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## PHONEME AND GRAPHEME: HOW PARALLEL CAN THEY BE?

DAVID G. LOCKWOOD  
*Michigan State University*

INTRODUCTION. In one of the classic papers on the linguistic treatment of writing, the British linguist C. E. Bazell (1956) noted that published literature contained two alternative conceptions of the grapheme. In one of these 'the graphic shape of an allograph is dependent on its graphic surroundings' (Pulgram 1951, as quoted by Bazell [359]). In the other view, found in a study of Old English writing by Stockwell and Barritt (1951) 'two graphs are allographs of the same grapheme if they represent the same phoneme, whether or not they stand in relations of complementary distribution' (Bazell 359). So in the first conception <ph> would be the same sequence of two graphemes in *graph* as in *uphill*, and in both cases utterly distinct from the <f> in *fine*. In the Stockwell-Barritt view, on the other hand, <ph> in the first example would be a coallograph with <f> (along with the <gh> of *rough* and *laugh*), and this would be utterly distinct from the other usage, where <p> and <h> would be separate graphemes by virtue of representing different phonemes.

More recently, the German scholar Manfred Kohrt (1986), has given names to these alternative conceptions. The first is termed the ANALOGICAL VIEW, because it makes the grapheme-allograph relation parallel to that between phoneme and allophone. The alternative is called the REFERENTIAL VIEW, because it is based on the phonological reference of the various graphemes.<sup>1</sup>

1. EVALUATION OF VIEWS. In evaluating these views, it must first be said that students of writing need to include both kinds of relations in any model they adopt. Any reasonable overall model, in other words, must have a place to treat both the variant forms of a 'letter', 'character' or other graphemic unit and a way to discuss and systematize as much as possible the referential relations that exist between written and spoken language. Except in the special case of a perfect one-to-one relation between units of writing and spoken language, however, these cannot be treated all at once. They will involve separate sections or components of the overall graphonomy.

That said, the analogical view is the one that makes the most sense, as long as it is incorporated into a model that also allows one to relate writing to spoken language in a systematic way. Two major reasons for preferring this view are as follows:

- INDEPENDENCE. Certainly no respectable linguist would propose that we make our analyses of sound systems dependent on writing. In the same way, it seems undesirable to make our analyses of writing dependent on phonology.

- **COMPREHENSIVENESS.** If a grapheme is defined as a set of ways of representing a phoneme, it would seem impossible to include under the grapheme writing systems not based on sound, or even those based on syllables rather than segments.<sup>2</sup>

2. **REMAINING PROBLEMS.** Having decided which fundamental path to follow, however, one must still consider two serious problems, and both involve certain ways in which graphonomy is less than ideally parallel to phonology.

2.1. **FIRST PROBLEM: RECOGNIZING COALLOGRAPHS.** One problem concerns how we recognize which physically different written shapes are to be assigned to the same grapheme. The referential model suggests an automatic solution to this problem, even though it may have fairly bizarre consequences. In following the analogical model, it is natural to look to parallelisms with phonology. Since the classic presentation of phonemic methodology by Morris Swadesh in 1934, the assignment of sounds as allophones of the same phoneme has been based on three key principles:

1. Phonetic similarity
2. Non-contrastive distribution<sup>3</sup>
3. Pattern congruity

It should be clear that non-contrastive distribution and pattern congruity can readily be applied in graphemic analysis: coallographs must indeed occur in such a way that they do not contrast in a given writing system, and alternative conceptions can be evaluated for their relative contribution to the regularity of patterning, causing one to prefer a solution which contributes more to such regularity over one that contributes less. But what about the analog of phonetic similarity, namely graphic similarity? Is this a reasonable requirement for marks treated as coallographs?

Consideration of familiar facts about alphabetic writing suggests that no requirement of graphic similarity would be reasonable. Consider capital and lower-case characters in the Roman and similar writing systems. Now it is true that capital and lower case letters are not simply coallographs, because in modern writing and printing they are functionally contrastive. Corresponding capital and lower-case forms must be treated as graphemically distinct, but that does not mean that they are simply different graphemes. Rather, following the practice of Gleason (1961) and Herrick (1966), we need to view capitalization as involving a suprasegmental grapheme present in addition to the letter grapheme. So any differences of shape under capitalization can be seen as analogous to allophones of vowel or consonant phonemes under different conditions of accent or tone. Thus, allography would clearly be involved. In the modern uses of the Roman and Greek alphabets (termed Neo-Roman and Neo-Hellenic by Herrick 1974) capitals differ from corresponding lower-case letters in relative size, but often differ in shape as well. Let us consider the situation in the three major modern scripts that use capitalization, the Neo-Hellenic (as for Modern

