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Grapholinguistics as a unified framework for the cross-linguistic study of writing

Dimitrios Meletis and Christa Dürscheid

1.0. Introduction

Grammatology, orthography, graphem(at)ics, graphology, graphonomy, writing systems research – these are only some of the many terms used to denote a discipline that emerged in linguistics during the second half of the 21st century (cf. Meletis in press a for a historiographic account of the terms denoting the study of writing).[1] The meanings of as well as the boundaries between these terms are not always clear, which will be illustrated with several quotes showing how (loosely) they are used in the literature: For instance, in a handbook chapter titled "Orthography", Hanna Rutkowska addresses various topics that are by no means only concerned with orthography: At the beginning of her chapter, she states: "Graphology and orthography can […] be considered synonymous to the writing system" (Rutkowska 2017: 204). This gives the impression that there is no difference between *graphology*, *orthography* and *writing systems research* – an assumption that is certainly inaccurate. The second quote is comparable; in the blurb of David Crystal's book on Shakespeare's language, it says: "Graphology is the study of the writing system of a language – the orthographic conventions that have been devised to turn speech into writing" (cf. Crystal 2012). The third quote is by Bruce G. Trigger and refers to *grammatology*, a term originally coined by Ignace J. Gelb in his seminal 1952 book "A study of Writing". Trigger (2004: 40) seems to place *grammatology* on a par with the general field of writing systems research: "Grammatology, the study of writing systems, offers a useful way to evaluate evolutionary approaches to understanding change in cultural phenomena." Finally, a last quote deserves to be mentioned here. It stems from the Call for Papers for the fifth iteration of the conference series *LautSchriftSprache/ScriptandSound* on which the present volume is based: "The conference and book series *LautSchriftSprache/ScriptandSound* is devoted to *Historical Graphemics*. It promotes research on the general structures of documented scripts and writing systems, both synchronically and diachronically." This potentially suggests that *graphemics* covers the whole research field on writing. However, as will be argued below, *graphemics* (also referred to as *graphematics*) comprises only one – albeit central – part of the study of writing, namely its linguistic and communicative functions.

Despite being related and often treated as synonyms, the aforementioned terms have their origins in different paradigms and research traditions. What unites them is their focus on different aspects of writing. These aspects may be subsumed under the heading of

[1] Sections 1–3 of this paper were written by Christa Dürscheid. Section 4, consisting of several subsections, is the core of this paper; it was written by Dimitrios Meletis, who also compiled the conclusion and outlook in Section 5.

grapholinguistics – a designation and field that is well-established in German-language research (as 'Schriftlinguistik', cf. Dürscheid 2016). The present article is dedicated to important developments within the field of grapholinguistics. It is structured as follows: First, we trace the German grapholinguistic tradition and distinguish it from the work that has emerged in the Anglo-American realm in the past two decades (Section 2). We then address current developments and exemplify one new research area that is attracting increasing attention: the study of handwriting (Section 3). The fourth part of the paper introduces the fundamentals of a structural grapholinguistic framework by characterizing the trichotomy of (1) graphetics, the study of all aspects concerning the materiality of writing; (2) graphematics, examining the linguistic and communicative functions of writing, and (3) orthography, dealing with the normative aspects of writing which includes – but is not limited to – its official regulation via codified rules. Furthermore, three core descriptive concepts will be presented: the grapheme, allography, and graphotactics. This descriptive framework (cf. Meletis 2020a, Meletis/Dürscheid 2022)[2] has only recently gained traction in grapholinguistics; it can be used to describe, classify, and compare diverse writing systems; thus far, its focus has been synchronic, but it is believed to be useful also for diachronic research on writing, e.g., for the systematic description of historical writing systems (such as Ancient Chinese, see Andreini in this volume). Finally, we discuss the possibilities that arise when the various subdisciplines and perspectives in grapholinguistics collaborate in examining writing (Section 5).

2.0. What is grapholinguistics?

Let us start with a characterization of this relatively new subdiscipline of linguistics: Grapholinguistics is an interdisciplinary field of research that covers not only structural questions concerning writing but also adopts sociolinguistic, psycholinguistic, and several other perspectives as well as methodologies to do this complex and multifaceted phenomenon justice. One of the aims of grapholinguistic research is thus the establishment of a framework for the systematic investigation of writing systems, including analytical subbranches and descriptive concepts. Notably, such a framework must be capable of accounting for all writing systems – and not just alphabets (cf. Meletis 2020a).

One might wonder why such an introductory characterization is necessary at all for such an important field of linguistics. Other subdisciplines, such as sociolinguistics or psycholinguistics, would likely not be presented in this way, given that their respective objects of investigation could be assumed to be known. And indeed, in German-language academia, the term *Schriftlinguistik* is already established and well-known. This can be, in

[2] In Meletis/Dürscheid (2022), fundamental considerations of the relationship between the spoken and written modalities of *language* (often inaccurately interpreted as synonymous with *speech*) are presented. This is followed by an introduction to graphetics, graphematics, and orthography, as well as an overview of the most important types of writing systems.

part, attributed to the textbook "Einführung in die Schriftlinguistik", first published in 2002 and since reissued in several new editions (the latest of which is the fifth edition, Dürscheid 2016). It highlights the breadth of the field, as it contains, among others, chapters on spoken and written language, typography, orthography, and the acquisition of literacy. However, the book focusses mainly on the German writing system and does not cover the entire research field. For instance, a chapter on handwriting is lacking. This is different in Meletis/Dürscheid (2022), which integrates into its approach several of the world's writing systems and contains a chapter that deals with the graphic design and materiality of writing, including several sections on handwriting. In the next section, we will take a closer look at this topic that has so far received relatively little attention in grapholinguistic research.

In complete contrast to its status in German-language research, the international status of grapholinguistics is a markedly different one: Most importantly, the term has not yet arrived in Anglo-American discourse. This is evident from the fact that there is no entry for it in the English-language Wikipedia (as of November 2023) and it has not yet been included in the Oxford Dictionary. Even within the research community (or, more accurately, communities) interested in matters of writing, it is our impression that many English-speaking colleagues are not yet familiar with the term. This is confirmed when reading, for instance, the statement of linguist Max Liberman from the University of Pennsylvania (cf. also Meletis in press b), which was posted on a prominent language blog in 2020. He uses the announcement of the 2020 iteration of the conference series "Grapholinguistics in the 21st Century" as a starting point to discuss the supposed novelty of the term, stating: "We've never heard of grapholinguistics because you just made up the word. Under headings like 'Writing Systems', the issues involved are widely taught in universities […]. And libraries are well stocked with books about the nature and history of writing systems, from many points of view".[3]

However, when searching for entries on grapholinguistics in Google Scholar, for example, one will find at least some more recent works – and even a number of earlier ones (e.g., Sariti 1967 on Chinese grapholinguistics). Most of the titles in the results have indeed been published in relation to the conference series referred to by Liberman, which has been held every two years since 2018 under the direction of Yannis Haralambous (cf. /gʁafematik/ 2018, 2020, 2022). While the first conference did not bear the label *grapholinguistics* in its title, the conference titles of the 2020 and 2022 iterations were *Grapholinguistics in the 21st Century* (see above). Likely as a result, several conference participants used the term in their presentations, and the proceedings (including papers by such renowned grapholinguists as Florian Coulmas, Amalia E. Gnanadesikan, and Martin Neef), which are published in the book series *Grapholinguistics and Its Applications*[4] also refer to it. This implies that the familiarity of the concept denoted by the pair of terms

[3] Cf. https://languagelog.ldc.upenn.edu/nll/?p=46324 (November 23, 2023).

[4] Cf. http://www.fluxus-editions.fr/index.php (November 23, 2023).

Schriftlinguistik/grapholinguistics is gradually increasing also beyond the German-language research realm.

In his post, Liberman goes on to ask why, if grapholinguistics is a subfield of linguistics like psycholinguistics or sociolinguistics, it is not taught in universities. In fact, it *is* taught; in German-speaking universities, it is even integrated into the curricula.[5] Additionally, the topic is discussed at major conferences in the German-speaking area (such as the annual conferences of the AILA or the Leibniz-Institut für deutsche Sprache in Mannheim).[6] Furthermore, at the University of Hamburg, a professorship for grapholinguistics has recently been implemented. Finally, in a well-known German dictionary of linguistics (Glück/Rödel 2016), the term had already been included in the first edition (1993), and nowadays there is even an entire dictionary dedicated to this topic as part of the series *Dictionaries of Linguistics and Communication* (published by De Gruyter). In it, Martin Neef, one of the dictionary's co-editors, wrote the entry for *Schriftlinguistik*. The following quote (our translation) is taken from this article; it aptly illustrates the subjects that make up the field:

> In the field of grapholinguistics, as a thematically comprehensive discipline, objects of various kinds can be identified and classified as follows: The core area is represented by system research in the sense of a *langue*-science, which is originally located in linguistics. Here, writing systems are studied more or less explicitly as abstract objects. Theoretical concepts fundamentally reflect the relationship between written and spoken language and provide models that can be assigned to the autonomy hypothesis, the dependency hypothesis, or intermediate stages thereof […]. Sometimes, orthographic forms are directly related to linguistic levels (e.g., Eisenberg 2013) or mediated through concepts such as graphematics (e.g., Neef 2015). While in the German-speaking scientific community, primarily due to the organizational structure of linguistics as part of individual language philologies, the focus is on the study of the writing system of a single language or a narrowly defined language family, comparative language studies predominate in the English-speaking scientific community. Corresponding typological approaches distinguish, for example, alphabetical, consonantal, syllabic, and logographic writing systems with their respective basic units. (Neef 2021, p. n/a)

In this quote, Neef points out an important aspect that has contributed to the establishment of grapholinguistics as a discipline in its own right: Grapholinguistics is not primarily concerned with the description of individual writing systems but with attaining a fundamental understanding of the structure and use of the most diverse writing systems (which includes aspects such as the relationship between written and spoken language, handwritten and typed text, and the acquisition of literacy). He also alludes to the reason why in the Anglo-American tradition many linguists may not see a necessity for a cover term like grapholinguistics: they are focused mainly on typological and diachronic aspects

[5] Cf., for example, https://www.dsg.rwth-aachen.de/cms/dsg/Studium/~iwjik/Lehrveranstaltungen/ (November 23, 2023).

