commentary:
 - ⟨b⟩ relates not to the usual South Sumatran shape that is similar to the Bugis-Makassarese one, but is for all intents and purposes identical to the shape in a single Lampung manuscript reproduced in van der Tuuk (1868). This is a rotated (or flipped) and fragmented counterpart of the conservative Philippine and Batak shape. Although ⟨m⟩ is flipped/rotated with respect to the South Sumatran variant that also possesses a medial loop, it corresponds very directly to the proto-script shape and may well reflect a more conservative variant from the east coast of Sumatra. ⟨l⟩ is both written more vertically and flipped horizontally: this may be in order to distinguish it from ⟨p⟩.
 - The zero consonant vowel bearer ⟨'[a]⟩ is related not to the usual South Sumatran shape but to the singleton shape found in the Tanjung Tanah Code of Law. This is strong evidence that this variant may have been more prevalent in a since disappeared east coast variety of South Sumatran script beside the ⟨b⟩ and ⟨m⟩ variants discussed above.
- Four letters — ⟨k⟩, ⟨g⟩, ⟨y⟩ and ⟨w⟩ — have no obvious South Sumatran cognate. On closer examination, however, ⟨k⟩ and ⟨g⟩ both contain substructures (the starred intermediate forms) that result from the expected reinterpretation of these shapes in terms of the arch stereotype. These two forms are basically indistinguishable from ⟨s⟩ and ⟨n⟩. The extra structure on top of these shapes has no South Sumatran counterpart. The clue to the more complex shapes comes from ⟨w⟩, which is nearly identical to the Javanese letter as written in Balinese and early 17th century Javanese styles. Javanese/Balinese ⟨d⟩ also relates closely to the *jangang-jangang* shape, as much as the vertically written South Sumatran shape does.

The Makassarese *jangang-jangang* (“bird”) script (4)

- It seems that these similarities may have been the inspiration for partial borrowing from early modern Javanese script, as illustrated in images reproduced from several letters from the Sultan of Banten to the Dutch, written in 1619-1620 (Dutch *Nationaalarchief* inventory number 1070: 1.04.02, *Inventaris van het archief van de Verenigde Oost-Indische Compagnie (VOC)*, 1602-1795 (1811)):
 - Some variants of the Banten ⟨k⟩ have a closed counter not found in modern variants; this corresponds directly to the closed counter in the *jangang-jangang* letter. This counter is formed in a similar way in both scripts. In the Javanese letter, there is an initial tall, narrow arch followed by a second, low arch to its right. A third arch is drawn on top of the second one, forming the counter, and a fourth tall, narrow arch is drawn to its right, ending in a long downward stroke. The same process applies to the *jangang-jangang* letter: a third high arch bridges the second arch of the base and to its right a final long downstroke is drawn, but fragmented from the third arch, unlike in the Javanese letter.
 - A similar process relates *jangang-jangang* ⟨g⟩ to the Javanese letter. With the first narrow arch of the Javanese letter equated to the single arch base of the *jangang-jangang* letter, the remaining two arches of the Javanese letter are drawn on top of the base.
 - The case of ⟨y⟩ is slightly more complex. Taking a rotated, more vertical South Sumatran ⟨y⟩ and redrawing it with the stereotypical South Sulawesi arches yields the starred form shown in the table. Here, the South Sumatran ⟨y⟩ plays a role in the formation of the letter but the Javanese ⟨y⟩ does not. As with ⟨k⟩ and ⟨g⟩, this is part of the shape of the letter and serves as a base to which other structure is added. Here, the extra strokes seem to be added by analogy with ⟨k⟩, perhaps to distinguish this letter from ⟨g⟩: as in ⟨k⟩, the right end of the top arch is closed by a smaller arch below, and a downstroke fragment is added to the right.
- The structural correlations between these early *jangang-jangang* letters and their early modern Javanese counterparts are evidence that this script was likely formed around the early 1600s by combining base letters and structural elements from South Sumatran and Javanese sources with the arch stereotypes and vowel marking system of Bugis-Makassarese script. The forms of some *jangang-jangang* letters are also evidence for distinct variants likely common at the time on the east coast of South Sumatra.