		Vowel		
		i	u	a
Consonant	p	Λ	>	<
	t	П	ㄣ	С
	v	Δ	ᶇ	ᶈ
	r	ᵿ	ᵿ	ᶑ

*Table 1. Representations of some Inuktitut CV syllables in the Evans script. (Based on Nichols 1996)*

Greek), the Neo-Roman (as for English), and the Neo-Cyrillic (as for Russian)<sup>4</sup>. In each of these, there are letters that exhibit no strong resemblances of shape between the two types, alongside others that do.<sup>5</sup> For the Greek alphabet, half of the 24 letters show distinct shapes: A/α, B/β, Γ/γ, Δ/δ, Z/ζ, H/η, M/μ N/ν, Ξ/ξ, Σ/σ, Υ/υ, Ω/ω. The others show identical or closely resemblant shapes: E/ε, Θ/θ, I/ι, K/κ, Λ/λ, O/ο, Π/π, Ρ/ρ, Τ/τ, Φ/φ, Χ/χ, Ψ/ψ. In the Roman, the proportion is smaller but still considerable, with the following ten letters having distinct shapes: A/a, B/b, D/d, E/e, G/g, H/h, L/l, N/n, Q/q, R/r. The other sixteen do not have distinct shapes—C/c, F/f, I/i, J/j, K/k, M/m, O/o, P/p, S/s, T/t, U/u, V/v, W/w, X/x, Y/y, Z/z. In the Cyrillic, we find only three of the 32 letters with distinct capital shapes—A/a, Б/б, E/e—while the others have almost the same shapes, with capitals differing only in size and a few minor details: В/в, Г/г, Д/д, Ж/ж, З/з, И/и, Й/й, К/к, Л/л, М/м, Н/н, О/о, П/п, Р/р, С/с, Т/т, У/у, Ф/ф, Х/х, Ц/ц, Ч/ч, Ш/ш, Щ/щ, Ъ/ъ, Ы/ы, Ь/ь, Э/э, Ю/ю, Я/я.<sup>6</sup>

These examples illustrate that coallographs do not have to show graphic similarity, though obviously they may. In this sense, coallography is more closely parallel to coallogomorphy than it is to coallogophony: allomorphs of the same morpheme are often phonemically similar, but in line with the usual view, they do not have to be similar at all. Without a counterpart of phonetic similarity, however, there may be problems in deciding how to group graphic shapes as allographs: we can use similarity when it occurs, but we may not always have it available.

As a further illustration, let us consider some uses of the Evans script for some languages spoken in northern Canada. This script was originally devised in 1840 by a missionary named James Evans for the Ojibwe of Ontario and a form of Cree spoken in the vicinity of Norway House, in what is now Manitoba. According to Nichols 1996, forms of this writing have continued to be used for various dialects of Cree and Ojibwe, and the same basic system has been modified for use with some Inuit<sup>7</sup> languages and some sub-Arctic Athabaskan languages as well.

Nichols’s account refers to this system as a syllabary, and apparently Evans himself conceived of it in such terms. Its structural organization, however, differs from that of an undoubted syllabary such as Cherokee or Linear B because the shape of a character indicates the initial consonant, while vowel differences are indicated by the orientation assumed by that shape. See Table 1 for some examples, based on the Inuktitut orthography established by the Inuit Cultural Institute. This shows three vowel

qualities, which are all that are needed for Inuktitut. For Algonquian languages, four orientations are generally needed.

In the same book that contains this article, Peter Daniels (1996) expanded the traditional typology of writing systems to include some additional types beyond the traditional logography, syllabary, and alphabet. In particular he includes a category called an ABUGIDA, which was intended to cover systems like Ethiopic (from which the name originates) and various Indian writing systems such as Devanagari. While neither Daniels nor Nichols makes this suggestion, it seems reasonable to conclude that the Evans system exemplifies a variety of the abugida rather than a syllabary. The definition of an abugida (ibid 4) states that in such a system 'each character denotes a consonant accompanied by a specific vowel, and the other vowels are denoted by a consistent modification of the consonant symbols.' It is not clear that 'consistent modification' is intended to be broad enough to include the orientational distinctions central to the Evans system. It is at least somewhat different in that there is no obviously unmarked variety, such as the characters for consonant plus short /a/ in Sanskrit Devanagari. It is proposed here that Daniels' otherwise very useful typology<sup>8</sup> be modified so as to allow an abugida to be either DIACRITIC (like the Ethiopic and Devanagari and other Indian systems), or ORIENTATIONAL (like the Evans system)<sup>9</sup>.