[6] A recent talk that included the term in its title is "Schriftlinguistische Perspektiven auf das geltende Amtliche Regelwerk" (by Nanna Fuhrhop), see https://www.ids-mannheim.de/aktuell/veranstaltungen/tagungen/2023/programm/ (November 23, 2023).

of writing (see, for instance, Daniels 2018). Thus, multiple writing systems are analyzed in juxtaposition rather than in relation to each other, highlighting system-specifics rather than writing as a complex phenomenon. By contrast, in the grapholinguistics that originated in the German research tradition, the focus is firmly on general aspects of a theoretical framework of writing. Thus, in Meletis/Dürscheid (2022: 4), we state clearly: "German grapholinguistics has always been interested in how writing systems can be described instead of 'only' describing them."

It is trivial to point out that the focus of a distinctly *historical* graphem(at)ics as advanced in the context of the *ScriptandSound* conference series has been the study of writing systems that are no longer in use.[7] Thus, the fifth iteration, on which this volume is based on, dealt intensively with – among other topics – runic writing (cf. the contributions by Salomon, Kallström, Heier, Zimmermann, Bauer, and Waxenberger in this volume). By contrast, the grapholinguistics that sprung from the German tradition of studying writing is primarily focused on modern writing systems – and especially that of German. However, this analytical division between a historical and a modern perspective is not necessary. In fact, it rather hinders fruitful exchange: on the one hand, historical graphematics can profit from the theories and methods used in analyzing modern writing systems, and on the other hand, grapholinguistics, per definition, should be the study of writing in general, thus encompassing all its facets. This means it should also account for historical writing systems and their use, which it hitherto has largely neglected (cf. Elmentaler 2018). Specifically, while the general diachronic development of writing *is* commonly addressed, it is often 'outsourced' into separate chapters (cf., for instance, the chapter on the history of writing in Dürscheid 2016); as a result, historical aspects are often not included in the rest of the chapters that treat general aspects of writing, including tools and methods for its description. Granted, attempts at developing a comprehensive framework for grapholinguistics that integrates all aspects of writing are rather recent and very much still in progress (cf., for example, Meletis 2020a). The first step that has been taken in carving out a broader descriptive apparatus is the inclusion of writing systems other than German, especially non-alphabetic ones, in order to account for all types of writing systems, i.e., attain typological breadth (cf. Section 4).

3.0. Grapholinguistics and public discourse: the example of handwriting

While the bulk of this article will be devoted to a characterization of structural grapholinguistics, as mentioned in the previous section, grapholinguistics also adopts perspectives focused on the use of writing and considers topics of relevance in and for

[7] An exception is, of course, Chinese, which is the oldest writing system that has – in one form or another – been in continuous use since its first development. However, as writing in Chinese has, of course, changed dramatically since its inception, 'Chinese' is merely an umbrella term for different diachronic stages of the writing system for Chinese (or, more accurately, of the writing systems for its different varieties), with historical graphematics focusing on older ones.

everyday life in literate communities. One such topic that is rising in popularity is handwriting. Notably, although handwriting is a subject with high visibility in public discourse, research on it has thus far mainly been limited to specific phenomena. This includes, for example, the psycholinguistic treatment of character amnesia (cf. Huang et al. 2021) or the question of whether pen- or keyboard-based writing training better equips preschool children to read and write words (cf. Kiefer et al. 2015). However, three genuinely linguistic studies are noteworthy as they offer a broader perspective on the topic: In 2014, an edited volume was devoted to handwriting (Böhm/Gätje 2014); in 2021, Andi Gredig authored a monograph highlighting linguistic and cultural perspectives on handwriting (Gredig 2021); and in 2023, Niklas Reinken published a book in which he investigates the 'grammar of handwriting', i.e., the variation in handwriting that makes visible units such as the syllable, the foot, the morpheme, or the word (Reinken 2023). In the following, we will focus predominantly on a sociocultural perspective and refer to Gredig's book, which captures central topoi in the public discourse on handwriting and discusses current handwriting practices using examples such as greeting cards, condolence letters, and other text genres.

One of the reflections of the public discourses on handwriting is the topic's negotiation in provocatively titled newspaper articles. An example is the 2014 *New York Times* piece "What's Lost as Handwriting Fades?".[8] This question raises several more: Is it an accurate assertion that handwriting is becoming obsolete? Will typing eventually replace it? Can we not argue that different contexts call for the use of different literacy practices? Although it is true that there are fewer instances necessitating the use of "old-school" handwriting, to this day, we do engage in handwritten communication. And despite the pessimistic headlines predicting its demise, most children *are* still taught how to write by hand in schools. To answer the above-mentioned questions, we need to consider what can nowadays even be understood as handwriting. In its conventional sense, handwriting pertains to the act of writing by hand using an instrument such as a pen on a physical surface, most typically paper. However, with the advent of digital tools that allow individuals to write by hand on smartphones and tablets, the definition of handwriting has evolved further. Today, touchscreens have become ubiquitous, and individuals frequently interact with them by either typing on virtual keyboards or using special pens as writing tools. As a result, the traditionally analogue practice of handwriting has been transformed into one that may be decidedly digital. Furthermore, the English word 'handwriting' is ambiguous as it can refer to either the process of writing by hand or the products that result from it. As for the latter, in the digital age, a third meaning must be considered: writing that looks like handwriting but is not (see below).

In his comprehensive study on the social practices of handwriting, Gredig dedicates several chapters to handwriting practices such as writing condolence letters or signing one's last will. As for the topics discussed in the public discourse, these encompass various

[8] Some of the aspects presented here are taken from our blog post "Why we shouldn't write off handwriting just yet" (see https://blog.degruyter.com/why-we-shouldnt-write-off-handwriting-just-yet/, November 23, 2023).

fields such as handwriting in schools, the (supposed) abolition of handwriting, and the cultural value of handwriting. The book also provides a discussion of five central topoi found in these discourses: handwriting as an 'endangered' practice; the survival or 'comeback' of handwriting; the benefits of handwriting for motor skills and cognitive processes; the permanence of handwriting and its perception as a trace of the writing process and writers' emotions; the aesthetics of handwriting and its association with individuality and personality. Regarding the distinction between handwriting and typing, it is said that this distinction is often mistakenly paralleled with the binary opposition of analog/digital (cf. Gredig 2021: 70). Indeed, handwriting and typography, as two fundamental materializations of writing, exist on a continuum rather than being diametrically opposed to one another. As the possibilities in type design abound, it is sometimes even impossible to tell whether a text was handwritten or typed: there are typefaces that simulate handwriting, and conversely, handwriting that gives the impression of being typed (see Figure 1).

Figure 1: Left: Script typeface 'Respondent' designed by Måns Grebäck. Right: Hand lettering that resembles the typeface used in the corporate design of pastry shop 'Peti Pari' in Vienna, Austria (from Meletis/Dürscheid 2022: 77)

Writing researcher Steve Graham presents an interesting paper on the merits of handwriting and argues that, as pen and paper are inexpensive, transportable, and handy, handwriting remains "alive and healthy" (Graham 2018: 1367). This proves especially relevant in regions of the world where new technologies are still unaffordable to most people and digitization is slow. In general, it can be concluded that traditional handwriting will certainly survive in several domains. One is notetaking, (where writers are usually less concerned with accuracy than with speed, and often make use of the spatial possibilities afforded by the two-dimensional writing surface (by drawing mind maps, shapes, tables, and so on). Another is the personal signature, which will likely remain the preferred way of authenticating proof of identity. However, it is also true that in many literate societies, handwriting has become a "marked" choice for special purposes of written communication. The decision to write by hand alone can reveal valuable information about a communicative situation, including the purpose of a text or the relationship between those involved, making handwriting an interesting and rich object of research. Yet, there has been, as mentioned, strikingly little research on handwriting from within linguistics.

Typography, by contrast, has been much better researched, and numerous studies describe the various communicative functions typography assumes or the role it plays in reading processes. The same questions, however, are also relevant to handwriting. Take, for example, the following much-debated questions about the act of writing by hand: does it benefit motor skills and cognitive processes? How does it affect the way we read? What unique means of expression does writing by hand afford, especially when compared to typing? Handwritten text, for example, can be underlined, written in all caps, or with a pen of a different color, but typography allows far greater variation in the appearance of text, and seemingly infinite choices of presentation. These questions cannot be pursued in detail here; instead, we would like to refer to the chapter in Meletis/Dürscheid (2022: 76–114) in which both handwriting and typography and their sociosemiotic potentials are contrasted.

4.0. Structural grapholinguistics: a comparative descriptive framework

4.1. Towards a comparative approach

The grapholinguistic branches and concepts that will be presented in the following result from the adoption of a comparative approach. They serve as a descriptive foundation that is essentially theory-neutral, making it versatile for an application both in different linguistic paradigms and from diverse perspectives (including usage-oriented perspectives such as psycholinguistic or sociolinguistic ones). Since the systems that went into their assumption were, to a large degree, modern writing systems, one next logical step would be to test whether they also suit the study of historical writing systems and to modify them if needed.