Derivation of *jangang-jangang* lettershapes

Early Javanese & Balinese
 Bird script
 Unattested intermediate forms
 Some South Sumatran variants rotated
 South Sumatran variants

k	g	ng	c	j	ny	t	d	n	p	b	m	s	l	r	y	'[a]

Phonological mapping and the origin of SSP ⟨ny⟩ and ⟨ng⟩

- In general, the structural correspondences between phonologically homosemous early informal Devanagari and old Philippine letters are direct and systematic, as are the relationships between the intermediate proto-script and the Sumatran and Bugis-Makassarese scripts. There are two significant problems though, both involving letters representing nasal phonemes:

- The letters ⟨ny⟩ and ⟨ng⟩ in the SSP scripts are not structurally related to the Devanagari letters used to write the corresponding Sanskrit sounds. Neither of these sounds occurs in the native phonology of Gujarati and indeed, the corresponding Devanagari letters are not to be found in any of the old manuscripts consulted via the online Avestan Digital Archive.

Instead, SSP ⟨ny⟩ is most convincingly related to the Devanagari retroflex nasal letter ⟨ṅ⟩ (but not to Devanagari ⟨ny⟩) and, perplexingly, ⟨ng⟩ in turn is clearly directly related to Devanagari ⟨ny⟩ (but not Devanagari ⟨ng⟩).

- Alongside the usual ⟨n⟩ variant with an arch and a straight or wiggling descending adjunct beneath it, the Philippine script has a relatively rare second variant in some hands with a square, boxy structure unlike anything else found in that script. Apart from its general similarity to the usual variant, the second shape is almost identical in appearance to Devanagari ⟨ṅ⟩, a fact that begs for an explanation given the close structural correspondences between other Philippine letters and early informal Devanagari.

Phonological mapping and the origin of SSP ⟨ny⟩ and ⟨ng⟩ (2)

- The solution to these two questions has to take into account the differences between the Gujarati and Malay phonological inventories. On the likely assumption that the proto-script resulted from the adoption of early informal Devanagari by Sumatran Malays, the process of transferring the script and adapting it to represent a new language would have had to deal with Gujarati-Malay phonological mismatches.
- Each language has a dental /n/ in its inventory, but the rest of the buccal nasals are not shared. Gujarati has a second, retroflex nasal /ŋ/ in its inventory; Malay has a palatal and a velar: /ɲ/, /ŋ/. The only place feature common to these nasals is the posterior coronality of /ŋ/ and /ɲ/.
- As shown in the following table, it seems that this shared common feature triggered the transfer of the early Gujarati Devanagari letter ⟨ŋ⟩ to represent /ɲ/, its nearest counterpart in Malay phonology:
 - The structure of the letter is clearly reflected in Batak, where the structure of ⟨ny⟩ corresponds directly to the Devanagari letter but as expected with the complex structure preceding the stem on the right end of the letter, any historically present downstroke or tail has disappeared, as in ⟨s⟩.
 - The Sumatran letters show slightly less clear but still detectable structural correspondences due to the distortions of those scripts' checkmark and countercheckmark stereotypes, but one Lampung variant (the third in the group) shows a square structure that corresponds much more closely, and may be an archaic survival. (The *jangang-jangang* shape with its triple arch and two intermediate loops corresponds most closely to this particular variant.)
 - The Bugis-Makassarese letter shows a double arch likely derived from the headstroke, the middle downstroke and the stem; the adjunct cup below is likely an abbreviated version of the initial rightward curling downstroke of the Devanagari letter resulting from the loss of the initial indeterminate downstroke which was followed by stereotyping and change in stroke order.

Phonological mapping and the origin of SSP ⟨ny⟩ and ⟨ng⟩ (3)