The general graphemic analysis of an orientational abugida such as is found in those writing systems based on the Evans script should, it would seem, distinguish graphemes of basic shape, which symbolize the consonants, from the orientational factors which distinguish the vowels, so each form associated with a consonant + vowel syllable would be seen as simultaneously embodying a grapheme of shape and another of orientation. Graphemically, this is quite different from a true syllabary, like the Cherokee, whose typical graphemes represent particular consonant + vowel sequences as wholes. It is also different from an alphabet, which has graphemes of different shapes for consonants and vowels. Another factor which must be considered in relation to the Evans script is the symbolization of consonants that stand in syllable-final position, not followed by any vowel. Generally, the device adopted for these is a symbol of reduced size and suprascripted position placed to the right of the character representing the onset and coda. In the forms of the script used for Inuit languages and for the more easterly Algonquian languages, these suprascript consonants share the same shapes as the non-suprascripted consonantal form, and are placed in the orientation that would indicate a following /a/ in a non-suprascripted occurrence. It seems reasonable in such a case to abstract suprascripting as another graphemic property at work here, symbolizing the lack of a following vowel. (This compares functionally to the usage in Sanskrit Devanagari, where an explicit stroke [termed the *virama*] indicates that no vowel is to be pronounced after the consonant.) This would also allow us to consider the orientation associated with /a/ or no vowel to be the unmarked one, suggesting that only the orientations associated with other vowels require additional simultaneous orientational graphemes. An analysis for a representative portion of the Inuktitut version along these lines is presented in Table 2.

		Vowel				
		i	u	a	Ø	
Consonant	p	Shape	Λ	>	<	<
		Analysis	< +UP	< +RT	<	< +SS
	t	Shape	∩	∪	C	c
		Analysis	C +UP	C +RT	C	C +SS
	v	Shape	Δ	∩	∠	<
		Analysis	∠ +UP	∠ +RT	∠	∠ +SS
	r	Shape	∩	P	ϣ	ϣ
		Analysis	ϣ +UP	ϣ +RT	ϣ	ϣ +SS

Table 2. Some Inuktitut uses of the Evans script with graphemic analysis.

		Vowel					
		e	i	o	a	Ø (Ojibwe)	Ø (Cree)
Consonant	p	V	Λ	>	<	<	l
	t	U	∩	∪	C	c	/
	c	∩	∩	J	∩	∩	-
	k	∩	P	d	b	b	\
	r	∩	∩	P	ϣ	ϣ	3

Table 3. Varieties of the Evans script in representing syllable-final consonants in Algonquian languages. (Based on Nichols 1996)

When we consider the versions of the Evans script in use for more westerly Algonquian languages (generally Cree dialects spoken to the west of James Bay), however, we find a situation that is roughly analogous, but is different in one crucial detail: the shapes found in suprascripted position for a particular consonant are not relatable in any obvious way to those indicating corresponding onsets, as illustrated in Table 3<sup>10</sup>. This could be treated as a matter of allography, with special shapes occurring when accompanied by the suprascripting grapheme, just as Roman, Greek, or Cyrillic letters accompanied by a grapheme of capitalization may assume different shapes, sometimes without an obvious similarity to their other shapes. There is, however, a crucial question affecting the acceptability of such an analysis. It would be acceptable if we can consider aspects of the function of a grapheme in relation to phonemes (or other units of a spoken language) in deciding between logically possible graphemic analyses, but not if we are prohibited from doing so, in the way a phonologist surely ought to be prohibited from deciding between alternate phonemic analyses on the basis of any writing system that might be in use for the language.

Name	Denotation of characters	Examples
LOGOSYLLABARY	Individual words (or morphemes) as well as particular syllables	Chinese Sumerian
SYLLABARY	Particular syllables (with no systematic graphic similarity between characters for phonetically similar syllables)	Linear B Cherokee Kana
CONSONANTARY (OR ABJAB)	Consonants only	Phonician Hebrew
ALPHABET	Consonants and vowels	Greek Roman Cyrillic
ABUGIDA:	Consonant accompanied by a specific vowel, with other vowels denoted by a consistent modification of the consonant symbols	Ethiopic Devanagari (Evans?)
FEATURAL SYSTEM	Distinctive features of segments	Han'gul Pitman shorthand

*Table 4. Types of writing by units represented according to Daniels 1990, 1995.*

It seems better to allow the consideration of the reference of a graph, then, when it helps us to decide a case like this. One alternative would be not to associate the coda-consonant graphs with the others at all, and the other would be to associate them in a totally arbitrary way.

