What Do Kanji Graphs Represent in the Current Japanese Writing system? Towards a Unified Model of Kanji as Written Signs

Keisuke Honda

Abstract. In the current Japanese writing system, kanji graphs constitute a major subpart of its signary. There are two opposing views on how to characterise them in linguistic terms, making different claims about the type of linguistic unit they represent. The first view claims that kanji graphs are based primarily on the morpheme because a majority of currently used graphs represent individual morphemes. The second view maintains that they are based primarily on the sound and only secondarily on the morpheme because all graphs represent sounds that may or may not correspond to individual morphemes. The present paper discusses the advantages and disadvantages of both views and sketches out a new, unified model of how kanji graphs function as written signs. In this model, kanji graphs are seen as the formal building blocks of simplex or complex written signs representing the phonological exponents of individual morphemes.

Introduction

This paper discusses the type of linguistic unit represented by the graphs of the kanji (漢字) script in the present-day Japanese writing system.

The starting point of the present article is a practice widely observed in graphemics, in which individual writing systems are referred to as being 'phonemic,' 'syllabic,' 'morphemic' and so on (Section 1). More specifically, each writing system is characterised in terms of a particular type of linguistic unit (e.g., phoneme) if all or most of its written signs represent the individual instances of that unit (e.g., /i/, /a/, /o/, /p/, /t/, /k/, ...). A prerequisite for such a characterisation is a linguistic analysis of the signary, that is, the set of written signs employed in the given writing system. The validity of the characterisation, then, depends on the adequacy of the signary analysis.

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In this regard, Japanese kanji graphs deserve special attention (Section 2). They are sinographs or 'Chinese characters' employed in the Japanese writing system, used alongside the graphs of the kanji-derived hiragana (平仮名) and katakana (片仮名) scripts as well as the Latin script known as rōmaji (ローマ字) (Smith 1996, pp. 209–210; Honda 2012, pp. 39–47; I. Taylor and M. M. Taylor 2014, pp. 271–283).[1] Despite the persisting belief that kanji graphs represent things and ideas without recourse to language (e.g., Suzuki 1975, p. 178), they are in fact closely related to the phonological, morphological and semantic properties of the Japanese lexicon (e.g., Unger 1987, pp. 45–49, 1990, pp. 397–411; Kōno 1994, p. 11; Matsunaga 1996, pp. 2–12). Today kanji graphs are used mainly to write individual content words or their stems in the Sino-Japanese, native Japanese and hybrid vocabularies. Given the mixed use of kanji and other graphs, kanji graphs constitute what may be seen as a major subpart of the signary of the Japanese writing system. An important question, then, is whether a single type of linguistic unit should be postulated to account for the functioning of kanji graphs and, if so, what that unit might be.

In the literature, it is possible to identify two major schools of thought on this question (Sections 3 and 4). For convenience, the present paper refers to the first one as the *morphographic theory* and the second one as the *morphophonic theory*, borrowing the respective terms from Joyce (2011, p. 58) and Matsunaga (1996, p. 17).[2] The morphographic theory claims that kanji should be considered primarily morphemic because there is a one-to-one correspondence between individual graphs and morphemes in most kanji-written words (Hill 1967, pp. 93–96; Miller 1967, pp. 92–93; 1986, 15ff; Nomura 1999, pp. 1–3; Sproat 2000, pp. 154–160; Joyce 2001, pp. 12–111; 2011, pp. 63–72; Sampson 2015, pp. 208–232). In contrast, the morphophonic theory holds that kanji graphs are primarily phonographic and only secondarily morphemic because all graphs represent sounds that may or may not correspond to individual morphemes (DeFrancis 1989, pp. 138–143; Matsunaga 1994, pp. 34–39, 1996, pp. 14–18; also see Unger 1987, pp. 35–49; DeFrancis and Unger 1994; Unger and DeFrancis 1995).

To the knowledge of the present author, there has been little attempt to examine the validity of these two theories through direct comparison. However, they deserve special consideration because they provide

1. For a comprehensive description of kanji graphs and their use, see Satō (1987–1989), Satō et al. (1996), and Kōno, Nagata, and Sasahara (2001), among others.

2. DeFrancis (1989, p. 58) first proposed the term 'morphophonic,' together with the alternative form 'morphonic'. The present paper adopts the former, although with a warning not to confuse it with the unrelated term 'morphophonemic,' because the latter is conventionally associated with the notion of 'morphon' in Stratificational Grammar (Lamb, 1966).

significantly different interpretations of the way kanji graphs function as written signs. According to the morphographic theory, kanji graphs relate directly to the morphological level of linguistic representation. An important implication of this notion is that they function in a fundamentally different way from phonographs or phonologically based written signs. Contrastively, the morphophonic theory suggests that kanji graphs relate mainly to phonology and only optionally to morphology. This implies that they share a common ground with phonographs, in that sounds play a crucial role in both types of written signs. These considerations motivate a comparative examination of the two existing theories.

This paper presents a critical analysis of the morphographic and morphophonic theories and develops a preliminary sketch of a new, unified model of how kanji function as written signs in the current Japanese writing system. Section 1 introduces the notion of linguistic unit underlying a writing system. Section 2 provides the necessary background on kanji graphs and kanji-written words. Section 3 takes a closer look at the morphographic theory, with a particular focus on the analysis of two-kanji compound words presented by Joyce (2001; 2011). Section 4 turns to the morphophonic theory, focusing on Matsunaga's (1994; 1996) discussion of what are known as the phonetic elements of kanji graphs. Section 5 proposes an integrated model of kanji as written signs, which draws on the advantages of the existing theories while avoiding their disadvantages. In this proposed model, kanji graphs are viewed as the formal building blocks of structurally simplex or complex written signs representing the phonological exponents of individual morphemes. Section 5 summarises the discussion and draws conclusions.