- The unusual Philippine shape, so nearly identical to Devanagari ⟨ṅ⟩, is likely the result of a functional merger between the proto-Bugis-Makassarese ⟨ny⟩ and ⟨n⟩. Tagalog had only one coronal nasal: /n/. When the early B-M script was adopted in the Philippines, it is plausible that this letter was learned from the Sulawesi mariners or traders as the way to write what to Tagalog ears would be an unusual-sounding phonetic variant of /n/.
- With Devanagari ⟨ṅ⟩ repurposed as ⟨ny⟩ in the Malay proto-script, it remained to find an appropriate Devanagari letter to write the velar nasal /ŋ/, nonexistent in the Gujarati phonological inventory. Devanagari has letters for ⟨ṅ⟩ and ⟨ṅ⟩, both rare sounds in Sanskrit. It is likely that the Gujarati merchants had a passive familiarity with these letters, having probably learned them as part of the phonetically based grid of consonant letters in the script. (It is significant that not one token of either letter appears in the old Gujarati texts used as a source for the early informal Devanagari and Gujarati lettershapes in this study.) Although Devanagari has a distinct letter for ⟨ṅ⟩, it was ⟨ṅ⟩ that was chosen to represent Malay /ŋ/. On the face of it, this is surprising, but several possible contributing factors come to mind:
 - The two Devanagari letters may have been familiar to the Gujarati merchants only as “other” nasal sounds whose actual phonetic values they had never consciously learned, hence it was a toss-up which to use.
 - There may have been a motivation to choose ⟨ṅ⟩ because it was more typical of the body plus stem stereotype of Devanagari letters.
 - The fact that ⟨ṅ⟩ is identical in shape to the retroflex ⟨ṅ⟩ letter (and is only distinguished from the latter by a diacritic dot (*nuqta*) in Modern Devanagari) may have led the early Gujarati merchants not to even consider it as a nasal letter or at least to favour the choice of ⟨ṅ⟩.

⟨ny⟩, ⟨ng⟩ vs Gujarati–Devanagari ⟨ṅ⟩, ⟨ṇ⟩

Devanagari
 (Sanskrit /n/, /ṅ/, /ṇ/, /ṅ/)

(Modern) Gujarati
 (/n/, /ṅ/
 + rare Sanskrit /ṇ/, /ṅ/)

