Open questions in the cross-linguistic conception of the grapheme

Linguistic value and (supra)segmentality

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Abstract

A recent proposal for a cross-linguistic definition of the concept of grapheme (Meletis 2019) raises some open questions when applied to writing systems with certain idiosyncratic features (such as Japanese) or – given its synchronic bias – ancient writing systems. Two of these questions are addressed in this paper: (1) How written units that are either polyvalent or only have a partial value can be conceptualized, and (2) how determinatives – as a feature found predominantly in historical writing systems – fit into a definition of grapheme. It will be argued that graphemes can have both multiple or partial linguistic values if – in default contexts or uses – they have a stable value (i.e., correspondence with a linguistic unit such as a phoneme, syllable, or morpheme) and that determinatives are value-distinguishing graphematic elements rather than independent graphemes. Furthermore, given the larger

contexts in which the phenomena addressed in this paper assume their functions, the feasibility of a suprasegmental graphematic approach will be considered.

Keywords: grapheme, comparative graphematics, grapholinguistics, okurigana, determinatives, (supra)segmentality

1. Introduction

It is self-evident that writing systems, as complex structural systems, consist of basic units which are combined to form larger units such as written words or phrases. However, for a long time, and for various reasons, there had been virtually no attempts in linguistics to explicitly define this unit – at least not in a way that can account for the formal and functional diversity of the world's writing systems. The definitions that *were* formulated were restricted to a given type of writing systems – the segmentary (cf. Gnanadesikan 2017) or segmental phonographic type (and mostly alphabets) – or even specific writing systems (such as that of German, cf. Kohrt 1986). As part of a larger enterprise of establishing a descriptive and explanatory framework for the comparison of diverse writing systems (cf. Meletis 2020a), in 2019, I proposed a cross-linguistic grapheme definition (Meletis 2019).

It consists of three criteria that a written element must meet to be considered a grapheme in a given writing system: (1) It must be distinctive (= *distinctiveness criterion*). This means that like phonemes, graphemes change the meaning of words. This can be tested using written minimal pairs such as <back> and <pack> in English, which show that <b> and <p> are two graphemes. Importantly, *carrying* meaning also counts as being distinctive. This is important when considering Chinese graphemes, which, due to their morphographic nature, relate to a linguistic meaning – a meaning that is, in turn, distinct from other such meanings. The distinctiveness criterion

also allows for the discovery of allography, i.e., the analysis of what even counts as a distinctive unit in a writing system vs. what is merely a non-distinctive variant (cf. Meletis 2020b). Next, to be a grapheme, (2) an element must also have (some) linguistic value (= *linguistic value criterion*). Admittedly, in the 2019 definition, this was by far the fuzziest criterion.[1] In short, graphemes have a 'linguistic value' prototypically (or only?) when they are directly related to primary linguistic units such as phonemes, syllables, or morphemes. However, what counts and what does not count as linguistic value is a contentious issue that will be addressed in Sections 2 and 3 of this paper. For example, subsegmental components in Chinese are considered subsegmental graphematic elements instead of graphemes even though they clearly have linguistic value – but neither they nor their (semantic or phonological) values are 'independent' as they are integrated into larger units (compound graphemes corresponding with morphemes[2]). And this problem is even further complicated by the third criterion, which is driven by the principle of economy and holds that (3) graphemes must be minimal (= *minimality criterion*). In other words, graphemes are the smallest units for which the first two criteria apply, sifting out both units that are too small such as the vertical stroke and its position in <b> and <p> in the above-mentioned minimal pair and those that are too big such as digraphs that correspond with linguistic units but in which both constituents are

[1] Cf. Meletis (2020a: 95): "Depending on what exactly a grapheme corresponds with or relates to – whether it is a single, concrete linguistic unit or less palpable linguistic information or a linguistic function – it will be imperative to assume different classes of graphemes that should not be lumped together. I leave this open for future discussion."

[2] There is no overt trace of that in the 'new' morpheme and its phonological representation save for a phonetic similarity to the pronunciation of the morpheme that the phonological graphematic component derived from. By contrast, there is an overt and analyzable structure present in the shape of the new grapheme. Writing, here, is 'richer' than the spoken language – as is also the case in French (considering mostly silent inflectional endings such as plural -s), to name just one example.

already individual graphemes on their own, cf. <th> in English (but cf. Osterkamp & Schreiber 2021; Reinken 2022a).