1. Linguistic Unit Underlying a Writing System

Writing may be seen as a system of visible and/or tactile marks, by means of which utterances can be encoded into and decoded from particular graphical representations in a more or less conventional manner (Daniels 1996, p. 3; 2018, pp. 156–157; Coulmas 2003, pp. 1–17). This paper refers to such marks individually as *graphs* (Sampson, 2015, pp. 10–11) and collectively as a *script* (Sproat, 2000, p. 25). Graphs may be used individually (e.g., <p>) or in fixed combinations (e.g., <pp>) to represent distinct sounds (e.g., /p/), sound combinations (e.g., /pa/), or sound-meaning units (e.g., /papa/ 'father'). Thus, one may speak of *written signs*, each formed by an arbitrary association of a graphical form as the signifier (e.g., <p>) and a linguistic value as the signified (e.g., /p/).[3] When a

3. This account is based on Saussure's (1916) dyadic model of signs. It remains an open question whether this model is in any way preferable to Peirce's (1931–1958)

set of written signs is used in accordance with a body of conventions to write a particular language, it is common to regard them respectively as the *signary* and the *orthography* of a *writing system* (Daniels and Bright 1996, pp. xliii–xliv; Coulmas 2003, pp. 35–36).

The notion of *linguistic unit* plays a crucial role in graphemics or the linguistic study of writing systems. Firstly, it is commonly assumed that each written sign represents a specific instance of a particular linguistic unit. For example, a written sign is said to represent a phoneme if its graph corresponds to a single vowel or consonant (e.g., 'Finnish <p> represents /p/'), or a morpheme if the graph has a sound-meaning value (e.g., 'Chinese 山 represents {mountain} = /shān/ 'mountain') (for more examples, see descriptions of the world's writing systems in Daniels and Bright 1996 and Kōno, Chino, and Nishida 2001). Secondly, as already mentioned in the introduction to this paper, it is common to characterise a writing system in terms of a particular linguistic unit (e.g., 'Finnish is a phonemic writing system,' 'Chinese writing system is morphemic') (again, see Daniels and Bright 1996 and Kōno, Chino, and Nishida 2001). The underlying assumption seems to be that every writing system can be—or even should be—described in terms of one single type of linguistic unit that is most relevant to the signary of that system.[4]

Gelb (1963, pp. 190–205) provides a clear formulation of this assumption in his explanation of what he terms the 'evolution of writing'. Gelb notes that "[t]here are no pure systems of writing" because any writing system "may contain elements from different phases of its development" (pp. 199–200). To cite his examples, the English writing system employs some word signs (e.g., <£>) in addition to phonemic signs (e.g., <p>) (p. 200).[5] Nonetheless, Gelb describes English as being 'alphabetic'. In other words, the entire writing system is characterised as being phonemic, abstracting away from the use of word signs. This, according to

triadic model of signs for a better understanding of writing (Gerald Penn, personal communication, 14th June 2018).

4. Sometimes compound descriptors like 'morphosyllabic' are also used (e.g., DeFrancis 1989, p. 58; see Section 4.1). However, assuming a headed structure in such compounds, it is reasonable to interpret the head as the main part of the characterisation (i.e., morphosyllabic). Moreover, at least in English writing, hyphenation would be used if they are meant to be dvandva compounds (i.e., morpho-syllabic). Thus, as far as English is concerned, 'morphosyllabic' should be interpreted as 'primarily syllabic' (Kaiser, 1995, p. 163).

5. This currency symbol can be seen as a word sign because it represents a particular sound-meaning unit (i.e., <£> /paʊnd/ 'currency unit') rather than a sound sequence (e.g., not *<com£> for *compound*). However, it can also be interpreted as a morpheme sign when it is used for writing the monomorphemic *pound* as in <£1>, and as a word sign when used for the polymorphemic *pound+s* as in <£2>. It may also be considered as being ideographic when reduplicated as in <£££>, rendered variously as *hundreds of pounds*, *three-digit pounds*, *a lot of money* and so on.

Gelb, is justified on the grounds that it allows one to capture "only the major characteristics" of the writing system (p. 200).

If one accepts Gelb's (ibid.) above observation that there are no pure writing systems, it would follow that the signary of every writing system contains different subsets of signs based on distinct types of linguistic units. In that case, characterising a given writing system in terms of a single linguistic unit would presuppose a distinction between units of primary and secondary importance. By calling a given system alphabetic or phonemic, for instance, one is implicitly or explicitly stating that the phoneme is central—and all other units peripheral—to the functioning of its signary. Such a distinction must be made on the basis of a thorough and systematic linguistic analysis of the signary. This point deserves emphasis because an inadequate analysis could lead to an inaccurate description of the writing system in question.

2. Kanji Graphs and Kanji-Written Words

One of the most striking features of the current Japanese writing system is its mixed use of multiple scripts (Backhouse 1984, p. 219; Smith 1996, p. 214; Joyce 2001, p. 12; Joyce 2011, p. 62; Honda 2012, pp. 38–39). As already mentioned above, there are four main scripts currently in use, namely the sinographic kanji, kanji-derived hiragana and katakana, and the Latin script known as rōmaji. While it is theoretically possible to write Japanese entirely in one of these scripts, the norm is to use all of them for different purposes in a complementary way.[6] In other words, the four scripts function as distinct but interlinked subparts of a complex signary in the current Japanese writing system.

The kanji script constitutes the largest of those subparts. Currently some 2,000 to 3,000 kanji graphs are in common use, together with another few thousand graphs of relatively low frequency (Joyce, 2001, pp. 17–19). A majority of these graphs were historically imported from the Chinese writing system, while others were invented in Japan following the same formation principles underlying the imported ones (Satō

6. This functional division, which is non-binding but commonly observed, can be outlined as follows: (1) kanji graphs are used for content words and morphemes (see below); (2) hiragana graphs are used for grammatical particles, derivational and inflectional affixes, as well as some content words; (3) katakana graphs are used for modern loanwords, native mimetics and the names of flora and fauna; and (4) rōmaji graphs are used for foreign words and abbreviations of native and non-native words. Some might oppose the possibility of writing Japanese solely in kanji graphs, saying that they cannot indicate grammatical information. However, this is a viable option in view of the historical use of *man'yōgana* (万葉仮名) or phonographically employed kanji graphs (e.g., Seeley 2000, p. 190).