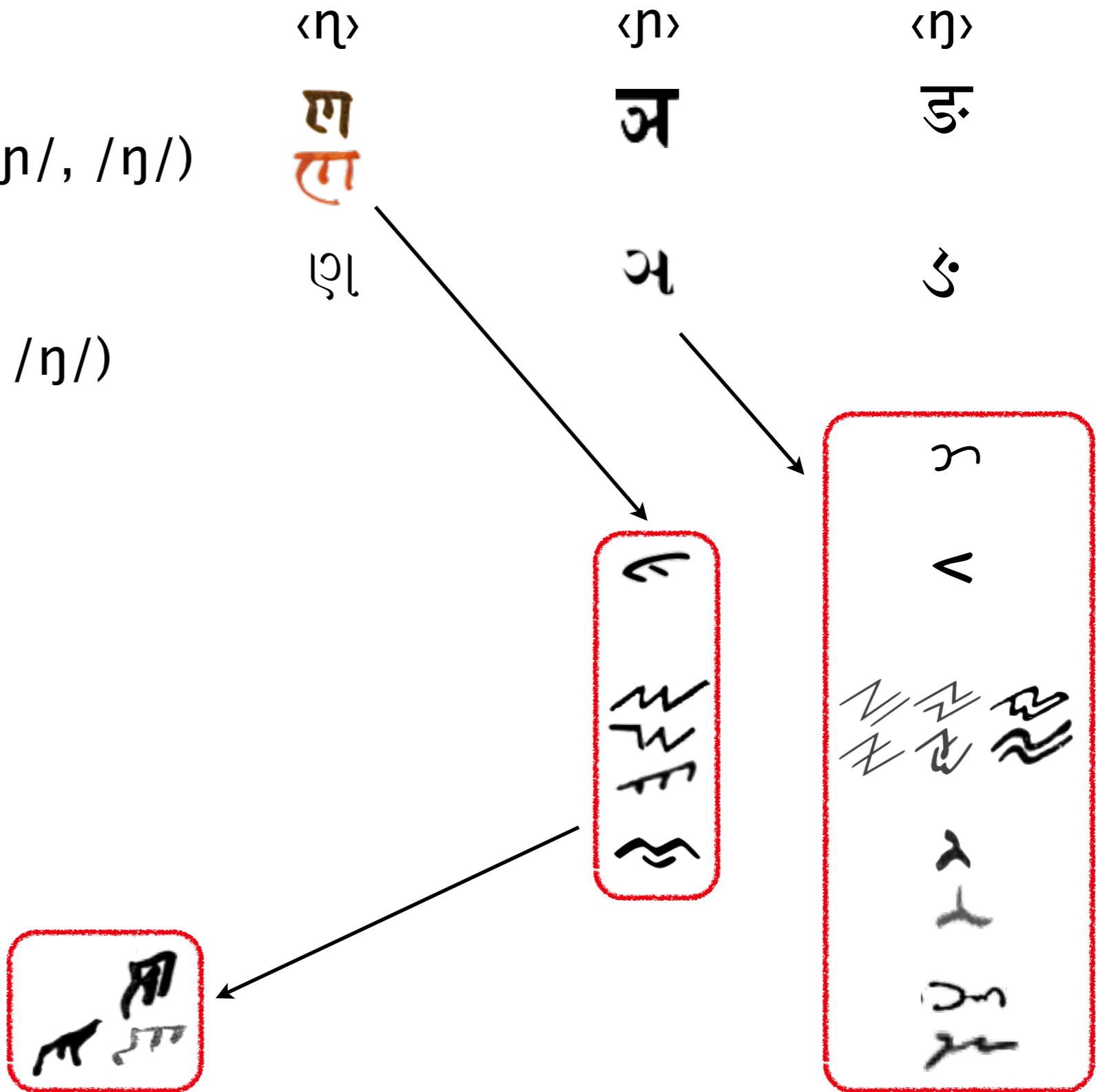
Malay
 /n/, /ṇ/, /ṅ/

Batak
 /n/, /ṇ/, /ṅ/

South Sumatra
 /n/, /ṇ/, /ṅ/

Bugis
 /n/, /ṇ/, /ṅ/

Tagalog
 /n/, /ṅ/



Vowel and coda marking systems

- The regular and systematic structural correspondences reviewed above are convincing evidence that the base letters of the SSP scripts originate — apart from a very few later borrowings — in an early informal variety of Devanagari script introduced to Sumatran Malays by Gujarati merchants.
- This is not the case for the inventory of dependent (bound) signs used to indicate vowels and certain coda consonants, and to indicate a consonant is to be read without any vowel, i.e. as a coda consonant.
- As can be seen in the following table, although there are sporadic resemblances in some scripts with certain Devanagari/Gujarati dependent signs, it seems quite clear that across all the SSP scripts, the vowel/coda marking system is derived directly from the Old Javanese Kawi inventory. As discussed earlier, a signature feature of Batak scripts is a range of simple angled strokes corresponding to earlier clockwise curls, which came to be prohibited at some point in the development of the proto-Batak script. Given the otherwise clear relationship of the Batak vowel/coda marking system to the South Sumatran and Javanese inventories, it is certain that the similarity of some Batak signs to their Gujarati counterparts is a chance result of the way the prohibition on initial curls restructured the relevant signs.
- It is surprising on the face of it that despite the systematic evidence that their base letters derived from early informal Devanagari, the SSP scripts all use Javanese-derived vowel/coda marking systems.

Vowel and coda marking systems (2)

- This apparent hybrid nature of the proto-script finds an explanation in a peculiarity of North Indian mercantile scripts. It is recorded (Grierson, 1881, 1908; Taylor, 1908) that Gujarati script when used for mercantile purposes, like other closely related North Indian mercantile scripts, spelled vowels only when syllable-initial (using the appropriate independent letters) but did not use the available dependent vowel signs to spell vowels following an onset consonant.
- Although this observation applied to these scripts as encountered during the 19th century, this leaves in doubt whether this was the reflection of a long historical tradition or was merely a relatively recent innovation. That the non-spelling of non-initial vowels was current in related mercantile scripts whose lettershapes had significantly diverged is good circumstantial evidence that this practice must have been relatively old in the 19th century.
- Evidence from Randle (1944) indicates that the unvowelled, abjad-like style of spelling was likely quite old. Randle reproduces two samples (in different styles) in the traditional script of the South Indian Saurashtran community, who speak an Indo-Aryan language related to Marathi and Gujarati. These two samples and the modern standard typeface diverge in the forms of certain letters and dependent vowel signs.
- Nonetheless, the base letters are systematically related to a Gujarati style of early informal Devanagari, with inconsistent borrowings from neighbouring South Indian scripts. Most importantly, the dependent vowel and coda signs are borrowed more or less obviously from neighbouring South Indian scripts, and though their shapes differ in the three varieties, they do not correspond to the Devanagari vowel/coda system.