These criteria are sufficiently general in nature to account for the basic units of many typologically diverse writing systems, which may also be the reason they obviously raise several problems and open questions, two of which shall be selectively addressed in the following: How are both polyvalence and partial reference (or partial 'valence') explained in the context of this definition (Section 2)? And what is the graphematic status of determinatives, a striking feature of writing systems and a core driver in their diachronic evolution (Section 3)?

Note that this is a position paper consisting of preliminary ideas and possible solutions regarding these open questions. Further research and collaboration between, among others, experts on different writing systems as well as scholars from different writing-related disciplines will be vital to test whether its assumptions hold (cf. also Meletis 2021).

2. Polyvalence and partial reference

In 2021, Japanese linguist Kazuhiro Okada gave a talk titled *The less unitness of grapheme in the Japanese writing system*.[3] In it, he criticizes[4] the linguistic value criterion of the Meletis (2019) definition against the

[3] It was presented in August 2021 at the 16th International Conference of the European Association of Japanese studies, cf. for the abstract https://nomadit.co.uk/conference/eajs2021/paper/61432 (accessed June 29, 2023).

[4] I am very grateful for this type of criticism. As mentioned in Meletis (2021), it is only through the collaboration of experts on different systems and in different disciplines that we can carve out concepts that are not only applicable cross-linguistically and valuable in comparative work but that are still also precise enough to be used in descriptions of single systems. Criticism of the Meletis (2019) definition was also voiced in Edeleva & Neef (2022: 89) or Reinken (2022a: 322); however, statements such as – in the latter – "even this multidimensional grapheme definition is not entirely free of contradictions" are too vague to allow a direct response and modification of the definition.

background of an analysis of the Japanese writing system. As acknowledged above, this criterion had indeed been the vaguest in the 2019 proposal (cf. also Edeleva & Neef 2022: 89). Okada's starting point is the observation that in Japanese, "one can find several variations in accordance with correspondence of graphic and linguistic units" (Slide 5[5]). The specific phenomenon that he singles out is *okurigana* (cf., for an overview, Honda 2009), i.e., syllabographic hiragana either used to inflect adjectives and verbs or to signal a specific reading for a given morphographic kanji (which would give them the status of phonological determinatives or complements, cf. Section 3). Before addressing the former use, some additional criteria regarding the linguistic value criterion should be mentioned:

> In order to identify a unit as a grapheme, it is not necessary for it to refer to only one linguistic unit, and its linguistic reference does not need to be stable. It is only imperative that it has a linguistic value in all contexts in which it is used. (Meletis 2019: 36)

While (or because) this addendum makes the original definition broader (and vaguer), it remediates some points inherent in Okada's criticism – which, notably, he voiced based on the grapheme definition in Meletis (2020a), where these two sentences had been omitted. Given these two stipulations and the fact that the relevant direction of analysis in the establishment of a writing system's grapheme inventory is *writing → language* (i.e., decoding, cf. Meletis 2019: 36; Meletis 2020a: 94),[6] a lack of transparency of given graphemes is not considered a problem. In other words, the definition allows for the fact that in many writing systems, graphemes – while commonly having a default value – are also used with other values

[5] The slides can be accessed – for now – at https://www.academia.edu/51080109/eajs2021_okada (accessed June 29, 2023).

[6] In other words, we are interested in how written units refer or relate to linguistic units (such as phonemes, syllables, and morphemes) and not vice versa.

depending on factors such as their graphematic context. This, then, should account for the various ways that a given word can be written in Japanese (cf. also Joyce & Masuda 2019). An example that Okada provides is *torishimaru*, which, according to him (Slide 15), can be written as (1) 取りしまる, (2)取り締まる, (3) 取り締る, or (4) 取締る. The example highlights graphematic variation at a level higher than the segmental one, i.e., a type of variation that may make necessary the adoption of a suprasegmental approach (see the end of Section 3).