From the perspective of grapholinguistics, there is an important peculiarity of the study of historical writing systems that needs to be mentioned: in the synchronic study of modern languages, linguistics has traditionally focused primarily on the spoken modality. When studying historical languages that are no longer in use, however, this situation was reversed as for them, there exist no spoken documents, only written ones. In other words, in a diachronically oriented linguistics, the written modality is often the only window we have into the corresponding languages. This also means that historiographically, the study of writing represented the core of many philological branches and was in general accepted much more (and much earlier) by diachronic linguistics than by synchronic linguistics. This, then, makes 'historical graphem(at)ics' a much less contentious field than a grapholinguistics focused on modern writing systems. However, different philologies are characterized by their own longstanding traditions that include distinct terminological and conceptual conventions; these philologies coexist but are arguably in very little contact with one another, hindering transdisciplinary exchange.[9] It is against this background that

[9] The fifth installment of the *ScriptandSound* conference series (2022), on which the present volume is based, was indeed the first one to "move into focus further types of script and writing systems" beyond the alphabetic type (quote taken from the book of abstracts), which underlines that this is a rather recent development.

the following characterization – which can merely be a sketch – aims to further stimulate the establishment of analytical tools that are shared not only by the studies of modern vs. historical writing systems but also by different branches within the multifaceted diachronic study of writing.

In Section 4.2, the three different modules of writing systems – and the fields studying them – will be presented in a rather general manner: graphetics, graphematics, and orthography. Then, in Section 4.3, the central descriptive concepts of grapheme, allography, and graphotactics will be characterized more specifically, drawing on examples from both modern and historical writing systems.

4.2. A multimodular model of writing

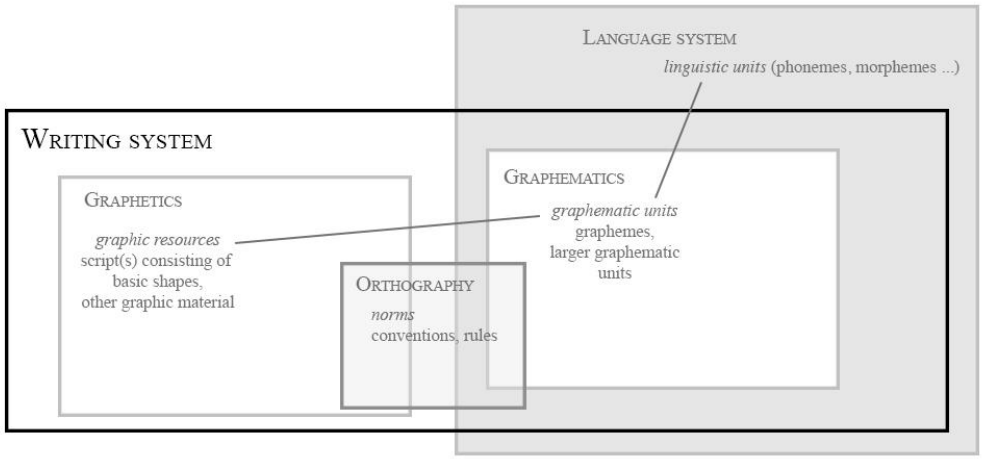

Figure 2: Multimodular model of writing systems (modified from Meletis 2020a: 22)

Based on Meletis (2020a), which is a modification of Neef (2015), we propose a multimodular model of writing systems as illustrated in Figure 2. Describing writing systems in terms of their different constitutive subsystems – which we call modules – allows, firstly, an analytical separation of phenomena relevant at different grapholinguistic levels as well as the theoretical and methodological resources needed in studying them. Secondly, it makes possible a systematic investigation of the complex relations and interactions between the different modules. These are language as a basis and graphetics, graphematics, and orthography as writing-specific modules. Notably, the latter three terms are ambiguous as they denote not only the modules but, at a metalevel, also the subfields of structural grapholinguistics devoted to their study.

This approach takes as axiomatic the glottographic nature of writing. In other words, it is based on the narrow definition of writing (cf. Meletis 2020a: 20) that interprets writing exclusively as that graphic notation and/or communication which relates directly to specific linguistic structures. Cave paintings, for example, while undeniably a type of graphic communication that conveys meaning (and is indeed a forerunner of writing), show no stable relation between their graphic substance and specific linguistic referents.

In usage-based terms, they cannot be read; they can only be (more or less loosely) interpreted. As this possibility of directly encoding and decoding language with graphic means is at the core of this descriptive model and our definition of *writing system*, cave paintings do not count as writing. It must be noted that basing our model on the narrow definition of writing may, of course, lead to challenges in applying it to historical writing systems, as these often include non-glottographic, or semasiographic, resources, especially in early stages of their development (cf. Dürscheid 2016: 100–103; see Section 4.2.3 for further discussion).[10]

4.2.1. Language system

Against the background of this glottographic orientation, the underlying basis of a writing system must necessarily be a language system such as English, Chinese, or Sumerian. Thus, a language is a prerequisite for a writing system to exist. In the context of studying historical writing systems, it is necessary to add that a given (synchronic) state of a language serves as the basis of a writing system. In other words, while both languages and writing systems are certainly in flux and exist in many versions, the present model is synchronic in representing a snapshot at a particular time; however, it can certainly be useful in comparing not only writing systems of distinct languages but also writing systems at different historical stages of the same language.

Each language has its own resources, structures, and regularities that the associated writing system can exploit and relate to; in that sense, a writing system is a specific analysis of a given language (cf. Daniels 2013: 53) – and certainly only one of many possible ones. Contrary to what is frequently insinuated in the largely phonocentric linguistic literature and its reductionist, often parenthetical treatments of writing, these resources that writing systems relate to are by no means restricted to phoneme inventories. Consequently, writing systems are not merely lists of phoneme-grapheme correspondences. Instead, they relate to and make visible a wide range of linguistic structures and resources – examples ranging from the morphological and lexical strata of a language to its textual level as well as relevant pragmatic phenomena – and beyond.[11] In a nutshell, in our model, we interpret writing as a full-fledged – albeit optional – modality of language that, in a given language system, may complement the primary modality (either speech or signing). Its strategies of representing language often relate to these other modalities but may also be entirely idiosyncratic and independent of them. Such an example of a phenomenon that is distinctly written in nature is the list mode, i.e., the possibility of making lists that differ markedly from running text (cf. Reißig 2015). This already points to the fundamentally spatial nature of writing (see the next section).

[10] Considering resources such as emojis and multimodality in general, this also applies to modern writing systems.

[11] As a graphic and thus highly salient modality, and given its material permanence, writing is also a fitting means for conveying (socio)semiotically all sorts of information about the (regional, temporal, …) context in which a text was produced, about its producer(s), etc.

Importantly, in this multimodular approach, the language that a writing system is based on is the criterion for a conceptual and terminological distinction between different writing systems. Writing systems are often grouped together because they share the same script (e.g., Roman script) or because they share the same typological principle (e.g., being an alphabet). While grouping them according to these criteria may prove important in the investigation of specific questions, to receive the most accurate and fine-grained description of writing systems possible, we deem it fitting to separate them by language. Thus, following Weingarten (2011), writing systems can roughly be conceived of as pairs of languages and scripts: the German writing system pairs German with Roman script, the English writing system English with Roman script, the Sumerian writing system Sumerian with cuneiform,[12] etc.

As mentioned above, each module of a writing system gives rise to a field studying it. The discipline that studies language is, obviously, linguistics itself. Thus, the fact that writing systems are based on language renders a broad knowledge of linguistics a prerequisite to studying writing. This also means that the investigation of writing is no peripheral or 'exotic' linguistic matter but one raising questions of, for instance, a phonological, morphological, or syntactic nature. Furthermore, having the required associated knowledge is not only necessary for scholars studying writing but also for the people who develop(ed) it or are learning to use it (i.e., in both phylogeny and ontogeny): In creating a writing system, (ideally informed) decisions must be made as to which features of the given language to include and which to leave out – hence the interpretation of writing systems as selective analyses of languages (see above). And in learning to use a writing system, users must acquire a certain degree of metalinguistic awareness to be able to grasp how writing works, especially how it is connected to language.

4.2.2. Graphetics: the material module

The graphetic module contributes all graphic resources needed to materialize a writing system, thus lending it its substance. At the core of these resources is always a given *script* such as Roman script, Cyrillic script, Chinese script, runes, or cuneiform. Such a script offers a set of so-called *basic shapes* that serve as the materializations of graphemes (see below). Thus, in our definition, *script* refers to an inventory of shapes that can be adopted by different languages – a process that has, indeed, occurred myriads of times in the history and transmission of writing. Thus, scripts (as well as other graphic resources, which are attended to below) are, at least in theory, language-independent. Of course, scripts are commonly first conceived as language-specific inventories, and in their first stages and when used with the language they were originally devised for, there may exist form-function relations that reflect this (such as iconicity). However, the adoption of an existing script (in many cases Roman script) has nowadays prevailed as the default strategy in the development of new writing systems, making it reasonable to not assume an *a priori*

[12] For two contributions on cuneiform, cf. Rossi (in this volume) and Basello/Desset/Gianni (in this volume).

relation between a script and the language(s) it is used for. In other words, from a strictly analytical and ahistorical viewpoint, the connection between a given language and a given script is arbitrary.[13] This explains the placement of the graphetic module outside of the language system (cf. Figure 2). At a metalevel, too, different writing-related fields such as typography may be interested exclusively in the material aspects of writing (e.g., its appearance) without having to simultaneously focus on the linguistic content that is conveyed by them,[14] which solidifies the position of graphetics within the model – as a field, graphetics is interdisciplinary and serves as a bridge between linguistics and other disciplines invested in writing (cf. Meletis 2015 for an overview).