Vowel and coda marking systems (2)

- Historical evidence given by Randle indicates a likely period of migration during the 12th-15th centuries, consistent with the period when Gujaratis were trading in Sumatra. Since Saurashtran script borrowed its vowel/coda signs from neighbouring scripts, it seems reasonable to take this together with the hybrid nature of the SSP scripts as evidence that early informal Devanagari, unlike the formal version of the script, did not spell vowels other than in syllable-initial position.
- This pattern of taking base letters from one source and vowel/coda marking from another is repeated in several scripts of the Malay archipelago. Apart from Makassarese *jangang-jangang* script discussed above, this also occurs in the *Lontara' bilang-bilang* script (Tol, 1992), where the base letters are derived from Arabic numerals but the vowel signs are all from Bugis-Makassarese script, and in the *Gangga Malayu* cipher script of Malaysia (Kern, 1908), whose base letters appear to be partly inspired in form by Arabic letters but whose vowel marks are in the majority borrowed from Javanese script.
- That three historically attested scripts of the Malay archipelago display the same kind of hybrid structure certainly has something to do with their Indic structure. This is not enough to explain why it seems to be an areal feature though. A plausible explanation seems to be that this is the perseveration of a part-remembered combination of Gujarati-origin letters with Javanese-origin vowel/coda signs.

Vowel and coda marking systems

	i (ī)	u	ě	e	o	-m/-ng	-h	-r	-Ø
Guj	ᮒ ᮓ	ᮔ		ᮕ	ᮖ	ᮗ	ᮘ	ᮙ	ᮚ
Kawi	ᮛ	ᮜ	ᮝ	ᮞ	ᮟ	ᮠ	ᮡ	ᮢ	ᮣ
Jav-Bal	ᮤ	ᮥ	ᮦ	ᮧ	ᮨ	ᮩ	᮪	᮫	ᮬ
Sunda	ᮭ	ᮮ	ᮯ	᮰	᮱	᮲	᮳	᮴	᮵
Lampung	᮶	᮷	᮸	᮹	(ᮺ)	ᮻ	ᮼ	ᮽ	ᮾ
Batak	ᮿ	ᮾ	ᮿ	ᮾ	ᮿ	ᮾ	ᮿ		ᮾ
Bugis	ᮿ	ᮾ	ᮿ	ᮾ	ᮿ				
Philippine	ᮿ	ᮾ							