1987–1989; Seeley 2000; Frellesvig 2010; Okimori 2011). The Chinese-made graphs were initially adopted to read and write texts in classical Chinese. They were gradually adapted to write both what had become Sino-Japanese (SJ) lexical items and their native Japanese (NJ) equivalents by way of translation. On the other hand, the Japanese-made graphs, known as *kokuji* (国字) or 'national characters,' were used to write NJ lexical items that had no equivalents in Chinese.

Today both classes of kanji graphs are used to write a large subset of Japanese lexical items, which are etymologically SJ (e.g., 書物 /shomotsu/ 'book'), NJ (e.g., 書留 /kakitome/ 'registered post') or a hybrid of both (e.g., 書棚 /shodana/ 'bookshelf').[7] Although some content words are written with individual graphs (e.g., 書 /sho/ 'writings'), the majority are written with strings of two or more graphs (e.g., 書道 /shodō/ 'calligraphy,' 書道家 /shodōka/ 'calligrapher'). *Kanji* graphs may also be combined with hiragana graphs to write inflected words (e.g., 書く /kaku/ 'write') and derived forms thereof (e.g., 書き /kaki/ 'the way one writes something'), as well as a small number of non-inflected words (e.g., 且つ /katsu/ 'besides').[8] They may also be used in combination with hiragana or katakana graphs to write hybrid compounds (e.g., 書道セット /shodōsetto/ 'set of calligraphy tools').

As noted in Section 1, a written sign can be seen as an arbitrary association of a graphical form and a linguistic value. Assuming that kanji graphs constitute the forms of written signs, it is possible to isolate their values through a comparative analysis of kanji-written words. For instance, a comparison of such words as 書 /sho/ 'writings,' 書物 /shomotsu/ 'book' and 書棚 /shodana/ 'bookshelf' reveals that the graph 書 has the value /sho/, which conveys 'writing' and other related meanings. Traditionally, the value of a kanji graph is referred to as *yomi* (読み) or, in English, 'readings'. Each reading consists of a particular pronunciation which often, but not always, denotes a specific meaning (Section 3.2). Due to the historical background of kanji graphs and kanji-written words described above, a single graph may be associated with an *on* (音) or SJ reading, a *kun* (訓) or NJ reading, or both.[9] It is also common

7. *Kanji* graphs may also be used to write non-Chinese loanwords (e.g., 煙草 *tabako* 'tobacco,' 浪漫 *roman* 'romanticism'). However, this usage is confined to a small subset of the vocabulary and is often replaced by hiragana or katakana writing (e.g., kanji 煙草 by katakana タバコ).

8. In this usage, there is often a mismatch between the kanji-hiragana boundary and the morpheme boundary within a word. To illustrate with 書く /kaku/ 'write' (morphologically *kak-u* 'write-non.past·aff·plain'), the hiragana く corresponds to both the stem-final /k/ and the suffix /u/. In the literature, there are different approaches to account for such a mismatch (e.g., Kaiser 1995, p. 165; Honda 2012, pp. 133–142). The present paper leaves this topic for future research.

9. With regard to the types of readings, the present paper uses the terms *on* and *kun* instead of SJ and NJ. This is because some readings commonly thought to be NJ

for a single graph to have multiple *on* readings, multiple *kun* readings or both, owing to the fact that kanji-written words were borrowed from different dialects of Chinese, and then translated into Japanese by different schools of literate traditions. For example, the graph 音 has two *on* readings /on/ and /in/, and two *kun* readings /oto/ and /ne/, all meaning 'sound'.

There are two special uses of kanji graphs which require particular mention here. The first one is *jukuji* (熟字) or 'polygraphic character,' in which a string of two or more graphs forms a single functional unit and corresponds to a lexical item in a many-to-one manner. Used this way, the graph string is said to carry a special *kun* reading known as *jukujikun* (熟字訓), sometimes translated as 'idiomatic kun' (I. Taylor and M. M. Taylor, 2014, p. 279). One example of *jukuji* is 田舎, which has the *jukujikun* /inaka/ 'countryside'. Importantly, the graph 田 is usually rendered in the *on* reading /den/ or the *kun* reading /ta/, both meaning 'rice field,' and 舎 in the *on* reading /sha/, meaning 'hut'. As this example illustrates, a *jukujikun* is not the total sum of the regular readings of the graphs constituting the given *jukuji*.

The second special use of kanji graphs includes *on'yaku* (音訳) and *ateji* (当て字), both involving what is known in the literature as the 'rebus principle' (Coulmas, 1996, pp. 433–434). On'yaku, which may be translated as 'phonetic translation,' was historically used to transcribe non-Chinese loanwords like 檀那 /danna/ 'master' (< Sanskrit *dāna*) and 襦袢 /juban/ 'underskirt' (< Portuguese *gibão*) (NKDDHI, 2000–2002). In both examples, each kanji graph is used for the phonological property of its regular reading without regard to the meaning. To illustrate this point, the readings of both 檀 /dan/ 'cedar, sandalwood' and 那 /na/ 'that, which' are used purely phonologically in the first example above, abstracting from their etymologically irrelevant meanings. The same principle underlies *ateji*, roughly translated as 'assigned character,' which refers to rebus notation of non-Chinese loans such as 浪漫 /roman/ 'romanticism' as well as NJ lexical items like 野暮 /yabo/ 'unrefined' (ibid.).

Finally, a special mention should be made of the *Jōyō Kanji Hyō* (常用漢字表) or 'List of Characters for General Use' (Japanese Cabinet, 2010). This is a body of guidelines on the use of kanji graphs and their readings, defined for everyday purposes by the Japanese Ministry of Education. First promulgated by the Japanese Cabinet in 1981, the list went through a partial revision, and a new version was issued in 2010. The current list contains 2,136 graphs and 4,388 readings (2,352 *on* and 2,036 *kun*), together with examples of common words written with them. Although legally non-binding, these graphs and readings are widely accepted as

in fact originate in Chinese (e.g., 馬 /uma/ 'horse') or Korean (e.g., 寺 /tera/ 'temple') (NKDDHI, 2000–2002).

a de facto standard for kanji orthography.[10] Nevertheless, it should be stressed that these graphs and readings constitute only a subset of those actually used in the current Japanese writing system. In this sense, the List of Characters for General Use must be seen as a representative sample and not as the whole picture of kanji usage.