What the plural 'scripts' in Figure 2 insinuates is that more than one script may be in use in a writing system at a given time. In modern Serbian, for example, both Cyrillic and Roman scripts are in use, with their alternation being determined by a complex bundle of factors. Likewise, in historical Egyptian, hieroglyphs were at one point used next to the hieratic and demotic scripts. These are cases of *bi-* or *multiscriptality* (terms taken from Bunčić 2016) that concern largely the graphetic module. However, due to small asymmetries in basic shape-phoneme correspondences, it may be debated whether, for instance, Serbian in Cyrillic script vs. Serbian in Roman script are two distinct writing systems or two versions of the same system. In any case, due to their visual dissimilarity, users must learn the different scripts and their correspondences with linguistic units to be literate in them. Notably, the concurrent use of multiple scripts may also be accompanied by more fundamental differences in the functioning of the system(s): the writing system of Chinese, which uses Chinese characters, is typologically morphographic, whereas the Pinyin system using Roman script is alphabetic. Here, we can definitely speak of a coexistence of multiple writing systems for the same language (see also the next section).

While scripts are at the core of graphetics, additional resources that are less palpable and thus often marginalized in the literature are just as relevant; they include non-scriptual graphic material,[15] blank spaces, and other strategies of textual arrangement. This example underlines that since writing is a graphic modality, i.e., one inscribed in a surface, the relevant dimension is space, rendering different facets of spatiality essential for the

[13] One phenomenon that highlights this is script switches such as the one for Turkish: in 1928, the Arabic script was abandoned in favor of the Roman script. More recent examples include several switches for the writing system of Azeri (cf. Hatcher 2008) and, similarly, for Kazakh. Note that 'arbitrary', here, refers to the linguistic link between a script and the language it is used for. By contrast, what is evident from the switches mentioned is that the choice of scripts is certainly not arbitrary from a sociolinguistic or more specifically socio-political point of view – quite to the contrary.

[14] It can be argued that since these material aspects still concern writing, i.e., the graphic representation of language, in a broader sense, these fields are still concerned with language or at least communication.

[15] A German term that must be mentioned in this respect is *Schriftbildlichkeit* (lit. 'pictoriality of writing'; see for an overview Krämer/Cancik-Kirschbaum/Totzke 2012). It refers to the fact that the boundaries between the written and the pictorial are fluid. Thus, texts (in a broad sense) are not only often multimodal in that the written material in them is accompanied by pictures, figures, etc., but the writing itself can also take on qualities of other semiotic modes, specifically images. A historical writing system for which Schriftbildlichkeit is a central concept is Aztec (cf. Perri in this volume).

graphetic module and its analysis. As a direct consequence of writing being a graphic and spatial modality, there are several features that distinguish it markedly from speech and sign language, including its material (semi-)permanence or its two-dimensionality (or even three-dimensionality, as in the case of Ogham, cf. Forsyth in this volume). The latter invites a description – or *cartography* (cf. Reißig 2015) – of the arrangement of elements on a writing surface as well as a systematic division of this surface into subspaces (cf. Meletis 2015, 2020a) that is also central in an analysis of graphotactic constraints (cf. Section 4.3.3).

A usage-based field that proves revelatory in identifying modality-specific material features of writing is emergent literacy research (cf. Meletis 2020a: Chapter 7.1.1; Treiman/Kessler 2014). Before they enter school, where they are familiarized with the glottographic nature – i.e., the linguistic function – of writing, children who are socialized in literate communities and thus constantly surrounded by text in their language in one form or the other have already acquired sophisticated implicit knowledge about the systematics of writing. The fact that this knowledge is non-linguistic in nature reveals a lot about the idiosyncratic graphetic features and regularities of writing.[16] Children can, for example, distinguish their own script from other, even similar-looking, scripts (cf. Lavine 1977).

The first batch of features derived from emergent literacy research concerns the artificial and commonly arbitrary and abstract nature of writing: writing is artificial in the sense of being a cultural artefact produced by humans, and children grasp early on that writing can therefore not be found in nature – unlike the stripes on a zebra, for example (cf. Treiman/Kessler 2014: 105). And even though most writing systems exhibit iconic shapes at the beginning of their development, these tend to become increasingly abstract and, in turn, arbitrary over time (which occurred, for example, in the history of the Chinese writing system). In most modern writing systems, the shapes of graphemes no longer pictographically resemble their function (in the case of morphography this is their linguistic meaning, see below). In emergent literacy, this is ontogenetically reflected in children's realization that the process of writing as well as the products it creates differ fundamentally from those of drawing (cf. Gombert/Fayol 1992).

As a core characteristic of the spatiality of writing, *two-dimensionality* was already mentioned above – in writing, both the horizontal and the vertical dimensions are exploited. The areal phenomena that are made possible by this have long been neglected by linguist(ic)s due to what Sybille Krämer calls the *dogma of linearity* (Krämer 2003: 159). Crucially, this view contributed to the general marginalization of writing as a subject of research in linguistics: indeed, if the two-dimensionality of writing is disregarded, the impression can be gained that writing is but a static linear transcription of speech, a 'boring' concatenation of letters that does nothing but refer to sounds. Against this background, acknowledging the relevance of the materiality, specifically the spatiality of

[16] Cf. Kazzazi (2016) for a study comparing emergent child literacy with historically evolved writing principles.

writing was a key moment in cementing the relevance and independence of what would develop into the interdisciplinary grapholinguistics outlined here.

Of course, writing is not spread chaotically on a surface but rather in an ordered fashion: it is produced in lines that follow a certain direction. The specifics of these features – *rectilinearity* and *directionality* – are variable, and different writing directions can be observed in the world's writing systems (and sometimes even within a single writing system, especially historically[17]).

A third batch of features zones in on the above-mentioned scripts as inventories of basic shapes. Whether they are produced as segments separated by blank spaces or not (as in connected writing in Arabic or generally in most cursive handwriting), signs of writing are originally disjunct segments (cf. Goodman 1968; *segmentality*). This makes a text a concatenation of independent segments and distinguishes it markedly from the fluid acoustic continuum that we call speech. Scripts are, by and large,[18] closed inventories, meaning they are made up of a limited number of shapes. This *finiteness* is determined top-down, i.e., glottographically: basic shapes materialize graphemes, which are related to linguistic units of (relatively) closed classes (mainly phonemes, syllables, morphemes). Several other features that concern the combination of shapes are also grasped relatively early by children: that shapes seldom occur alone but mostly in combination (*multiplicity*), that they usually alternate, i.e., the same shape is rarely iterated more than twice (*alternation*), and that certain combinations of shapes/graphemes are disallowed (*sequentiality*). These features are already graphotactic in a narrower sense; they are systematic regularities of how elements of writing are combined that take on the form of restrictions (see Section 4.3.3).

As a field, graphetics is interested not only in the generalized (and abstracted) graphic and spatial features of writing systems but also in their concrete (types of) materializations, which includes the materials and tools needed in producing them. Accordingly, the surface (stone, bark, leather, paper, screens …) and the tools used (styli, pens, chisels, keyboards, fingers …) are considered central components that co-determine the appearance and shape of writing.[19] Interestingly, what has been bemoaned for linguistics in general – that graphetic questions are largely neglected or relegated to the outer periphery of the field – does not apply to historical graphematics, for which the materials and tools used and the

[17] Strategies that come to mind are *boustrophedon*, where the writing direction was changed for each successive line (with individual letters also being oriented towards the given writing direction), or *capovolto*, a snake-like way of writing where letters were additionally flipped over vertically (cf. Meletis 2020a: 269–272, Brekle 1996: 487f., Zinn 1950/51).

[18] Although it is the exception rather than the rule, new shapes can be added to scripts. A recent example is the introduction of an uppercase <ß> in German in 2017. In Chinese, too, given the morphographic nature of the system, for new morphemes or words, new characters can be introduced.

[19] At Heidelberg University, there is a Collaborative Research Center titled *Material Text Cultures*; its focus is on the materiality and presence of writing in non-typographic societies, and it publishes an eponymous open-access book series at De Gruyter (https://www.degruyter.com/serial/mtk-b/html?lang=en, November 23, 2023). In the inaugural volume (Meier/Ott/Sauer 2015), different writing materials and different practices of inscribing them are treated in dedicated chapters.

material conditions surrounding writing in general – both as a process and as a product – are most definitely subjects of great interest that have even spawned the establishment of auxiliary disciplines such as epigraphy or paleography.

4.2.3. Graphematics: the linguistic module

As mentioned at the outset of this paper, terminologically, *graphem(at)ics* has often served as an umbrella term for the study of writing, and it is arguably still used as such in the label *historical graphemics*. However, in the context of the multimodular model outlined here, graphematics is only one part of a writing system. As illustrated in Figure 2, the graphematic module provides the semiotic link between the graphematic module and the underlying language system, making it a linguistic link.

It was shown above that the multimodular model accepts only glottography as writing, and this is nowhere as evident as in the conception of the graphematic module, which is essentially the link between the graphic and the linguistic that makes writing *writing*. By contrast, this link does not exist – or is a lot more indirect and vague – in semasiographic systems or semasiographic elements within otherwise glottographic systems, given that these types of graphic communication often mix and overlap.[20] Interestingly, in the earliest historical writing systems – and in the diachronic development of writing in general – we can often observe transitions from semasiography to glottography. These are frequently characterized by varying degrees of iconicity, a salient type of semiotic (in this case graphematic) relation that, in its glottographic form, is constituted by a similarity of some kind between a graphic signifier and certain aspects of a linguistic signified (such as a word). For writing, the most obvious type of iconicity is pictography (or *imagic iconicity*, cf. Nöth 2001), in which the shapes of graphemes resemble or approximate the appearance of the object or referent that the grapheme's meaning refers to (cf. Meletis in press c). The shape of the grapheme relating to the morpheme *water*, for instance, could resemble the appearance of a wave (cf. Meletis/Dürscheid 2022: 246). Pictography is, of course, feasible only in largely morphographic writing systems in which graphemes relate to morphemes, which – unlike phonemes – possess a meaning that can potentially be depicted. However, this also applies only to morphemes for concrete phenomena and not to morphemes of function words (e.g., prepositions) or abstract concepts (e.g., *freedom* or *love*). Interestingly, the gradual loss of pictography – or, if viewed from a different perspective, the increase of abstractness (see above) – can be observed across writing systems such as Chinese, Sumerian, or Mayan, with the increasing arbitrariness arguably also fostering the increase of glottography: a stable and conventional(ized) link between the signifier and a signified becomes necessary, and this is exactly what the graphematic module provides.