Vowel/coda marking systems: properties

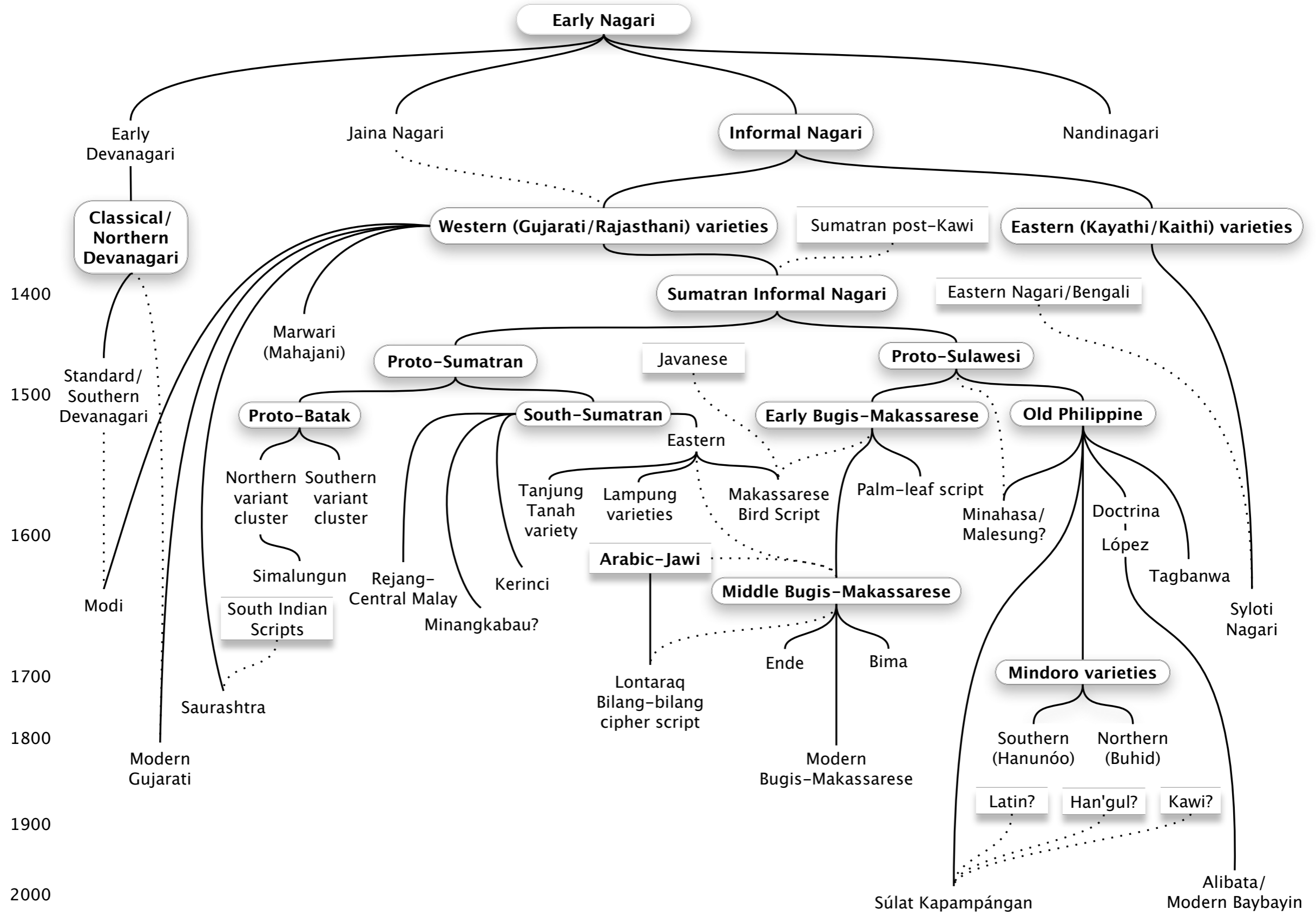
- Beyond the evidence for the combination of Javanese vowel/coda signs with early informal Nagari letter shapes, the vowel/coda marking systems of the SSP scripts have divergent properties.
- In the Eastern (Sulawesi-Philippine) group:
 - Coda consonants are not spelled out.
 - Vowel marks can be doubled up on a single base letter for two syllables beginning with same consonant. This is likely a side effect of a tradition of combining dependent marks on the same base letter for didactic purposes, attested in slightly different forms in South Sumatra, Sulawesi and the Philippines.
- In the Sumatran group:
 - Coda consonants are explicitly signalled with a zero vowel marker (virama) and specific dependent signs are used to spell coda -r, -h, -ng, and (more recently) -n and -r-/C_V.
 - Both Lampung and the Mandailing Batak script varieties have similar vowel sign spelling rules (van der Tuuk, 1885; 1886). Both have a convention (present in a restricted form in Kerinci script) whereby a coda consonant sign remains closer to the base consonant than the vowel sign for the same syllable. Both also have a rule whereby vowel signs in closed syllables are separated from their logical syllable-initial host and displaced onto or (in the case of some vowel signs in Batak) after the syllable-final consonant letter. The origin of this unusual displacement rule is not clear, however it seems plausible that it may be an analogical extension of the first rule. What is clear is that both kinds of displacement rule must have originated in the proto-Sumatran script from which both the Batak and South Sumatran scripts descended: both are unusual and complicated enough that it is quite unlikely that there would have been any motive to borrow either of them, let alone both, between northern and southern Sumatra.

Two main branches of SSP scripts

- The evidence from divergent spelling conventions in Sumatra and the east aligns with other regionally restricted features, indicating that the SSP scripts form two main groups.
- The Eastern group (Sulawesi and Philippines) is more conservative in some respects:
 - Scripts in this group share orthographic features distinct from the Sumatran scripts: coda consonants are not spelled, and subsequent syllables beginning with the same consonant can be abbreviated by doubling vowel signs on a single consonant letter.
 - Some letters are more similar to the early informal Devanagari shapes than in Sumatra: ⟨g⟩ and ⟨l⟩ retain a stroke equivalent to the Devanagari (headstroke plus) stem.
- The Sumatran group is more innovating in some respects:
 - Scripts in this group share vowel sign reordering conventions not found in the Eastern group.
 - Both ⟨g⟩ and ⟨l⟩ lack an extra stroke corresponding to the Devanagari (headstroke plus) stem. Several letters in the Sumatran scripts, including these two, show possible influence from the Malayu script used in Sumatra around the 14th century and later.