While the exact function of the okurigana in these examples is not the focus here, they do aptly highlight several interesting points that Okada makes: Firstly, that "[m]orphograms with syllabogram are not so distant from those without syllabogram; in other words, they consists [sic] a kind of *allography*" (Slide 20, emphasis in original). And secondly, that "[i]t is interesting that in JWS [= Japanese writing system, D.M.] every graphs [sic] can be understood to represent partial information on correspondence with linguistic unit. Thus partial morphogram writing can be aided by syllabogram" (Slide 23).[7]

As for the first point, alternative representations of the same value (of, for example, a lexeme) in the form of either morphographic graphemes or combinations of morphographic graphemes and syllabographic graphemes (or maybe only syllabographic graphemes) certainly represent an important type of graphematic variation. In terms of the descriptive graphematic framework presented here, however, they are not allographic in the narrow sense as they are constituted by independent graphemes that cannot, at the same time, be allographs (cf. Meletis 2020b: 261–262). In other words, allography is only present when two variants are not (semantically) distinctive among each other in any contexts in the writing system. Examples include

[7] An additional statement that warrants further analysis is that "Nagano & Shimada (2014) proposes that kanji does represent lexemes (lexical items just with meaning), rather than morphemes (signs of sound and meaning pair)" (Slide 23).

variant characters such as <群> and <羣> *qún* "group, flock" in Chinese, positionally conditioned variants such as the positional allographs of Arabic graphemes, and the two variants of *sigma* in Greek (<σ> word-initially and word-medially and <ς> word-finally). The bottom line is that written variants which graphematically represent the same element, structure, or utterance are thus not necessarily allographs.

The second point concerns what has been called *overspelling* (Schreiber 2022: 108–114) or *graphematic excess* (Meletis 2020a: 254), among other terms. In general, it is an overrepresentation of a given linguistic value in writing. With respect to the okurigana example provided above, it means that – word-final – parts of the phonological representation of a kanji are reduplicated by the added hiragana grapheme. As a consequence, in the 'phonological output' associated with these variants, the kanji retains only part of its original value – which is, likely,[8] what Okada was referring to. Importantly, now, this specific 'partial' use of kanji and hiragana graphemes – no matter how widespread a feature it is in the Japanese writing system – does not rule out their status as independent graphemes, given that their default values, which they have in (many) other contexts, remain the same. This partial use was arguably already covered in the Meletis (2019: 36) definition, specifically by the statement "the linguistic reference [of a grapheme] does not need to be stable". A more general takeaway from this could be that the grapheme definition should be based on default uses and default values of graphemes, which do not imply or include all possible contexts or ways in which these graphemes may be used in the system. The definition should *allow* for the latter, however. This is echoed in Okada's fitting concluding sentiment that "[…] we find the best graphematic theory is one that accounts for any possibilities but rejects any impossibilities" (Slide 25).

[8] Note that as I only have the slides of his presentation to infer his arguments, I cannot be positive that I am representing them here completely accurately.

3. Determinatives

In the history of writing, in certain contexts (especially settings of language contact and ensuing borrowing processes), the polyvalence of graphemes was dealt with through a specific means of disambiguation: determinatives. Interestingly, the process of determination perfectly encapsulates the central grapholinguistic dichotomy of phonography vs. morphography or, more generally, sound vs. meaning: phonographically polyvalent (i.e., homophonous) graphemes could be semantically disambiguated using semantic determinatives, and semantically polyvalent graphemes could be disambiguated using phonological determinatives.[9] It is important to note that in both cases, the determinatives do not *add* anything to the morphological or phonological representation of the initial written element(s) – they only *signal* a specific reading, which will be central in capturing their graphematic function. Thus, in general, determinatives can be considered reading aids. A precise definition of semantic determinatives[10] is given in Mora-Marín (2008: 195–196):

> Semantic determinatives are placed adjacent to a logographic, logophonetic, or phonetic spelling of a word; they disambiguate between alternative orthographic values—not necessarily only between alternative words spelled out

[9] Note that in the case of phonological (or phonetic) determinatives, scholars often speak of phonetic complementation (cf., for example, Mora-Marín 2008) given that the value (= pronunciation) of an ambiguous morphogram is disambiguated by a phonographic element that technically reduplicates some of the pronunciation (which would also make the okurigana of Section 2 phonetic complements/determinatives). Examples of phonological determinatives can be found, for instance, in Akkadian (cf. Coulmas 1996: 6).

[10] He distinguishes them from semantic classifiers, which "are adjacent to a logographic, logophonetic, or phonetic spelling of a word; they do not disambiguate between alternative readings of such spellings but simply indicate, visually, what the semantic category or domain of the spelled word is" (Mora-Marín 2008: 195). Given that for the most part, determinatives and classifiers behave similarly both graphetically and graphematically, this distinction will not be central in the present paper but should be kept in mind for more detailed future analyses.