Its basic unit is the *grapheme* (see Section 4.3.1), i.e., the written segment. With segmentality being a core feature of writing, as a field, graphematics has often been

[20] When considering elements such as emojis or other pictographic symbols, such a mixture can be observed in many modern writing systems.

understood narrowly as the study of phoneme-grapheme correspondences. On the one hand, this reflects the phonocentrism prevalent in linguistics, and on the other, it is symptomatic of how underdeveloped graphematics has traditionally been (within the study of writing or even *pars pro toto* as the study of writing). In rectifying this, it must first be emphasized that there exist other types of correspondences as well: one of them was mentioned above, namely the morpheme-grapheme correspondence central in morphographic writing systems. Given the diachronic origins and trajectory of writing, morphography is, in fact, primary to phonography. Additionally, highly relevant phenomena or strategies of writing such as determination – i.e., the use of determinatives of different kinds – requires us to consider types of correspondences between the graphic and the linguistic that go beyond phonographic or morphographic and even segmental relations (cf. also Section 4.3.1). Furthermore, writing systems have at times been called 'messy' for mixing different kinds of typological principles and correspondences (cf. Rogers 2005: 272). One of the core tasks in describing individual writing systems as well as comparing them with each other is thus to carefully disassemble and analyze these mixtures including the possible hierarchies and different functions associated with the various correspondences that they entail.

Another – almost trivial – fact that is often overlooked due to the focus on the segmental grapheme is that graphematics covers not only this segmental level but also the suprasegmental level that concerns the combination of graphemes into larger units (cf. Dürscheid 2016: 128). The relevance of the latter level is especially foregrounded in German grapholinguistic research, where we find systematic descriptions of larger units of writing such as the graphematic syllable (Fuhrhop/Buchmann 2009), the graphematic word (Fuhrhop 2008), or the graphematic sentence (Schmidt 2016), units that place into focus phenomena such as visual[21] and linguistic cues for syllable boundaries, word spacing, or punctuation. Beyond that, of course, we have texts, which, despite a nowadays broader, modality-independent reading of 'text', have traditionally been seen as *written* texts studied by, among others, textlinguistics as a dedicated linguistic subdiscipline. Importantly, graphematics extends also in the other direction in that it concerns also the subsegmental level: phenomena studied at this level concern, for instance, possible graphematic subcomponents that are systematically combined to form graphemes in the first place (such as semantic and phonological components in Chinese, cf. Myers 2019).

Regardless of the level at which they are located, graphematic correspondences are often not biunique, i.e., one-to-one. This leads to situations in which graphemes relate to more than one linguistic unit or one linguistic unit is written by more than one grapheme (or grapheme combination). The different possible variants of spelling words or utterances produced by these multiple relations give rise to the so-called *graphematic solution space* (cf. Neef 2005, 2015). In theory, this space – understood as a 'virtual space' and the core part

[21] Reinken (2023) shows how – in German – certain features of handwritten text visualize different linguistic units and boundaries between them.

of a writing system – stores all[22] possibilities that a given writing system allows, i.e., all those that are systematic (or, to borrow an established linguistic term, 'grammatical').[23]

In sum: the graphematic module highlights that writing systems are indeed *systems*. This is true in two different senses: firstly, writing systems are – albeit optional – linguistic (sub)systems of languages and as such intimately related to other subsystems such as phonology or morphology. Secondly, writing systems are semiotic systems in and of themselves, characterized by idiosyncratic regularities and restrictions independent of the other subsystems of the languages they are based on (cf. the two examples of allography and graphotactics below). Instead, these regularities and restrictions *echo* the ones found in other linguistic subsystems. In other words: a phenomenon such as allography does not depend on – or merely 'depict' – phenomena like allophony or allomorphy but is rather analogous in how it functions. This is a highly relevant observation that cements writing as a linguistic matter and with it the possibility or even necessity of using established linguistic concepts and tools to study it (*contra* Daniels 1991; cf. also Section 4.3). In conclusion, the graphematic module doubly renders writing a modality of language, which makes graphematics – as a grapholinguistic subbranch – the genuinely *linguistic* study of writing in an overall interdisciplinary and comprehensive grapholinguistics.

4.2.4. Orthography: the normative module

When speaking of *orthography*, we must first clarify that in the model presented here, this term is used in a narrow, normative reading: following the decades-old distinction made between graphematics and orthography in the German grapholinguistic tradition (cf. Dürscheid 2016: 128), we interpret *orthography* as the standardization of a writing system. Accordingly, while 'German writing system' means the entire descriptively reconstructed system inclusive of all resources it offers – which, as mentioned above, often entails multiple alternative ways of spelling one word or utterance let alone materializing it –, 'German orthography' signifies only that subset of the writing system's resources that is, from a normative perspective, regarded as 'correct' – that subset that results from the fact that the orthographic module curtails the graphematic and graphetic modules. What is included in this normatively correct subset is, in German, externally regulated via codified orthographic rules issued by an official authority of linguistic policy, the plurinational *Rat für deutsche Rechtschreibung* (Council for German Orthography). The presence of this official orthographic regulation has certainly shaped the German reading of *orthography*. One could

[22] It can be debated whether it truly stores all theoretically possible variants or whether it is based on the actual usage of the system and accounts only for variants that can be observed in it.

[23] In its original conception, the graphematic solution space included segmental correspondences and the variants they bring forth at the segmental level (such as <f> or <ph> for /f/ in English or German), while the constraints on how graphemes may be combined (i.e., graphotactics, see Section 4.3.3) were assigned to *systematic orthography*. Contrary to this, we define the graphematic solution space more broadly to include also those suprasegmental regularities and constraints that concern the spelling of larger units such as words (cf. Meletis/Dürscheid 2022: 172).

argue for a similar influence for the broader and descriptive use of the term prevalent in Anglo-American scholarship, in which *orthography* is often used more or less synonymously with *writing system*, for instance, when speaking of *English orthography*. This reflects the fact that for pluricentric written English (with its different varieties), no official rule-giving authority and thus no palpable orthographic 'rules' exist. The conventions[24] of written English have instead always been dynamically negotiated by various actors (including publishers of dictionaries but also the users of the system themselves), giving off the impression that in English, the writing system including its orthographic conventions is self-regulating (cf. Berg/Aronoff 2017, 2018). Against this background, for a writing system like English, orthography in a narrow, normative sense is more difficult to capture – which does not mean that it does not exist or is irrelevant. The same applies to other writing systems, including historical ones, as we will show below.

Thus, not every writing system has an official external regulation consisting of codified orthographic rules like German does – this kind of orthography is 'optional' (cf. Meletis 2020a: 28). However, this observation is trivial and of little analytical value if we work comparatively and are interested in the normativity present in writing systems that are not equipped with an official regulation – which includes historical writing systems.[25] Arguably, literacy may foster a sense and an awareness of normativity due to several features and conditions surrounding the process and product of writing: (1) the permanence and (re-)accessibility of writing allows the scrutinization of texts by others, (2) the common absence of the communication 'partners' (i.e., the reader when writing and the writer when reading) makes necessary not only a more explicit recording of information and language but arguably also a (more) standardized one, (3) due to its independence of time and – depending on the point in history and available possibilities of dispersion – region, writing becomes a tool and marker of cultural, political, etc. unification and unity. Against this background, it remains an open question whether there exist literate cultures in which writing is truly 'free' in the sense of 'devoid of normativity' and alternative co-existing variants of putting something to writing are seen as completely equivalent at all levels (cf., as a possible example, polynomic Corsican, see Jaffe 2021). If these do exist, the orthographic module in general may be optional, which is a question that cannot be settled here but had to be mentioned to underline that in our current conception of the multimodular model, the orthographic module is not necessarily tied to an official regulation.

As for its function, the orthographic module essentially selects certain resources from the graphetic and graphematic modules and – via norms that may be expressed as

[24] In the context of this article and for illustrative purposes, we only make a rough distinction between two types of norms: *conventions* as looser, mostly implicit (and/or unconscious) norms, and *rules* as explicit, often externalized (e.g., codified) and more binding norms. The reality is, of course, far more complicated than that.

[25] In this context, it must be mentioned that Neef (2015) distinguishes between two types of orthography that correspond with the two readings presented here: *systematic orthography*, which is constituted by the (mostly implicit) norms of writing negotiated among users, and *conventional orthography*, which more or less corresponds with an external, explicit regulation of orthographic norms by an authority (cf. also Meletis/Dürscheid 2022: 185–187).

prescriptive rules in one form or the other – proclaims them as 'correct'. This way, the orthographic module instils into the system and its users the above-mentioned normative notion of correctness that is commonly not as pronounced for other matters of language (such as grammar) and certainly not for its spoken modality.[26] Notably, as a descriptive structural abstraction, the multimodular model is focused on the units, structures, and relations that make up a writing system. What the orthographic module offers in this regard is, as mentioned, rules or conventions that superimpose the other modules and – if users adhere to them – lend a writing system its standardized 'surface form' in which it is usually substantiated and perceived (cf. Schmidt 2018). Notably, rules are not particularly interesting under a structural lens.[27] As stipulations that are perceived as binding and followed by users who wish to *behave* according to them, they are far more central from pragmatic and sociolinguistic perspectives, rendering orthography a largely usage-oriented matter in which the focus is shifted from a writing system's structures to how users enact or instantiate these through actual literacy practices (cf. Meletis/Dürscheid 2022: Chapter 5). Indeed, especially from a historical perspective, what is of main interest is not orthography as a structural part of a writing system but orthography as a dynamic practice shaping the writing system – which is often the very process that leads, eventually, to official written standard varieties (see Baddeley/Voeste 2012). This is the crux of arguing that historical writing systems were already equipped with orthographic modules even if their norms were not officially regulated or codified; following Mihm (2016), they can be called *premodern orthographies*. In them, orthography does not revolve neatly around a rulebook (such as the *Amtliche Regelung* in modern German) but around (often implicit) norms negotiated by the users of a given writing system – whether only members of an elite or all members of a literate culture, which depends, among other factors, on the spread of literacy and the allocation of power in a given community. In a nutshell: The norms themselves are interesting, yes, but the question of *how* they are/were negotiated is arguably equally as interesting – if not more so. For most historical writing systems, both the norms and the processes of negotiation can only be theoretically reconstructed.