3. The Morphographic Theory

Turning now to the main subject of this paper, the morphographic theory sees the morpheme as the primary linguistic unit underlying the functioning of kanji graphs. While there are some different ways to define what a morpheme is, a textbook definition is that it is "the smallest unit of language that carries information about meaning or function" (O'Grady and de Guzman, 1997, p. 133). A morpheme can form a word by itself, in which case the word in question is said to be *monomorphemic* or *morphologically simplex*. It can also be concatenated with another morpheme to form a *polymorphemic* or *morphologically complex* word. In English, for example, the morpheme {write} can stand by itself as the monomorphemic word *write*, or form a part of polymorphemic words like *writing* and *writer*. With the notion of morpheme in mind, this section takes a close look into the morphographic theory of kanji graphs.

3.1. An Overview of the Morphographic Theory

The term *morphography*, also known as *morphemic writing*, refers to a one-to-one correspondence between graphs and morphemes (e.g., Joyce 2011, p. 59; Sampson 2015, 23ff).[11] As already introduced above, the morphographic theory holds that such a correspondence can be observed across kanji-written words. This theory is accepted by many studies in the field of Japanese linguistics, which describe kanji graphs as 'morphemic writing' (e.g., Miller 1967, 92–93ff, 1986, 15ff) or *hyōkeitaiso moji* (表形態素文

10. The 2,136 kanji graphs account for over 96% of all tokens of kanji-written words found in the 100-million word Balanced Corpus of Contemporary Written Japanese (Joyce, Masuda, and Ogawa, 2014, pp. 177–178).

11. Morphography differs from *logography* or the representation of individual words, and *phonography* or the representation of phonological units such as phonemes or syllables. While various instances of morphography can be found in the world's writing systems (Daniels and Bright 1996; Kōno, Chino, and Nishida 2001), views differ on whether it is possible to develop full-fledged writing based entirely or primarily on morphography (e.g., Hill 1967; DeFrancis and Unger 1994; Sproat 2000; Sampson 2015).

字), roughly translated as 'morpheme-representing characters' (e.g., Nomura 1999, pp. 1–3). It is also widely endorsed in general writing systems research, where kanji graphs are commonly characterised as a morphographic component of the Japanese writing system (e.g., Hill 1967, pp. 93–96; Sproat 2000, pp. 154–160; Sampson 2015, pp. 208–232). In this context, Joyce (2001, pp. 12–111; 2011) deserves particular attention because his study offers a powerful empirical basis for examining the morphographic theory.

At the heart of Joyce's (2001; 2011) discussion is the notion of *morphographic principle*, which he claims is fundamental to the way kanji graphs function. Under this principle, individual graphs not only represent morphemes but are also spatially arranged in accordance with the morphological structure of the word being written. Joyce maintains that this is the case in a vast majority of kanji-written words. To support this, he presents a morphological analysis of two-kanji compound words, that is, Japanese words written by combining two separate kanji graphs. They include SJ and NJ words as well as their hybrids, which, according to a dictionary-based survey of kanji-written words cited by Joyce, account for up to 70 per cent of all Japanese words (Yokosawa and Umeda, 1988, p. 377). Based on Nomura's (1988a; 1988b) study of word-formation patterns in kanji-written words, Joyce distinguishes nine principles underlying two-kanji compound words. These are presented in Table 1 below, reproduced with the original examples from Joyce (2011, p. 71, Table 3). For each principle, the left column shows two glossed examples and the right column indicates whether the principle in question is morphologically motivated or not.

According to Joyce (2001; 2011), the first eight principles are morphologically motivated, meaning that they involve the concatenation of two morphemes (e.g., 国道 /kokudō/ 'national road' = {country} + {road}). In writing, kanji graphs correspond to these morphemes and are linearly arranged in the same order as they are concatenated (e.g., 国 {country} + 道 {road}). Joyce maintains that the only non-morphologically motivated principle is the last one, designated as 'phonetic borrowing'. In his terminology, this is an umbrella term for words written in *jukuji*, *on'yaku* or *ateji* (Section 2). Individual kanji graphs do not correspond to morphemes either in *jukuji*, where they constitute polygraphs, or in *on'yaku* and *ateji*, where they function phonographically. Joyce dismisses words formed by phonetic borrowing as being "by far the exception" (Joyce, 2011, p. 71) to the predominantly morphological nature of two-kanji compound words and, by extension, the principally morphographic nature of kanji graphs. This is justified on the basis of Gelb's (1963, p. 199) above-mentioned observation that there are no pure writing systems. Thus, Joyce sees the morpheme as the primary linguistic unit underlying the functioning of kanji graphs.

TABLE 1. Word-formation principles underlying two-kanji compound words (reproduced from Joyce 2011, p. 71)

Principle			*Morphological*
Modifier + modified			Yes
山桜 /yamazakura/	'mountain' + 'cherry'	= mountain cherry	
国道 /kokudō/	'country' + 'road'	= national road	
Verb + complement			Yes
登山 /tozan/	'climb' + 'mountain'	= mountain climbing	
殺人 /satsujin/	'kill' + 'person'	= murder	
Complement + verb			Yes
外食 /gaishoku/	'outside' + 'eat'	= eat out	
毒殺 /dokusatsu/	'poison' + 'kill'	= kill by poison	
Associative pairs			Yes
親子 /oyako/	'parent' + 'child'	= parent(s) and child(ren)	
生死 /seishi/	'life' + 'death'	= life and death	
Synonymous pairs			Yes
山岳 /sangaku/	'mountain' + 'mountain'	= mountains	
変化 /henka/	'change' + 'change'	= change	
Repetitions			Yes
段々 /dandan/	'step' + 'step'	= gradually, by degrees	
個々 /koko/	'piece' + 'piece'	= individual, one by one	
Derivation			Yes
不明 /fumei/	'un-' + 'clear'	= unclear, obscure	
史的 /shiteki/	'history' + '-ic'	= historic	
Abbreviations			Yes
農協 /nōkyō/	from 農業共同	= agricultural cooperative	
春闘 /shuntō/	from 春季闘争	= spring (labor) offensive	
Phonetic borrowing			No
葡萄 /budō/		= grapes	
面倒 /mendō/		= care	