> by the same sign or sequence of signs, but more specifically between alternative orthographic values, of whatever type, of the same sign or sequence of signs.

In Meletis (2019), a functionally similar phenomenon, namely the semantic components ('radicals') and phonological components ('phonetics') of Chinese, were defined as graphematic elements rather than independent graphemes since they only retain partial linguistic values from the graphemes they are derived from. These values are then combined to amount to the 'full' value of the newly formed grapheme, which again corresponds with a morpheme: a textbook example is <妈> mā 'mother', combining the semantic component |女| 'female' with the phonological component that derives from the grapheme <马> *mǎ*. As seen in this example, the components are graphetically subsegmental. During the grapheme formation process, they have been minimized in shape to both fit into the idealized segmental square in which they then occupy only a certain part (hence also the term *components* … of a grapheme), with a degree of variation concerning the visual similarity between the original segmental graphemes and the shrunk derivative subsegmental components. Notably, their subsegmental status is not what determines that these components are not considered graphemes as we do find subsegmental graphemes in the world's writing systems:[11] examples

[11] In this context, I want to react to a criticism of the Meletis (2019) definition mentioned in Reinken (2022a: 322; cf. very similarly also in Reinken 2022b: 101), namely that "[t]he question of the letter components, such as the long stroke in the <p> and <b>, would still have to be addressed". It was indeed addressed in Meletis (2019: 41), and precisely in the context of Chinese subcomponents: "However, it cannot be denied that in Chinese, there is still a relevant graphematic level that is subsegmental, as obviously, semantic and phonological components, elements smaller than graphetic segments, i.e. basic shapes, can potentially have graphematic value. This is similar to what Primus (2004, 2006) proposes for the German writing system or more generally, writing systems using Roman script, observing that parts of basic shapes are graphematically related with phonological features." And in Meletis (2020a: 96), the question of whether the latter are graphemes is addressed directly: "[…] why are not the head/hasta in |b| vs. |p| or the lowest horizontal stroke of the |E| in |E| vs. |F| graphemes? The answer is simple: neither the hasta (or its location) in |b| and |p| nor

include the subsegmental graphemes of Hangul that are combined and arranged to form graphetically segmental blocks corresponding with syllables but also the secondary vowel graphemes of abjads such as Arabic and Hebrew and many abugidas including Devanagari-based systems and Thai. A commonality that can be observed from these examples is that subsegmentality, in general, while not clearly indicating (non-)grapheme status, correlates with boundness as both subsegmental graphematic elements and subsegmental graphemes are bound to (a) host grapheme(s).

On the other end of the spectrum, there also exist segmental graphematic elements that are not graphemes. An example given in Meletis (2019) is |c| in the German writing system, which – when using only the native stratum of the language in establishing a grapheme inventory – is not a grapheme itself but forms part of the complex digraphic grapheme <ch>, which in German relates to the phoneme /x/, or grapheme combinations such as <sch> (<s> + <ch>), which relates to the phoneme /ʃ/, as well as the syllabically conditioned combination <ck> (instead of geminate <kk>), which relates to /k/. This may already give us a clue about how determinatives may be analyzed under a graphetic lens: like German |c|, they are segmental bound elements. However, their graphematic status – i.e., their linguistic function – differs fundamentally from both |c| and the subsegmental components of Chinese: while the latter two are constitutive parts of graphemes to whose values they contribute significantly, determinatives are generally 'add-ons' in that they do not contribute to the constitution of an adjacent independent grapheme's value but instead to the selection of one of a set of alternative values that this grapheme may have. In doing so, determinatives may contrast with other possibilities (especially zero

the stroke in |E| correspond with linguistic units, meaning they do not meet criterion (2) [= linguistic value criterion, D.M.]." It can certainly be discussed whether these asssessments are accurate, but it is not true that I have "missed that also units smaller than a grapheme can correspond with linguistic information" (Reinken 2022b: 101, my translation).

marking), making them distinctive and fulfilling the above-mentioned distinctiveness criterion – leaving open only the question of how to conceptualize their linguistic value.