2.2. SECOND PROBLEM: GENERAL APPLICATION OF THE GRAPHEME CONCEPT. An advantage to the general adoption of the analogical rather than the referential view of the grapheme is that it allows the idea of the grapheme to be used with any type of writing system, whether or not it has reference to the phonology of the corresponding spoken language. With this broadening, however, come problems of how to apply the notion in writing systems which relate to spoken languages in various ways. Daniels' typology of these relationships (summarized in Table 4) marks a definite advance over the traditional one. When it is clarified to allow both diacritic and orientational varieties of abugida, it gives six different varieties of phonographic writing, plus the additional category for the Chinese type, which Daniels terms a LOGOSYLLABARY<sup>11</sup>.

In virtually any writing system, however, there is a hierarchical arrangement at least roughly parallel to hierarchies seen in phonology and other strata of a spoken language. In the Roman alphabet we have, for instance, written words composed of letters, and letters composed of various kinds of loops, curls, bars, and the extensions termed 'ascenders' and 'descenders' by printers. Accounts of the Chinese writing system (e.g., Coulmas 1989:95–96) tell us that full characters are composed of one or more base characters, and the Chinese tradition gives us a further analysis of the base characters into strokes of just eight basic kinds. The problem is deciding just where in



Name	Denotation of primary graphemes
SYLLABARY	Syllables: usually a CV combination, but also a vowel alone; or a more complex syllable.
CONSONANTARY (ABJAD)	Consonants.
ALPHABET	Consonants and vowels
ABUGIDA: DIACRITIC	Consonant plus a vowel treated as unmarked in the writing system, supplemented by diacritics indicating marked vowels or the absence of a vowel.
ABUGIDA: ORIENTATIONAL	Consonant (or the absence of a prevocalic C), but typically combined with graphemes realized in terms of orientation specifying the vowel accompanying (or its absence).
FEATURAL SYSTEM	Properties of segments, combinable with one another in specified ways to indicate a whole segment, or with secondary graphemes manifested by more abstract properties such a repetition or shading.

*Table 5. Types of phonographic writing as interpreted in terms of primary graphemes.*

such a hierarchy to apply the grapheme concept. Are the graphemes of English written words, letters, or the subparts of letters? Are those of written Chinese full characters, base characters, or strokes?

It is suggested here that this problem can be solved if we consider the relations between written and spoken language to some extent. Specifically, it is proposed that each writing system has a set of primary graphemes, definable on the minimum hierarchical level that bears a systematic relation to the spoken language. Table 5 shows how this applies to the various kinds of phonographic writing, recognizing that there will also be other kinds of graphemes, including suprasegmental and diacritic ones.

For the Chinese type, it appears that the base character would be the most obvious candidate for the status of primary grapheme. Strokes would be clearly excluded due to their lack of relation to the spoken language (any exceptions found being treatable as diacritic graphemes). Of the remaining candidates, the base character seems to be the best choice because it does typically relate to the spoken language, though this relation can be quite complex, sometimes involving a graphic kind of idiomaticity. Some writing systems, such as that of Japanese, are compound in that they combine distinct sets of primary graphemes of different types in one overall system. So the Kanji part of Japanese writing would be subject to essentially the same analysis as Chinese, but the Kana (Katakana/Hiragana) would have primary graphemes of a syllabic type.

3. CONCLUSION. In summary, it is proposed that the proper way to look at writing systems linguistically involves adoption of the analogical view in preference to the referential one, with the proviso that phonology may be considered for two purposes:

(1) classification of graphs as coallographs in the absence of graphic similarity, and  
 (2) determination of the hierarchical level appropriate for the primary graphemes of a written language.

This view may profitably be compared to positions presented in previous LACUS Fora by two experienced specialists in the study of writing, Peter Daniels and Earl Herrick. Daniels (1992) began the discussion by arguing against a structural graphemics, while Herrick (1995a) replied in support of the concept. From a reading of their positions, however, it seems evident that they were arguing in relation to different conceptions. Daniels fundamentally argued against the referential grapheme, while Herrick argued in favor of the analogical view. Both agreed, in other words, on the infeasibility of the referential conception. Herrick presented the view, however, that a structural graphemics based on the analogical conception was indeed feasible. In a reply to this, Daniels emphasized that he did not view writing as a form of language, so he as a linguist was interested almost exclusively in the study of writing in relation to speech. Herrick's conception of a structural grapheme based on the internal relations of writing was therefore of little interest to him.

The view presented in this paper is closer to that of Herrick in seeing a structural concept of the grapheme based on the analogical view as a valuable one. At the same time, it recognizes the importance of studying the relations between written and spoken forms of language, and finds some consideration of these relations of reference to be valuable in solving some otherwise difficult problems of analysis.