3.2. Problems of the Morphographic Theory

Joyce's (2001; 2011) analysis of two-kanji compound words provides a strong empirical basis for the morphographic theory of kanji graphs. At the same time, it faces at least two major problems that have gained little attention in the literature.

3.2.1. Semantic Transparency

The first problem is best captured by making reference to the notion of *semantic transparency* or the extent to which the meaning of a polymorphemic word can be predicted from the meanings of its constituent morphemes (Körtvélyessy, Štekauer, and Zimmermann, 2015, pp. 87–92). It is generally conceived as a scalar notion (i.e., greater-or-lesser) rather than a binary one (i.e., either-or), meaning that a given word may be considered more or less transparent than another.

Two intertwined factors contribute to semantic transparency, namely *compositionality* and the presence of *constant meanings* in word elements. To exemplify with the English word *blueberry*, it is analysable into two meaningful elements *blue* and *berry* through comparison with other words like *bluebird* and *blackberry*. Because these elements are not further analysable into smaller meaningful parts, they can be considered as two separate morphemes. Besides, one may speak of a part-to-whole relationship between the meanings of these morphemes (i.e., 'a colour' and 'a small roundish fruit') and that of the compound they constitute (i.e., 'a berry of that colour'). In this sense, *blueberry* can be seen as a semantically transparent compound of {blue} and {berry}. In contrast, semantic transparency is less evident in *strawberry*. While this word is also analysable into {straw} and {berry}, the meaning of the first morpheme (i.e., 'stalk of a cereal plant') is less clearly related to that of the compound when compared to that of {blue} in *blueberry*. This is even more so in *cranberry*, as the element *cran-* occurs only in this particular word and its meaning is therefore unidentifiable by way of comparison.

The notion of semantic transparency poses a serious challenge to Joyce's (2001; 2011) analysis of two-kanji compound words, which is pivotal to his argument for the morphographic theory. As noted above, Joyce assumes morphological constituency in most types of two-kanji compound words, with the sole exception of those formed by phonetic borrowing. This assumption predicts compositionality in such words because the presence of constant meanings is a prerequisite for the analysis of words into morphemes. To borrow an example from Table 1 above, Joyce (2011) categorises the commonly used word 変化 /henka/ 'change' as a synonymous pair and analyses it into 変 /hen/ 'change' and 化 /ka/ 'change'. This analysis is plausible in view of words like 変心 /henshin/ 'change of mind' and 化成 /kasei/ 'transformation'. Given the clear relationship between the meanings of the word elements and that of the compound itself, it seems reasonable to assume a certain degree of compositionality and, by extension, a morphological constituency in this word. As Vance (2002, p. 187) points out, however, it is often dubious to assume a similar degree of compositionality in words like 勉強 /benkyō/ 'study'. Also a common word formed by synonymous pair, it is analysable into 勉 /ben/ 'striving' and 強 /kyō/ 'strength' through

comparison with items like 勉励 /benrei/ 'diligence' and 強風 /kyōfū/ 'strong wind'. Nevertheless, unlike the straightforward compositionality in 変化 /henka/ 'change,' it is not immediately clear why the combination of 'striving' and 'strength results in 勉強 /benkyō/ 'study'.[12] In this light, it appears plausible to say that the degree of compositionality is higher in the first example and lower in the second one. This observation calls into question the notion of morphological constituency as an essential feature of all two-kanji compound words except for those formed by phonetic borrowing.

A key factor overlooked by Joyce (2001; 2011)—and in fact also by many proponents of the morphographic theory—is diachronic changes in lexical meanings. As for 勉強 /benkyō/ 'study,' there is evidence that this word underwent a semantic shift from the original meaning of 'diligence' to the current meaning of 'study'.[13] Although rather impressionistic, the meanings of 勉 /ben/ 'striving' and 強 /kyō/ 'strength' appear to be more closely related to this former meaning than to the latter one. If one accepts this interpretation, then it would be possible to say that the word under discussion has become less compositional over the course of history. As a matter of fact, such a decrease in compositionality can be observed in many two-kanji compound words. Of particular importance are words containing kanji graphs with obsolete meanings (Nomura 1999, p. 10; Tajima 2006, pp. 6–8). One example is 挨拶 /aisatsu/ 'greeting,' another commonly used synonymous pair word. Historically, it was a compound of 挨 /ai/ 'push' and 拶 /satsu/ 'shove,' denoting a religious practice of Zen Buddhism in which a monk would 'press' his peer verbally or even physically to test his level of enlightenment (NKDDHI, 2000–2002). At present, however, this meaning has become obsolete and can only be confirmed by consulting dictionaries and other reference resources. It is also important to note that the graphs 挨 and 拶 normally occur only in this particular combination.[14] Consequently, there is no way to isolate their present-day meanings—if they existed—by means

12. One might suspect that this is due to the English translations of the original meanings provided here. However, the situation remains by far the same even in view of other translations. For instance, Nelson's (1997) *Japanese-English Character Dictionary* gives the following translations: 勉 'serve, fill a post, serve under; exert oneself, endeavour, work, be diligent; play (the part of); as much as possible; diligently'; 強 'strength, might; strong person'.

13. This original meaning is attested in *Mōshishō* (毛詩抄), a collection of lecture notes compiled in the first half of the 17th century, whereas the current meaning probably came about in the 19th century (NKDDHI, 2000–2002).