To work as disambiguating devices in the selection of a given (mor)phonological representation or 'reading' of a grapheme (or a larger written utterance), determinatives must have some phonological or semantic value. Like Chinese semantic and phonological components, they have retained part of the value of the graphemes they originally derive from.[12] However, in the phonological representation of the combinations they constitute together with the graphemes they depend on, the concrete value of determinatives becomes null as they lack a phonological representation (or, as is the case for phonological determinatives, their phonological representation is redundant as it would have already been present in the grapheme, cf. the okurigana above). Looking to other linguistic (sub)systems for analogies,[13] determination can be compared to null (or zero) affixation, where null affixes are "morphological units—typically, bound morphemes—which make a grammatical or semantic contribution without directly introducing any phonological information" (Dahl & Fábregas 2018). The difference, of course, is that null morphemes (or allomorphs) are not only inaudible but also (usually) invisible whereas determinatives have a graphic substantiation.

[12] An open question, then, would concern determinatives that do not derive from other existing graphemes of a given writing system. For them, one could hypothesize, for example, that their value was 'partial' from their very inception.

[13] There is fascinating (yet unpublished) new research by Amalia Gnanadesikan presented at the 2022 iteration of the *Grapholinguistics in the 21st Century* conference series that shows how akṣaras, the central and structurally complex graphematic units of Brahmic writing systems, can be analyzed in terms of stems and affixes, thus using concepts well-established in the morphological study of (spoken) language and applying them to writing and (two-dimensional) space. Also noteworthy is James Myers' approach to the structure of Chinese graphemes, in which he speaks of 'character morphology' and 'character phonology and phonetics', thus transferring a hierarchy of structural relations from the study of (spoken) language to writing (cf. Myers 2019). This research clearly shows that a blanket claim like "writing systems do not work like linguistic systems" (Daniels 2017: 88) is inaccurate.

To sum up, then, what does distinguish determinatives from segmental bound graphematic elements such as |c| in German? Both are distinctive but lack the independent linguistic value; however, segmental bound graphematic elements are constitutive parts of complex graphemes. In German <ch>, for example, the presence of |c| does not merely disambiguate between possible values of <h>, it rather contributes to an idiosyncratic new value that the combination <ch> has holistically. Determinatives, on the other hand, are disambiguating (or, in the case of classifiers, merely indicating). Thus, terminologically, one could speak of *value-contributing graphematic elements* vs. *value-distinguishing graphematic elements*.

The necessity of analyzing determinatives in conjunction with the graphemes they occur with suggests that a segmental graphematic analysis, in this case, may fall short. Not only is the graphematic value of some written combinations only constituted at the supra- or polysegmental level (cf. Meletis 2020a: 129 for the difference), but the graphematic status of constituents at lower levels can sometimes only be evaluated when we gather information from a hierarchically higher level. This has been accounted for in developments in German grapholinguistics where a suprasegmental approach to conceptualizing graphematic units has recently gained traction (cf., for example, Berg, Primus & Wagner 2016). As Figure 1 shows, in this approach, different graphematic units are assumed at different hierarchical levels.[14]

[14] Interestingly, the grapheme plays only a marginal role in the model, being only relevant when letter combinations – such as German <sch> – have an idiosyncratic, i.e., non-compositional value (cf. Schmidt 2018: 138).

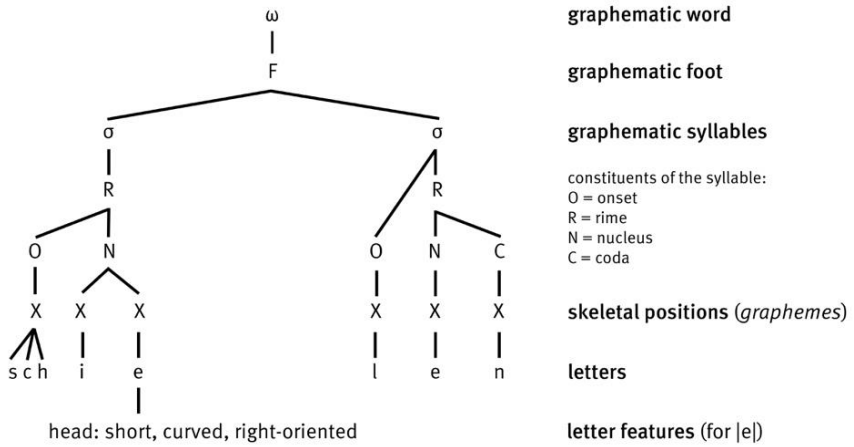

Figure 1: Suprasegmental model (from Meletis & Dürscheid 2022: 123)