What must be highlighted for historical writing systems is that orthography concerned not only graphematics, but also graphetics – and to a far greater degree than it does today

[26] There are commonly no external regulations pertaining to the grammar of a language – including its phonology, morphology, or syntax – as even 'rulebooks' of grammar are, in fact, descriptive in merely capturing what is grammatical in a language. As for language materialized in the spoken modality, so-called *orthoepy* echoes orthography in standardizing the pronunciation of spoken language; however, its influence and importance in linguistic communities (and even users' awareness of its existence) is marginal at best, the decisive difference between speech and writing being, of course, their transience vs. permanence (see also above).

[27] The rules themselves – especially if they exist in official codified form – may not be interesting, but the interaction between the orthographic module and the other modules is a major issue that has yet to be settled. Related questions include: when does an externally codified orthographic rule that does not reflect the actual usage – which means it was not graphematic prior to being codified – become graphematic, i.e., part of the core of the writing system? This question is even more difficult to answer for writing systems such as English that only have self-regulating, user-negotiated rules or conventions. Here, it may be altogether unreasonable to attempt to neatly separate graphematics from orthography.

(cf. the fact that the orthographic module also overlaps with the graphetic module in Figure 2). The reason for this is that the major driving force of the development of orthographic norms is arguably variation. In historical writing systems, given the material conditions surrounding the production of writing, graphetic variation was far more prevalent than it is today. Specifically, since excessive variation could lead to miscommunication, it was important to regulate normatively (in whatever manner, but mostly implicitly) also this aspect of writing. Nowadays, in most societies, writing occurs largely digitally by means of electronic devices and pre-existing typefaces. This has reduced (especially idiolectal) graphetic variation to a minimum – or at least it has shifted it to a different level.[28] There do exist conventions pertaining to the graphetic module – such as 'do not use playful typefaces when designing a resume for a serious job' –, but these lack the status or scope of official orthographic rules. However, in some writing systems, there *are* orthographic norms pertaining to graphetics such as the fixed stroke order in producing Chinese characters,[29] to name only one example.

4.3. Core concepts

In the following, we will present a triple of concepts that form the very core of how writing systems are built and how they function: the *grapheme* as the basic unit, *allography* as the systematic variation between variants at different levels, and *graphotactics* as a set of constraints that govern the structure and combination of graphemes as well as larger written units (word, sentences, …) including their arrangement on a writing surface. As already evident from the terminology, these concepts are modeled after well-known and accepted concepts from phonology and morphology; in the following, it will be argued how this underlines that writing systems are linguistic systems functioning much in the same way that languages and their structures do – making a structural grapholinguistics even feasible.

Note that in the preceding sections, we have presented separate modules that make up writing systems. Although the distinction between them certainly has its analytical benefits, in practice, the three modules often cannot be neatly separated. This will become clear in the ensuing discussion of the three core concepts: they are all graphetic as well as graphematic, and they all have implications for orthography, underlining that the three modules as well as the structural grapholinguistic branches they give rise to are intricately interwoven. Thus, while they may function as different lenses under which phenomena

[28] Writers are commonly not involved in the design of the typefaces they use; however, their *choice* of a specific pre-existing typeface in a given context can be analyzed from a sociolinguistic and sociosemiotic perspective (cf. Spitzmüller 2013).

[29] One reason for this may be the magnitude of the Chinese script in terms of the number of its basic shapes, which is a direct top-down reflection of the morphographic nature of the Chinese writing system. With growing script inventory size, assuring the graphic distinctiveness of shapes (and, by extension, graphemes) becomes a central problem, which is why orthographic norms regulating the graphetic module may be expected more in such systems.

can be viewed in a fine-grained manner, it is paramount to keep in mind that they are heuristic and idealized working categories.

4.3.1. Grapheme: the basic unit

The first core concept we turn to is the result of a trivial observation – trivial because we know it from language itself: like languages, writing systems, too, consist of basic units that are the building blocks of larger structures. However, a significant difference between the spoken and written modalities of language is that for the latter, the assumption that its basic units are originally segmental is uncontroversial.[30] Against this background and given the success story of descriptive linguistic concepts such as *phoneme* and *morpheme*, one would think that a *grapheme* would also have been an established linguistic concept by now.

Indeed, there have been two diverging main trends in treating the grapheme (cf. Meletis 2019), both of which have not exactly helped the establishment of a unified grapheme concept necessary for comparative work covering diverse writing systems. On the one hand, in the Anglo-American realm, Peter T. Daniels, a scholar central to the study of writing (especially matters of typology), rejected the possibility of a grapheme – and with it, a structural treatment of writing systems altogether (cf. Daniels 1991). His core argument was that writing, unlike phonology or morphology, is something we as humans are aware of, and only unconscious properties of the mind should be classified as emic and thus be denoted by a term carrying the suffix *-eme*. Daniels' forceful rejection as well as, arguably, the manifold different and often intransparent uses of the term *grapheme* spread throughout the literature (especially in psychological research, cf. Henderson 1985) may have led to a disinterest in or even an abandonment of questions surrounding the grapheme in English-language scholarship. Meanwhile, German grapholinguistics embodied the complete opposite: a suitable definition of grapheme – for German – has been one of the core topics since the beginning (which was roughly in the 1970s). Here, one of the main hurdles to overcome was a rather unproductive discussion of whether graphemes are 'depictions' of phonemes or whether they are minimal distinctive units of writing defined by analogy with phonemes (and also discovered using minimal pairs) – with the latter view prevailing in the end. In any case, even the most recent German grapheme definitions (among them Berg 2019, Fuhrhop/Peters 2023) still cater mostly to German. While defining the grapheme for a single language may certainly be a promising starting point, the next step must be to acknowledge and account for the formal and functional diversity of writing systems. Phonemes and morphemes exist in every language – why shouldn't graphemes? Is writing different?

Before attempting to answer this question and presenting a preliminary proposal for a cross-linguistic grapheme definition, we should address the question of the value that such

[30] This is still debated (albeit not prominently) for the phoneme, with some scholars arguing that the phoneme is only an epiphenomenon resulting from the introduction of (segmental) writing (cf. Faber 1992, Davidson 2019); Morais (2021) calls it a conceptual heritage from alphabetic literacy.

a definition would have. Considering the apparent diversity of writing systems – which seems insurmountable when juxtaposing systems such as German, Arabic, and Chinese –, one obvious danger of a cross-linguistically applicable definition is that it becomes too abstract and vague to be of any analytical value by having to sweep important system-specific features under the rug. This danger is real, but it is arguably outweighed by the possible benefits of being able to compare the basic units of different writing systems: specifically, identifying their building blocks not only promises to reveal a lot about the fundamental structure of the modality of writing in general but also makes possible a more systematic comparison of how writing systems are used. Indeed, as mentioned above, a lot of the psychological literature focusing on processes involved in literacy acquisition or reading do not have a sound let alone comparable descriptive basis. Thus, the value of otherwise important studies, for instance, on how children learn to read in Chinese vs. in English is diminished when findings cannot readily be compared. Without a unified descriptive framework, the discovery of commonalities or even universal tendencies (which arguably do exist beneath the more or less superficial diversity of writing systems), which then call for the search for explanations, itself crucial for a comprehensive theory of writing, becomes that much more challenging – if not impossible.

A preliminary proposal of a cross-linguistic grapheme definition was made in Meletis (2019; cf. also Meletis 2020a, Meletis/Dürscheid 2022). It is based on three criteria: (1) graphemes are lexically distinctive, i.e., distinguish between words, making them similar to phonemes (= lexical distinctiveness criterion). Unlike phonemes, however, (2) graphemes have an additional linguistic value by virtue of their relation with a unit of a different linguistic subsystem (such as a phoneme, a syllable, or a morpheme); this is the linguistic value criterion. Accordingly, in this conception, the grapheme is interpreted as a semiotic relation, i.e., a sign.[31] Finally, (3) graphemes are minimal units, i.e., the smallest units for which the first two criteria apply (= minimality criterion). This last criterion distinguishes graphemes from smaller graphematic elements (such as the semantic and phonological components in Chinese), on the one hand, and larger grapheme combinations or clusters on the other. As such, it is also essential in evaluating the graphematic status of digraphs (cf. Osterkamp/Schreiber 2021): in German, for example, <ng> (related to the phoneme /ŋ/) is a combination of two graphemes, as both <n> and <g> fulfill the lexical distinctiveness and linguistic value criteria on their own, whereas <ch> is a complex, i.e., non-segmental grapheme, since |c| is not a grapheme on its own, but together with <h>

[31] This view was for a long time rejected in German grapholinguistics as it insinuates that units of writing are 'merely' signs of something else, effectively rendering writing a secondary sign system. For some, this entails an implicit devaluation, as 'secondary' is interpreted as 'less important'. Thus, the rejection of this view is revelatory also with regard to a (historiographical) sociology of German grapholinguistics: at a time when studying matters of writing was still very marginalized (and potentially even a risk to careers), scholars were understandably eager to underline the independence of writing to justify the relevance of an independent study of writing. However, as argued here, a semiotic approach to writing (cf. also Klinkenberg/Polis 2018, Rizza 2019) does not devalue writing as something of less importance; it is arguably even necessary for a comparison of functionally diverse writing systems – i.e., phonographic vs. morphographic systems – to work.