While the proposal to depart from a strict analogical view to allow a limited consideration of reference for special purposes does in fact interrupt the strict parallelism with phonology, it does not seem so unreasonable when we consider the asymmetry that exists between phonology and graphonomy. While every spoken language has a phonology by definition, only some have an associated orthography. While the idea of a written language not associated with a spoken language does not seem theoretically unimaginable, it occurs in practice only in unusual cases, such as when we learn to understand an ancient written language we cannot pronounce, or when a deaf person unable to control the spoken form of a language still learns to read and write. In view of this practical asymmetry, the methodological asymmetries suggested here as appropriate do not seem unreasonable. Furthermore, this proposal is not made arbitrarily, but as a solution to genuine analytical problems.

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<sup>1</sup> Herrick 1995a/b suggests the term 'graphemic grapheme' for a grapheme according to the analogical view vs. 'phonological-fit grapheme' for one conceived according to the referential view. Herrick admits these terms are somewhat ad-hoc, and the first also seems to prejudge any comparison between them, suggesting that graphemes of the sort Herrick favors are 'the genuine article'. Kohrt's terms are therefore preferred in any discussion comparing these views.

<sup>2</sup> In the chapter on Writing and Language in Anttila 1972 the notion of graphemics suggested is explicitly restricted to the study of alphabetic writing (33). This statement can be puzzling to a reader whose acquaintance with the grapheme is based primarily on the two

chapters on writing in Gleason 1961. Classroom use of Anttila's book as the primary text in teaching historical linguistics always required the present writer to comment about this restricted view of the grapheme. It now seems apparent that Anttila had been influenced strongly by the use of grapheme/allograph in the Stockwell and Barritt referential tradition. Indeed the historical linguist would be primarily interested in writing as evidence for the phonology of ancient languages, and so would have a great interest in the referential relations, but this would not seem to justify adoption of that view overall.

- 3 Swadesh, of course, spoke of 'complementary distribution'. The use of the amended term reflects refinements made later, specifically in Hockett 1947. The discussion there concerned morphemic rather than phonemic analysis, but the same general principle also came to be applied in phonology.
- 4 The use of capitals characterizes most modern alphabets derived from the Greek, though it was not present in the older forms of Greek or Roman. Other scripts and script-variants showing this usage are Armemian, Coptic, some forms of Irish, and Fraktur (the so-called 'black letter' form of Roman common in German through the first half of the 20th Century). See Herrick 1999 for examples of an unsuccessful 1930s proposal to extend capitalization and italicization into Hebrew, intended as a way to modernize that writing system.
- 5 Obviously the resemblances are matters of degree. These divisions are based on the author's best judgement.
- 6 Cyrillic shows a fairly striking difference from its alphabetic relatives in this regard. This lack of difference makes printed Cyrillic resemble Roman printing that uses small capitals and precludes the use of small capitals for special uses in Cyrillic. There are greater differences, however, when handwritten rather than printed Cyrillic forms are considered.
- 7 In 1999 the Canadian government accorded special recognition to this writing system in connection with the establishment of the Inuit territory Nunavut, carved from a portion of the Northwest Territories. Both a special 46-cent stamp and a special \$2 coin issued in commemoration of this occasion contained the name of the territory in both Roman and the Evans script.
- 8 As Herrick 1995a points out, this typology is based on the fit of the writing system with the spoken language, rather than on internal properties of the writing system itself. This should not disparage its general usefulness, however, in organizing accounts of the written/spoken relations on which it focuses.
- 9 Some uses of the Evans system combine certain diacritics with orientational differences to accommodate richer sets of vowel distinctions. A raised dot, for instance, is used in the Inuktitut form to indicate that the vowel involved is long rather than short (Nichols 1996). So this overall system has features of both the orientational and the diacritic subtypes of abugidas. Indeed the introduction of such diacritics would seem to be the only way to devise a referentially adequate orientational abugida for a language with more than 4 distinct vowels. This is relatively easy when there are sets of vowels distinguished by such properties as length, height, frontness, rounding, tongue advancement, or nasalization.
- 10 In principle, the shapes the Western Algonquian coda allographs appear to derive from Pitman shorthand, though not all details of usage are identical. For instance, both systems use short dashed lines in different orientations to symbolize stops, but with differences of reference.
- 11 This terminology shows the influence of the idea promoted in DeFrancis 1989 treating Chinese writing as a rather complex, morphologically influenced sort of syllabary rather

than a logographic or morphographic system as has been supposed more traditionally. For a contrasting argument, see Sampson 1994.

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