

## Grapholinguistics, T<sub>E</sub>X, and a June 2020 conference

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### Abstract

This paper presents the conference *Grapholinguistics in the 21st Century* that was to take place in Paris, in June 2020. With the global health situation, it will now be held as a video conference (<https://grafematik2020.sciencesconf.org>). We give an introduction to the discipline of grapholinguistics, the history and the topics of the conference, and we close with the fundamental question: why should a T<sub>E</sub>X user join the conference?

### 1 What is Grapholinguistics?

*Grapholinguistics* is the discipline dealing with the study of the written modality of language.

At this point, the reader may ask some very pertinent questions: “Why have I never heard of grapholinguistics?” “If this is a subfield of linguistics, like psycholinguistics or sociolinguistics, why isn’t it taught in Universities?” “And why libraries do not abound of books about it?” To answer these questions we have to go back to the period 1906–1911, when the Swiss linguist Ferdinand de Saussure was lecturing in room B105 of the University of Geneva. His lectures set the foundations of modern linguistics. They were published posthumously in 1916, as the notorious *Cours de linguistique générale* (translated as *Course in General Linguistics*, or *CLG* for the initiated [33]).

In his work, Saussure violently attacked writing:

Language and writing are two distinct systems of signs; the second exists for the sole purpose of representing the first. The linguistic object is not both the written and the spoken forms of words; the spoken forms alone constitute the object. But the spoken word is so intimately bound to its written image that the latter manages to usurp the main role. [...] The preceding discussion boils down to this: writing obscures language; it is not a guise for language but a disguise. [33, p. 23–24, 30]

For him, language is oral, period. Writing is just an accidental secondary representation of language, one that betrays it and hides its true nature. His arguments were that (a) all human cultures have spoken languages, while only a small number of them write, (b) writing appeared much later than speech in

human history. These are historical facts, but chronological precedence is less important than the undeniable fact that writing was the spark that ignited culture and technology as we currently experience it.

Saussure being the founder of modern linguistics, his ideas were followed by generations of allegiant linguists. In every current Linguistics textbook the two lowest-level subdisciplines of this science are Phonetics and Phonology. Phonetics studies all sounds humans can produce in order to communicate (these sounds are called *phones*), and phonology studies systems of distinct equivalence classes of sounds used by languages (these equivalence classes are called *phonemes*).

The next level after phonology is morphology, the study of minimal units of meaning (called *morphemes*), such as [table] and [s] in the word “tables” (the morpheme [s] being the suffix of plural number). No linguist ever bothered to ask “are spoken and written morphemes different?” This would be heretical behavior: according to Saussure, morphemes are built out of phonemes, the only “true” building blocks of language, and writing them on paper is only a convention, a necessary evil, a curse in our civilization that would be in better health if it stopped using writing in the first place (as in Bradbury’s *Fahrenheit 451*).

Thus, linguists have inherited Saussure’s disdain of the written word and this resulted in an ideology that French linguist Jacques Anis [2] calls *phonocentrism*. Phonocentrism argues, among other things, that the ideal writing system would be a phonetic one: /ðə m'ɔ:ɪ ðə ɪ'tʃtɪn,ɪp,ɪzɛnterfən əv l'æŋɡwɪdʒ ɪz kl'ɔʊs tə ðə sp'ɔʊkən w'ʌn ðə b'ɛrə ænd m'ɔ:ɪ ɪf'ɪjənt ɪt 'ɪz/.<sup>1</sup> Once this argument is taken for granted, the next step is very naturally the simplification of writing systems: why bother with complex correspondences between graphemes (the elementary units of writing) and phonemes? Why not write a language as it is pronounced? For example, to pronounce Japanese you need only 32 phonemes (27 consonants and 5 vowels), why then learn tens of thousands of kanji characters?