(which is also a grapheme on its own) it is in a relation with the phoneme /x/. While the definition based on these three criteria is not groundbreaking, it strikes a balance between being too vague vs. too specific. It captures that the grapheme is the basic unit of writing formally[32] and functionally, making it the essential link between graphic shapes and language, i.e., the glottographic link that renders writing *writing* (see above).

This definition is, as announced, a preliminary proposal that must continually be tested against data from more writing systems. This process of testing and refinement unearths several challenges posed by the interesting idiosyncrasies of writing systems (or types of writing systems). Some of them that were already accounted for in the proposal include the subgraphemic components, such as the ones found in Chinese ('radicals' and 'phonetics'), ligatures as prevalent in abugidic writing systems, different types of variation and allography (see next section), subsegmental and optional grapheme 'diacritics' (as in Hebrew or Arabic), and diverse spatial arrangements of graphemes (such as the grouping of graphemes in syllable blocks in Korean Hangul) (cf. Meletis 2020a: 97–104). Notably, more intricate questions such as how – or even if – the graphematic polyvalence in modern written Japanese can be accounted for by the linguistic value criterion (cf. Okada 2021) remain to be answered and certainly require the collaboration of experts on specific writing systems.

4.3.2. Allography: systematic variation

Variation in writing is ubiquitous: it occurs at the graphetic level, as writing needs to be concretely materialized and every materialization is unique,[33] at the graphematic level, as the relations between graphic units and linguistic units in a writing system are commonly not one-to-one, and at the orthographic level, as the orthographic rules may either allow for a choice between different 'correct' variants or writers may for various reasons altogether (un)consciously deviate from the written norm. Crucially, some instances of variation are more systematic than others, in that they are inbuilt into the structure and use of a given writing system; in these instances, we speak of *allography*.

Specifically, when analyzing the units of a writing system to identify its graphemes and thus gradually compile a complete grapheme inventory, we sometimes come across units that are somehow related and are, among themselves, non-distinctive. What we have discovered, then, are different allographic variants of one unit. Historiographically, the fate that befell the concept of allography was not quite the same as for the grapheme, and *allo-*

[32] Graphemes are most commonly graphetically segmental in consisting of only one basic shape; however, given exceptions such as <ch> in German or the syllable blocks in Korean Hangul – where subsegmental graphemes are arranged in blocks that are themselves graphetically segmental –, this assessment must be taken with a grain of salt.

[33] Crucially, variation is often even sought after by speakers and writers. A maxim that we are nowadays familiar with at the lexical level – that repetitions should be avoided and a wide variety of different words should be used – is also transferrable to the graphetic and (to some degree) graphematic levels of writing both in historical and modern literacy practices. What intervenes here is, of course, the orthographic module with its norms.

graphy was indeed tossed around rather intuitively (both conceptually and terminologically) as a 'useful' analytical device (even Daniels thinks so, cf. Daniels 2017: 88) whenever talk was of any kind of variation in writing. 'Any kind' cuts to the central problem: different kinds of variation were lumped together, with 'allograph' becoming a melting pot for altogether distinct – if related – phenomena. In carefully separating these phenomena, the trichotomy introduced in the multimodular model proves useful, giving rise to two central types of allography: graphetic allography and graphematic allography (see Figure 3; cf. Meletis 2020b).

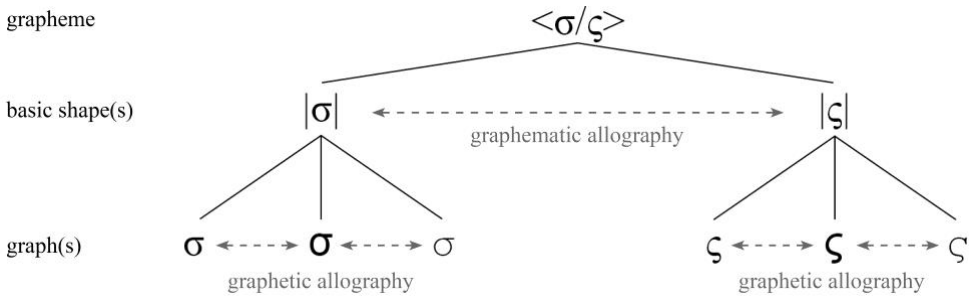

Figure 3: Types of allography (cf. Meletis 2020b; figure adapted from Reinken 2023: 31)

Graphetic allographs are 'just' graphic variants. They are concrete graphs (whether in writing that was produced by hand or in print) that materialize the same basic shape. They must bear some graphic similarity, making graphetic allography conceptually similar to *allophony*, where allophones require phonetic similarity. In other words, functionally equivalent (i.e., non-distinctive) variants that are materially similar are variants of one unit – tokens of one type.[34] For example, when writing the word <sleeps> either by hand or printing it, two *e*-graphs and two *s*-graphs will be produced. Arguably, every instantiation of writing is a variant (cf. Spitzmüller 2013); in other words, there is no material default against which other variants can be evaluated, making the basic shape merely a theoretical abstraction (that is psycholinguistically relevant, however, cf. Meletis/Dürscheid 2022: Chapter 4.7.2). In sum: The need for a concrete materialization in which abstract basic shapes that store spatial information must be given some substantial form – like bodies that put on clothes – makes graphetic allography omnipresent: indeed, *every* graph is simultaneously an allograph.

On the other hand, as distinct basic shapes that are variants of the same grapheme, graphematic allographs are located at a higher level. They are related to each other exclusively through their identical function/value, meaning unlike graphetic allographs,

[34] Here, we distinguish further between *syntagmatic graphetic allography*, which captures the variation between tokens of one type within one inventory (e.g., a given person's handwriting or a given font), and *paradigmatic graphetic allography*, which captures the variation between tokens of one type across different inventories (e.g., two people's handwriting or different fonts) (cf. Meletis/Dürscheid 2022: 154f.). As for graphic similarity, the assumption here is that syntagmatic graphetic allographs resemble each other more than paradigmatic ones.

they need not be materially similar. In this, graphematic allography resembles *allomorphy*, as allomorphs can be – but certainly do not have to be – phonetically similar. Which graphematic allograph is used in a specific context can be subject to different conditions, with one type of graphematic allography being positional (and thus similar to complementary distribution of allophones or allomorphs): prominent examples include the two different lowercase sigmas in Greek <σ/ς> (cf. Figure 3), of which the first one occurs at the beginning and in the middle of words and the latter at the end of words, or the different variants of Arabic graphemes that are used alternatively depending on a grapheme's position within a word. Interestingly, even such allographs of the graphematic type often result from graphetic variation: the positional allographs in Arabic, for instance, have developed due to the (co-)articulation processes involved in humans writing connected Arabic by hand. This emphasizes the importance of a diachronic perspective in explaining how allography developed. Notably, there is also – albeit more seldom – free graphematic allography in which different basic shapes such as |g| vs. |𝗀| can – in theory – be chosen freely; in practice, the occurrence of one of the variants is – at least in digital writing that entails the use of preexisting typefaces – determined by the variant that is included in the typeface; thus, the two (commonly) do not mix within one typeface or one person's handwriting. Finally, it must be mentioned that different ways of representing the same linguistic unit in writing – such as <s> and <c> for /s/ in words such as <sad> and <city> – are *not* considered graphematic allographs in our approach. They are rather different graphemes that – in some contexts – relate to the same phoneme, which makes them graphematic variants in a broader sense. Allography, as established above, is a phenomenon completely inherent to the writing system and as such can be evaluated without recourse to other (sub)levels of language.

As the parallels with allophony and allomorphy show, allography is one of the most convincing examples underlining the fact that writing is its own linguistic (sub)system that functions much in the same way that other linguistic subsystems like phonology or morphology do – and thus, contrary to what was claimed by Daniels (1991), that writing can and arguably even should be studied using the descriptive linguistic apparatus established in structural linguistics (with necessary modifications, of course).[35]

Allography – mainly its graphetic type – is especially relevant to the study of historical writing systems, in which variation is a lot more pervasive due to the fact that there was no technological factor driving invariance (such as the printing press or more recently digitalization, which brought forth the emergence of readily usable and graphically stable typefaces). By contrast, nowadays, given the prominence of digital writing and a perceived

[35] 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).

decline of handwritten literal practices (but cf. Section 3) – at least at the graphetic level and idiolectally –, we have arrived at much higher levels of material invariance. Variation and its sociopragmatic functionalization are still relevant, but the level at which they are enacted has shifted: for sociopragmatically indexical variants, writers mainly exploit the graphematic module, i.e., different ways of spelling words or utterances (pertaining to features such as correspondences between graphemes and linguistic units as well as punctuation). This, of course, conflicts with the orthographic module, as it is commonly only a single variant from inside the graphematic solution space that is licensed as normatively correct.

For the sake of completeness, we want to mention orthographic variation: alternatives such as <Typographie> and <Typografie> in German, which are both licensed as orthographically correct, give rise to epiphenomenal segmental orthographic variants such as <f> vs. <ph>. Firstly, such variants are infrequent as orthographic regulations usually strive to reduce variation and thus – as just mentioned – allow only one correct variant. Secondly, it is paramount to note that the variants that do exist are not allographs since they are not inherent to the system but, at least in the case of German, determined externally through rules officiated by an authority of linguistic policy. From a sociolinguistic perspective, the alternation between them is still interesting as users' different choices within the orthographic norm are also indexical.[36] Also, whereas the example mentioned concerns orthographic variants within one writing system, there also exist variants that are (socio-politically) relevant across different systems: examples include the existence of <ß> vs. the use of <ss> in different written varieties of German or different variants of Chinese graphemes in Chinese vs. the writing systems that have at one point in history borrowed them (including Japanese and Korean).[37] This cross-linguistic variation concerns – especially historically – also the graphetic and graphematic modules.