14. One exception is the variant form 一挨一拶 /ichiaiissatsu/ 'one pushing, one shoving,' which denotes the same Zen practice described above. In historical usage, 挨 and 拶 also occur in combination with other graphs, as instantiated by 挨次 /aiji/ 'consecutive' and 逼拶 /hissatsu/ 'put pressure'. However, there are only a handful of such words (ibid.).

of comparison. Therefore, as far as the contemporary Japanese lexicon is concerned, it is safe to conclude that 挨拶 /aisatsu/ 'greeting' has lost its historical compositionality and, hence, morphological constituency.[15]

One might be tempted to tackle this problem by attaching lesser importance to the role of meaning in morphemehood. As already noted, a textbook definition of morpheme is that it is the smallest linguistic unit carrying information about meaning or function. For kanji-written words, however, Miyajima (1973, p. 15) postulates a special kind of morpheme called *muimi keitaiso* (無意味形態素) or 'meaningless morpheme'. It is defined as "an element carrying no active meaning by itself, which always occurs in combination with certain other (meaningful) elements" (English translation by the present author).[16] Following Bloomfield (1933, 160ff), he equates meaningless morpheme to the *cran*-element in English *cranberry* in that it carries no denotational meaning but a differential meaning (i.e., standing for nothing but distinguishing *cranberry* from *blackberry*, *strawberry*, *gooseberry*, etc.). If one accepts this notion, it might be possible to treat kanji graphs like 挨 and 拶 as representing meaningless morphemes. However, such a treatment would obfuscate the delineation of morpheme and call for a radical reconceptualisation of morphography.

3.2.2. Orthographic Variation

The second problem concerns synchronic and diachronic variation in the orthographic forms of two-kanji compound words. Synchronically, there are a number of two-kanji compound words in which a kanji graph can be replaced with another one without changing the word's meaning. To give one example, both 少食 and 小食 are commonly used to write /shōshoku/ 'light eating'. Both 少 and 小 are associated with the *on* reading /shō/, which means 'few, little' in the former and 'small' in the latter. Assuming the traditional definition of morpheme as the smallest meaningful unit, they must be treated as representing homophonous but semantically related morphemes. This treatment is faced with the additional task of proving that 少食 /shōshoku/ and 小食 /shōshoku/ are distinct words denoting different meanings (e.g., 'eating little amount of

15. Morioka (2004, p. 102) reports that there are approximately 950 kanji graphs with obsolete meanings like 挨 and 拶 within the set of 6,355 common kanji graphs defined by the Japanese Industrial Standard for IT use. These include graphs used for writing common words (e.g., 絢爛 /kenran/ 'gorgeous,' 狡猾 /kōkatsu/ 'cunning') as well as those for relatively infrequent ones (e.g., 跼蹐 /kyokuseki/ 'cower,' 魍魎 /mōryō/ 'spirits and goblins').

16. The original definition reads as follows: " それ自身では積極的な意味をもっておらず、つねにほかの特定の（有意味的な）要素と結びついてあらわれる要素 " (Miyajima, 1973, p. 15).

food' versus 'eating small size food'). In reality, however, nothing seems to suggest that this is the case. Alternatively, one might argue that 少 and 小 represent two meaningless morphemes, but this argument is also untenable because the readings of these graphs are clearly distinguished in terms of meaning (i.e., 'few, little' versus 'small').

The situation becomes further complicated if diachronic variation is also taken into account. One interesting example is the common word 時計 /tokei/ 'timepiece' (NKDDHI 2000–2002; Tajima 2006, pp. 11–12). Superficially, it seems analysable into 時 /toki/ 'time' and 計 /kei/ 'measure,' which, despite the phonological discordance, might appear semantically transparent to some degree. Before modern times, however, the same word was written as 土圭, a compound of 土 /to/ 'earth' and 圭 /kei/ 'pyramid-shaped jade'. Historically, this older form was used for writing /tokei/, originally denoting Chinese terracotta sundials. After the introduction of Western mechanical clocks to Japan in the mid-16th century, it was gradually replaced by various other forms (e.g., 時計, 斗鶏, 斗影) to reflect the change in time measurement devices. The current 時計 became the only accepted form as a result of orthographic regularisation. It is difficult to see how to explain this orthographic change from 土圭 to 時計 from a purely morphological standpoint. The only possibility would be to assume two homophonous variants of the word /tokei/, consisting of different pairs of morphemes. The validity of such an assumption is open to discussion. For one thing, it is not immediately clear at what level of abstraction the word's referent (i.e., time measurement device) can be considered to have different meanings (i.e., 'sundial' versus 'clock'). For another, the change in orthographic form (i.e., 土圭 > 時計) and lexical meaning (i.e., 'sundial' > 'clock') does not necessarily entail a change in the word's morphemic make-up (i.e., {earth} + {pyramid-shaped jade} > {time} + {measure}).

4. The morphophonic theory

An alternative view has been suggested by the morphophonic theory, which characterises kanji graphs as being primarily phonographic and only secondarily morphemic. This section discusses the reasoning behind this claim.

4.1. An Overview of the Morphophonic Theory

DeFrancis (1989, pp. 47–64, 89–121) provides perhaps the strongest criticism of the notion of morphography as a major type of writing. The author argues that the most fundamental principle underlying all full-fledged writing systems is phonography, which may or may not be sup-

plemented by a limited number of non-phonographic signs. For DeFrancis, this is also applicable to the Chinese writing system, which is traditionally considered as a prime example of logographic or morphographic writing systems. Matsunaga (1994, pp. 20–39; 1996, pp. 14–18) follows the same line of argument and characterises Japanese kanji graphs as being *morphophonic*, that is, primarily phonographic and only secondarily morphographic (see footnote 4 above). For the purpose of the present paper, let us first take a closer look at DeFrancis' treatment of Chinese, and then proceed to examine Matsunaga's discussion of Japanese.