This is not the place to delve into detail about what such a suprasegmental hierarchy and analysis could look like in the case of writing systems that use(d) determinatives (let alone one that can account for all types of both ancient and modern writing systems), but it certainly *is* a noteworthy and promising grapholinguistic perspective that should be further considered – also since it could potentially account for several phenomena that still pose challenges to the Meletis (2019) definition, such as punctuation, the semasiographic use of graph(et)ic material not classified as writing (such as, nowadays, emojis, cf. Dürscheid & Meletis 2019), and the idiosyncratic functions of frequent graphematic combinations including digraphs (cf. Osterkamp & Schreiber 2021), complex graphemes (cf. Reinken 2022a), as well as ligatures (e.g., in abugidic systems), the latter of which also raise problems for the decomposability expected of individual graphemes.[15]

Interestingly, an approach that – in certain ways – resembles the suprasegmental one was proposed by Tranter (2013). In what he terms *layering*,

[15] This is the case especially for irregular ligatures, i.e., ligatures in which graphic remnants of the component shapes that were 'merged' can no longer be identified. An example is Devanagari <क्ष> (kṣa), which is an irregular ligature of <क> (ka) and <ष> (ṣa).

he analyzes the recursiveness of the process of determination, providing examples from, among others, Chinese, Mayan, and cuneiform (with notable differences in the segmental or subsegmental status that determinatives can assume). The cross-linguistic reliance on determination as a response to extension (cf. Handel 2019) in the development of several writing systems is striking and certainly warrants further grapholinguistic comparisons at various levels.

Finally, it should be mentioned that the adoption of a suprasegmental perspective raises a crucial question about the very feasibility of segmental approaches: Despite the inherent segmentality (and segmentability) of writing, may the core unit of writing be the written word instead of the segment? Consequently, could the central intermodal correspondence that we should focus on be the one between spoken and written words? If this were to hold, grapheme-phoneme correspondences – which are found at the center of not only many linguistic analyses of writing but also myriad psycholinguistic studies of reading and spelling – would be mere epiphenomena (cf. Stetter 2011 and Schmidt 2018 for this line of arguing). This, in turn, would also have grave consequences for the relevance of the problems addressed in this paper, problems regarding the grapheme as a segmental or sometimes even subsegmental unit. Yet, when considering determinatives (as well as other phenomena like mute letters in alphabets such as French), opting for a word-based analysis may be warranted as they unfold their meaning and function only in larger graphematic complexes.

4. Conclusion and outlook

Given the diversity of the world's writing systems, attempting to propose a definition of *grapheme* that is inclusive with regard to as many writing systems as possible is bound to come with several problems. Some of those have

solutions that are more straightforward than others. As this paper showed, 'linguistic value' can be present in graphemes only partially depending on the context, i.e., the other graphemes they cooccur with, and determinatives are crucial graphematic elements that are relevant in decoding – reading – processes (thus meshing a strictly structural analysis of writing with one that is aware of the psycholinguistic realities of literacy practices). Both aspects may warrant a further consideration of suprasegmental approaches. While these have already firmly entered Germanophone grapholinguistic discourses, the establishment of a cross-linguistic approach that is not only synchronic but also diachronic remains a desideratum.

It bears to highlight that while definitions of core linguistic concepts such as phoneme or morpheme are rather straightforward and agreed-upon (depending, of course, on the given paradigm, theory, etc.), the grapheme obviously presents an array of challenges that raise the question of whether its pursuit is 'worth it'. And even more so, they challenge the assumption that a grapheme is necessary in the first place. What can we even do with the graphemes of a writing system that can be discovered using an approach like the one outlined in Meletis (2019) and further developed here? What is their (not linguistic, but) epistemological value? I would argue that comparing grapheme inventories as the functional core of writing systems *is* valuable. However, there is a point to be made in arguing that the results of trying to formulate a cross-linguistically applicable grapheme definition – which may not paint a picture as clear as we would have hoped – are not what is most important; the process of getting there (or trying to) is. This process already involves the real and interesting conceptual and comparative work that requires finding the commonalities between writing systems. Commonalities which, at some level, must exist. The question is at which level, and what, in turn, the uncovered universality and diversity in the structural makeup of writing systems may reveal about our processing of them.

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