The SSP scripts in a larger Devanagari script family

- The bifurcation of the SSP scripts into Eastern and Sumatran branches is illustrated in the family tree below. Apart from the SSP scripts and cipher scripts of the Malay Archipelago, relationships between related Indian scripts derived from Devanagari are also illustrated (based on evidence not discussed here).
- Patterns of secondary influence (borrowings of characters or structure) are indicated by dashed lines, and scripts not derived from Devanagari are shown in sharp-cornered rectangles.
- An unexpected result of the research described here is the emergence of a relatively large Devanagari-based family of scripts, most of whose members derive from informal varieties of the script that took root in various locations in India and the Malay Archipelago.
 - The North Indian Kaithi, Modi and Gujarati scripts all developed in a situation of continued contact with formal Devanagari, and their modern versions (modern Gujarati in particular) show the effects of gradual (re-)incorporation of features from this prestige script variety that led to loss of various features typical of the older informal varieties from which they stem.
 - In contrast, the South Indian and SSP scripts (as well as Mahajani and other later North Indian mercantile scripts) show no sign of further influence from formal Devanagari. Where secondary influence from another script or scripts is present, it comes from other, usually not closely related scripts in the region.



Conclusion

- I have tried here to establish evidence that the SSP scripts originate in an early informal Devanagari variety introduced by Gujarati merchants into the Sumatran Malay homeland, a likelihood supported by historical evidence of Gujarati trading activity in this region.
- Rather than rely on subjective, impressionistic global comparisons between scripts, I have attempted to establish an independently motivated model of character structure in which clearly defined structural properties can be used as an independent metric for evaluating relatedness between characters in different scripts and for describing changes in character structure over time.
- This model has made it possible to describe the structural correspondences between character pairs in early informal Devanagari and the old Philippine script in a precise manner equivalent to phonological comparisons between language pairs.
 - The regularity of the correspondences between the scripts is so strong that there can be little doubt that the old Philippine lettershapes are the product of only minimal divergence from early informal Devanagari script.
 - The regular correspondences between the two scripts make it possible to reconstruct a set of intermediate proto-script shapes by applying specific changes affecting whole natural classes of letters in the same way.
 - These reconstructed forms, in turn, supplemented with a set of slightly changed variants found in the old Philippine script, show the same kinds of systematic structural relationships with Bugis-Makassarese script and the Sumatran scripts, taking into account the way these scripts patterned the structure of their letters on specific stereotypical stroke combinations.
 - The pairing of this model with the comparative method is to my knowledge a novel approach, and any competing theories of the origins of one or more of these scripts would either need to satisfy a similarly restrictive theory of structure or furnish crucial independent evidence of the inadequacy of this approach.

Conclusion (2)

- Apart from the evidence from the detailed chirographic level of analysis, evidence from orthographic structure and usage confirms the relationships of the SSP scripts and a major division into a Sumatran and an Eastern group.
- Comparative evidence from North Indian mercantile scripts and the Saurashtra script of South India supports the hypothesis that the early informal Devanagari introduced into Sumatra did not represent vowels in non-syllable-initial position. This explains why the vowel/coda signs of the SSP scripts are clearly of Javanese and not Devanagari origin.
 - This outcome of script contact is reflected in a number of consciously developed scripts in the region; in each of these scripts the source of the vowel/coda signs is different from the source(s) of the base letters. The existence of such peculiar contact-based hybrid scripts is an intriguing consequence of the clear dichotomy between the two kinds of characters in Indic abugida-type scripts.
- Alongside this exotic result of script contact, the SSP scripts show various sporadic cases of borrowing or possible structural influence from neighbouring unrelated scripts.
- The evidence here, together with similar comparative evidence for scripts in India, establishes the previously unsuspected existence of a large family of related scripts descended from informal Devanagari handwriting, one major branch in India and the other in Indonesia and the Philippines.

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