DeFrancis' (1989) argument for Chinese as an essentially phonographic writing system is based on two facts. The first one is that all graphs in Chinese, known as *hànzì* (traditionally 漢字 / simplified as 汉字), are associated with one or more monosyllabic readings, but not all readings convey constant meanings.[17] Thus, while DeFrancis acknowledges that many readings indeed correspond to individual morphemes, he emphasises that hànzì graphs are primarily monosyllabic and only secondarily monomorphemic. The second—and more important—fact is that the majority of hànzì graphs are what DeFrancis terms *SP compounds*, that is, combinations of graphical components called *semantic* and *phonetic elements*. Roughly, the semantic element suggests the semantic class under which the graph's reading is traditionally classified, whereas the phonetic element indicates the way this reading should be pronounced. To take one of DeFrancis' examples, 像 is associated with the reading /xiàng/ 'image' in Chinese. This graph consists of the semantic element 亻, which derives from 人 /rén/ 'person,' and the phonetic element 象, which by itself represents the word /xiàng/ 'elephant'. Here, the former suggests the semantic class 'person' irrespectively of the reading /rén/, and the latter indicates the pronunciation /xiàng/ without regard to the meaning 'elephant'. According to DeFrancis, phonetic elements are found in about 97% of all Chinese graphs created by the 18th century. Taking these two facts together, DeFrancis argues that the Chinese writing system should be characterised as being *morphosyllabic*, that is, primarily syllabic and only secondarily morphographic. A similar view is shared by his predecessor Gelb (1963, pp. 85–89) and contemporaries like Unger (1987, pp. 35–49) and Daniels (1992, p. 83; 2018, pp. 84–92).

While DeFrancis (1989) stops short of clarifying whether the same characterisation is possible for Japanese kanji graphs, Matsunaga (1994; 1996) argues in favour of that position. Given the polysyllabic nature of kanji readings in Japanese, Matsunaga characterises kanji graphs as being *morphophonic*, an umbrella term also proposed by DeFrancis to designate all writing systems that are primarily phonographic and secondar-

17. As an exception to the monosyllabic nature of hànzì graphs, 兒/儿 is read monoconsonantally as /r/ when used to write the diminutive suffix *-r*.

ily morphographic. Matsunaga finds support for her argument in Itō's (1979, pp. 71–75) survey of 1,933 frequently used kanji graphs. The set of kanji graphs used in this survey included 1,850 graphs of the *Tōyō Kanji Hyō* (当用漢字表) or 'List of Characters for Current Use,' a predecessor to the current *Jōyō Kanji Hyō* (Section 2). According to Itō, the 1,933 graph set included 1,248 SP compounds, of which 1,192 graphs had clearly identifiable phonetic elements. Regarding this latter subset, she reports that 734 graphs (61.6%) had phonetic elements that would indicate pronunciations in an accurate way. Based on Itō's findings, Matsunaga maintains that the role of phonetic elements is as important in Japanese kanji graphs as they are in Chinese hànzì graphs.

4.2. Problems of the Morphophonic Theory

Mastunaga's (1994; 1996) above argument provides important insights into the phonological aspect of the functioning of kanji graphs. Nonetheless, it places too much emphasis on the functionality of phonetic elements. There are two main problems with this.

Firstly, phonetic elements indicate only one of two types of readings. As will be recalled from Section 2, kanji graphs are typically associated with both *on* and *kun* readings, the former originating in Chinese and the latter in Japanese. Importantly, while phonetic elements indicate *on* readings more or less accurately in many SP compounds (see below), they do not provide any information about *kun* readings. For instance, 白 can both stand by itself as an independent graph as well as form a phonetic element in other graphs like 柏, 粕 and 泊. It provides an accurate indication of the *on* reading for these graphs, namely 白 /haku/ 'white,' 柏 /haku/ 'daimyo oak,' 粕 /haku/ 'dreg' and 泊 /haku/ 'stay'. With regard to *kun* readings, however, the same graphs are read in phonologically diverse forms, namely 白 /shiro/ 'white,' 柏 /kashiwa/ 'daimyo oak,' 粕 /kasu/ 'dreg' and 泊 /to(maru)/ 'stay'. As these examples clearly illustrate, phonetic elements may work for *on* readings but not for *kun* readings.[18]

Secondly, Itō's (1979) survey findings require careful re-evaluation. As already noted, Itō reports that 61.6% of the kanji graphs examined had phonetic elements that would accurately indicate pronunciations. It

18. There are some apparent exceptions in *kokuji* graphs (Section 2). For instance, 柾 is associated with the *kun* reading /masa(ki)/ 'Japanese spindle'. The graph incorporates 正, which can also stand by itself as an independent graph carrying the *kun* reading /masa/ 'exact' among other readings. Accordingly, this element may be considered as an example of phonetic elements indicating *kun* readings. However, in a discussion of 249 *kokuji* graphs, Sproat (2000, pp. 155–156) points out that only 8% of these graphs classify as SP compounds of this kind.

will also be recalled that this figure was obtained by dividing the number of SP compounds incorporating phonologically reliable phonetic elements (734 graphs) by the number of SP compounds with clearly discernible phonetic elements (1,192 graphs). Crucially, however, the percentage falls to 38.0% if one takes into account all the 1,933 kanji graphs used in the survey. This means that less than 2 in 5 graphs have a phonetic element accurately indicating *on* readings. In this light, the actual effectiveness of phonetic elements is also called into question even with regard to *on* readings.

In this connection, it is useful to consider two similar surveys conducted by later studies. The first one is Nomura and Itō's (1978, pp. 308–310) reanalysis of the 1,850 graphs of the *Tōyō Kanji Hyō*, which were part of the 1,933 graph set used in Itō's (1979) survey.[19] According to Nomura and Itō, they included 1,137 SP compounds incorporating clearly discernible phonetic elements. However, when it comes to accuracy, these elements indicated the exact pronunciations of *on* readings in less than 1 in 3 graphs (33.3%). This result shows an even lower estimate for the effectiveness of phonetic elements than the one reported in Itō's earlier study. The second survey is presented in Stalph's (1989, pp. 148–155) study of kanji graphs and readings. Stalph points out a methodological problem in the two previous studies. In a nutshell, both Itō (1979) and Nomura and Itō (1978) identified phonetic elements and their corresponding pronunciations based on historical usage, and then compared them directly with their present-day counterparts. Criticising this confusion of synchrony and diachrony, Stalph presents a strictly synchronic analysis of 1,945 kanji graphs included in the pre-revision version of the *Jōyō Kanji Hyō* or the List of Characters for General Use (Section 2). The author reports that this set included 310 SP compounds (16.0%) containing a phonetic element indicating the exact pronunciation of an *on* reading. This figure casts further doubt on the notion that phonetic elements play a significant role in kanji graphs.