4.3.3. Graphotactics: combinatorial and spatial restrictions

Now that we have addressed the basic units of writing as well as the variants that substantiate them, what is lacking is the regularities of how they may combine to form larger units. This is important, given that writing is a highly compositional system: we write to convey linguistic meaning, and we achieve this by means of larger units such as written words, sentences, and texts, not single graphemes. Thus, in a description of writing systems driven by a usage-based perspective, the suprasegmental (or polysegmental, cf.

[36] For example, the 'older' variant <Typographie> may carry connotations of old-fashionedness or traditionality whereas the more recently codified variant <Typografie> is regarded as more modern. These connotations, of course, may extend from the variants to the writers who use them.

[37] This question includes but is by no means reduced to the existence of traditional vs. simplified forms of the characters, the latter of which are the result of reforms aiming at character simplification (mainly through the reduction of strokes).

Meletis 2020a: 129) level is clearly primary.[38] As was the case for allography, for graphotactics, too, we find analogues in phonology and morphology, specifically *phonotactics* and *morphotactics*, which at their core also represent combinatorial restrictions. What is of little interest for a grapholinguistic description is how phonotactic or morphotactic restrictions are represented in writing: for instance, the fact that in alphabets, consonant clusters that are impermissible in the phonology of the underlying language are not found in writing is a trivial observation. Genuine graphotactic restraints, on the other hand, are those for which we do not find explanations in phonology, morphology, or other linguistic subsystems. Examples include the famous *three-letter rule* in English: the rule that content words such as <bee> or <buy> must consist of a minimum of three letters to distinguish them from function words such as <be> or <by> is a restriction that is idiosyncratically graphotactic (cf. Albrow 1972, McCawley 1994). Genuine graphotactic restrictions or regularities were already mentioned above in the context of emergent literacy research and the features of writing that children pick up on before they have consciously grasped that (or how) writing is related to language.

As was mentioned, graphotactics is a set of combinatorial restrictions. Since writing extends in space (see above), these are also of spatial nature. This means that they concern not only the combination of different graphetic and graphematic elements (including grapheme(ma)tic subcomponents, segmental graphemes, but also larger units such as graphematic words), i.e., their relation and their arrangement with respect to each other, but also their position and arrangement in space in general.[39] In other words, graphotactic restraints include those that prescribe how the written surface is occupied by written material (cf. Bredel 2008, 2011 for a graphotactic model proposed for the analysis of German punctuation).[40] To return to an example that was mentioned above: the list mode, aside from the optional presence of various kinds of bullet points or numbers (in unnumbered vs. numbered lists), is constituted by the fact that list items do not extend over the entire line (whether that line is horizontal or vertical, which depends on the writing direction of the system in question) (cf. Reißig 2015); this distinguishes it from the text mode in which lines are usually (almost) fully filled by written material.

Further examples of features of writing systems in which graphotactic restrictions take center stage include the secondary vowel graphemes in abugidic systems: in Thai, for example, many of the vowel graphemes are smaller in size than consonant graphemes. This reflects that they are formally and functionally dependent on the consonant graphemes, which they spatially orbit on all four sides (top, bottom, left, right). The position of a given vowel grapheme is fixed, and some of them (including <ɯ-> /ɛː/ and

[38] In German grapholinguistics, several scholars – among them Christian Stetter – interpret the word level to be primary, and correspondences between spoken words and written words to be central. For them, correspondences at the segmental level (prominently grapheme-phoneme correspondences) are thus of secondary or even epiphenomenal nature (cf. Schmidt 2018).

[39] The phenomenon of graphotactics shows that a division into what is graphetic vs. graphematic is not always useful – or even feasible (but cf. Meletis 2020a: 131–133).

[40] Following Klinkenberg/Polis (2018), this can also be called the *toposyntax* of writing.

<เ-> /aj/) are positioned before a consonant grapheme (i.e., to its left given the left-to-right direction of writing Thai) even if in the phonological equivalent, the corresponding vowels follow the consonants. In other words, some /CV/ sequences are written as <VC>; Winskel (2009) calls the vowels that behave this way *misaligned vowels*. Interestingly, the term 'misaligned' is a clear evaluation resulting from the expected ideal that writing must correspond neatly – and linearly – with what it represents, in this case sounds. What these vowels do show instead is the existence of independent graphotactic constraints.

Depending on the system in question, graphotactic constraints can be of varying complexity: examples that shall only be mentioned here include the writing systems of Aztec and Mayan, where the two dimensions of the writing surface are exploited – or space is 'framed' (cf. Perri in this volume) – in various ways, producing areal phenomena of various kinds and posing challenges both for a structural analysis and – although this cannot be proven – for processing, i.e., how writers and readers dealt with these systems' peculiarities when using them. Another – if unique – example is Ogham script, where the third dimension must be taken into consideration (cf. Forsyth in this volume). The remaining papers in this volume certainly reflect the breadth of graphotactic constraints in historical writing systems.

5.0. Conclusion and outlook

In the description of the conference on which this edited volume is based, it is stated that historical graphemics

> promotes research on the general structures of documented scripts and writing systems, both synchronically and diachronically. Thus it explores changes in the language systems and their graphemic responses and consequences within individual writing systems, scripts and orthographies. As a multidisciplinary research field, Historical Graphemics bridges a gap between philology, language history, epigraphy, palaeography, semiotics and other disciplines. Historical Graphemics is a research field in the making; most importantly it constitutes an interface between the above fields and has been gaining in profile […].

As this paper aimed to show, all of this pertains also to grapholinguistics as an emerging interdisciplinary field studying all aspects of writing. However, as it sprung from the German tradition of *Schriftlinguistik*, which focused predominantly on the modern German writing system, the study of historical writing systems including its specific conditions and requirements has arguably not been fully integrated into the research field of grapholinguistics – yet. As argued in the previous sections, this situation should be – and certainly can be – rectified. The next step in this direction is to test how the models and concepts established in a synchronically-oriented grapholinguistics can be extended to account for historical writing systems. This was in part attempted in Section 4, whose preliminary findings point both to the general fruitfulness of comparative concepts such

as *allography,* but also to the challenges presented by the need to account not only for typological, but also for historical breadth.

To illustrate just one example, historical writing systems introduce a slate of additional challenges for the proposed grapheme concept. The most pressing of them is determination (cf. Handel 2019): in the context of adoptions or adaptations of writing systems for languages different than the ones they were initially devised for (e.g., Akkadian borrowing cuneiform from Sumerian, Japanese adopting Chinese characters) and the concomitant transitions from morphography to phonography, determinatives assumed a central role. Given that they are commonly 'mute', i.e., do not have a linguistic correspondence inclusive of a phonological representation the same way that phonographic or morphographic graphemes do, can determinatives even be conceived of as graphemes? If not, how do they fit into a graphematic analysis of the writing systems in question (e.g., cuneiform, Egyptian, Mayan)? In this context, not only must the linguistic value criterion be reevaluated, but the possible existence of *zero graphemes* (by analogy with zero morphemes) must be discussed (cf. Meletis 2023). Also, to account for the function determinatives assume in conjunction with the graphemes they accompany (cf. Tranter 2013), what was initially conceived of as a segmental graphematic analysis – i.e., one focused on the individual written segment – may be extended to a suprasegmental analysis (in the vein of the suprasegmental paradigm in German grapholinguistics, cf. Berg/Primus/Wagner 2016).

While the descriptive concepts presented in this paper are rooted in structuralism, they are theory-neutral and thus versatile as for their use and application across paradigms and disciplines. Going forward, continuing to establish and then gradually refine a broad theoretical framework inclusive of all writing systems is certainly at the core of a study of writing – whatever one may call it. We hereby invite scholars interested in writing from all fields to use the concepts we proposed and refine them if needed. Arguably, only cross-disciplinary and, in particular, cross-philological exchange can eventually lead to an accurate descriptive framework for writing similar to the one linguistics has arrived at for language (cf. Meletis 2021).

To conclude, it is important to note that grapholinguistics is interested not only in the structural description of writing, but also in how it is actually used as well as in how it features in public discourse. As our brief discussion of the lively discourses surrounding handwriting highlighted (Section 3), people are highly invested in the graphic modality of language and its cognitive and communicative affordances. While more challenging to capture, literacy practices in historical writing systems are also studied and reconstructed not only for their structural, but also their cultural and cognitive implications. Indeed, it can be argued that it is the diachronic changes in how humans wrote and read and communicated through writing that drove the change and development of (the structure of) writing systems and the evolution of literacy practices. Thus, usage-based perspectives from, among others, psycholinguistics and sociolinguistics will be central in complementing the synchronic and diachronic structural description of writing with actual explanations; in other words, in investigating not only the question of how writing systems

are structured and what they have in common but *why* this is the case (see Meletis 2020a: Part III). This can then – as is also stated in the conference description – "deepen our understanding of script typology and historico-cultural dimensions" – and arguably of writing in general.

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List of figures

Figure 1: Left: Script typeface 'Respondent' designed by Måns Grebäck. Right: Hand lettering that resembles the typeface used in the corporate design of pastry shop 'Peti Pari' in Vienna, Austria (from Meletis/Dürscheid 2022: 77)
Figure 2: Multimodular model of writing systems (modified from Meletis 2020a: 22)
Figure 3: Types of allography (cf. Meletis 2020b; figure adapted from Reinken 2023: 31)