To summarise, Matsunaga (1994; 1996) is right in pointing out the prevalence of SP compounds and the existence of functional phonetic elements. However, the actual effectiveness of phonetic elements is virtually non-existent with respect to *kun* readings and highly limited in relation to *on* readings. In this light, it is implausible to characterise kanji graphs as being morphophonic or primarily phonographic on the basis of phonetic elements. By doing so, one confuses the historical formation principle underlying kanji graphs and the way these graphs function in the current Japanese writing system.

19. The survey reported in Itō (1979) was conducted before the publication of Nomura and Itō (1978).

5. A New Proposal

Following the discussion presented in Section 3 and Section 4, it is now possible to establish the pros and cons of the existing theories. On one hand, the morphographic theory excels in capturing the fact that many kanji graphs correspond to individual morphemes. However, it is misleading to suggest that the morphographic principle underlies all kanji-written words except for those formed by phonetic borrowing. For one thing, it is dubious to assume morphological constituency in two-kanji compound words with a low degree of compositionality. For another, it is unclear how to deal with synchronic and diachronic orthographic variation in which different kanji graphs are used to write the same word. On the other hand, the morphophonic theory sheds light on the phonological aspect of kanji graphs and kanji-written words without saying what is exceptional and what is not. At the same time, it assigns too much importance to the role of phonetic elements, whose effectiveness is highly limited in actuality. In short, while these two theories provide important insights into the relationship between kanji graphs and the morphological and phonological aspects of Japanese words, both make questionable assumptions to prioritise one aspect over the other.

For a better and more holistic understanding of the way kanji function as written signs, the present paper proposes to combine the advantages of the existing theories while avoiding their disadvantages. This proposal consists of two central claims. The first one is that kanji graphs relate to morphology by way of phonology. This is motivated by the observation that morphological constituency is justifiable in some kanji-written words (e.g., 国道 /kokudō/ 'national road,' 変化 /henka/ 'change') but not in those formed by phonetic borrowing (e.g., 葡萄 /budō/ 'grape,' 面倒 /mendō/ 'care') and those with a low degree of compositionality (e.g., 勉強 /benkyō/ 'study,' 挨拶 /aisatsu/ 'greeting'). What this means is that kanji graphs may or may not correspond to individual morphemes, while they always correspond to certain portions of words' phonological forms. Crucially, this is true regardless of whether or not the graphs incorporate synchronically effective phonetic elements. To capture these points, it is reasonable to generalise that all kanji graphs represent the phonological exponents of morphemes in both polymorphemic and monomorphemic words (Figure 1).

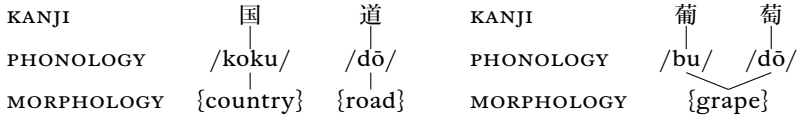

FIGURE 1. *Kanji* graphs representing phonological exponents of morphemes

The second claim is that kanji graphs function both individually and in fixed combinations. This is motivated by the existence of words written with single graphs (e.g., 書 /sho/ 'writings') and those written with multi-graph *jukuji* (e.g., 田舎 /inaka/ 'countryside'). As both groups of words are generally monomorphemic (Honda, 2012, pp. 120–123, 128–133), it is fair to assume that kanji graphs can form two structurally distinct types of monomorphemic written signs, namely the single-graph and the multi-graph (Figure 2). Such a distinction is also justified by the prevalent use of polygraphs or multi-graph functional units across the world's writing systems (Osterkamp and Schreiber, 2019).

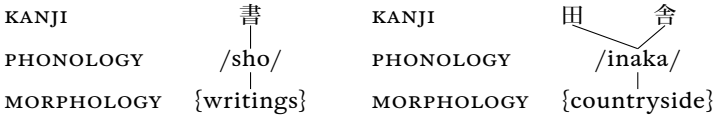

FIGURE 2. *Kanji* graphs forming single- and multi-graph written signs

Based on these claims, the present paper proposes a new, unifying model of kanji as written signs (Figure 3). In this model, kanji graphs are viewed as the formal building blocks of structurally simplex or complex written signs representing the phonological exponents of individual morphemes. The strength of the present model is that it provides a uniform account of the linguistic unit underlying the functioning of all kanji graphs without exception.

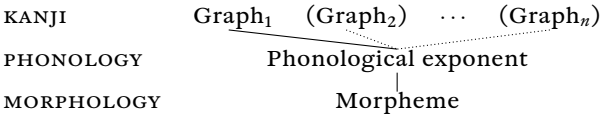

FIGURE 3. A unified model of kanji graphs as written signs

6. Concluding Remarks

This paper has discussed the type of linguistic unit represented by Japanese kanji graphs. After a preliminary discussion of the notion of linguistic unit (Section 1) and the relevant features of kanji graphs and kanji-written words (Section 2), it has presented a critical examination of the morphographic theory (Section 3) and morphophonic theory (Section 4). Based on the discussion, the present paper has offered

a preliminary sketch of a new, unifying model of the way kanji function as written signs in the current Japanese writing system (Section 5). It has been proposed that kanji graphs can form structurally simplex and complex written signs, both representing the phonological exponents of individual morphemes. Further research is needed to test the validity of this proposal.

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