The road to hell is paved with good intentions, and phonocentrism has caused a lot of misery, such as the 1982 monotonic reform in Greece, where accents and breathings were abandoned because, according to phonocentric dogma, they were inactive on the phonemic level [16]. In China and Japan there are regular initiatives to abandon the sinographic writing system; fortunately, none of them have been taken

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<sup>1</sup> = the more the written representation of language is close to the spoken one, the better and more efficient it is.

seriously [18]. There is even a Simplified Spelling Society (founded in 1908, in London), that publishes a journal. Even if most linguists today do not necessarily share Saussure’s scornful position vis-à-vis writing, he did succeed in moving writing outside the scope of scientific study for more than half a century.

Linguists in France, Germany, Japan, started to escape the phonocentric ideology only as late as the 1980s [2, 8, 10, 12]. Using again Anis’s terminology [2], some linguists have adopted the “autonomistic” principle, that states that writing is as important as speech, and that we can study the former without necessarily referring to the latter; others have adopted a less radical position, called “phonographism”, which states that writing is important but to study it we necessarily need to consider its interaction with speech.

The difference between the two approaches becomes clear when we look at the way these two currents define the minimal unit of the writing system, called *grapheme*. For autonomists, a grapheme is defined analogously to phonemes: we start by considering drawings created for communication purposes, called *graphs* [24], and then we build equivalence classes of graphs needed to build a system for a specific language, and we call them *graphemes*. For phonographists [5], *graphemes* are defined as merely written representations of phonemes or of morphemes; in the French word *chats*, pronounced /ʃa/, ⟨ch⟩ is a grapheme since it represents the phoneme /ʃ/ and ⟨s⟩ is a grapheme since it represents the (mute) morpheme [s] of plural number.

In analogy to phonology the new discipline that studies writing from a systemic point of view should be called “graphology”, but unfortunately that name was already taken by a pseudo-science. Many names have been proposed (“graphemics”, “graphematics”, “grammatology”, “graphonomics”, etc.). In this paper we will keep the name “graphemics” for the discipline that stands at the same level as “phonology”, and “graphetics” [24] for the discipline that stands at the same level as “phonetics”.

The discipline of grapholinguistics goes a step further: it aims to study aspects of language that are particular to its written representation, at all levels of linguistics, starting with graphetics, graphemics, and continuing with morphology, syntax, semantics,

## 2 The conference *Grapholinguistics in the 21st Century*

### 2.1 The 2018 conference and proceedings

In August 2016 the author began to contact researchers in the domain of grapholinguistics, advancing the idea of a conference in the field, and more

specifically a conference that would be interdisciplinary and bring together people from linguistics, computer science, typography and other areas. Their reactions were immediately very positive and encouraging. There was consensus in favor of such an event.

The 2018 conference took place in Brest, from June 14 to June 15. It lasted only two days, but these days were very intense: the keynote speakers were Florian Coulmas (*The Best Writing System of the World*, a provocative title for a very insightful talk [9]) and Christa Dürscheid (*Image, Writing, Unicode*, a talk involving emojis and Unicode as the guardian of the future of writing [11]). Both Florian and Christa are leading researchers in the field, and they both have written seminal books ([8] and [10]). Besides the keynote talks, we had 20 regular talks, from scientists and scholars coming from all around the world (Europe,<sup>2</sup> the US, India, Japan, China).

All talks were recorded. The interested reader can find the recordings on YouTube via the conference Web site.<sup>3</sup>

After the conference the author was in search for a publisher for the proceedings. This turned out to be a nightmare: one notorious scientific publisher would accept and publish only the technical papers; another famous publisher specializing in linguistics considered the topic of graphemics to be unworthy of his publication goals; then there was a third notorious publisher who accepted immediately but asked a ridiculously high amount of money to “cover the editorial fees”. Others would publish a book with chapters but not proceedings. . . It became clear that the only way of publishing decently the proceedings of a conference in such a topic would be to build one’s own infrastructure.

And this is what has been done. The author’s wife Tereza founded a publishing house, called *Fluxus Editions* and based in Brest. During the spring of 2019, conference participants expanded their talks into research papers and the proceedings were published in November 2019, as the first volume of the *Grapholinguistics and Its Applications* Series (ISSN 2534–5192).

The cover of the book displays a beautiful and enormous work of calligraphy by the Japanese artist Yuichi Inoue, discovered in the summer of 2019 in a beautiful museum in the Japanese town Niigata. To best appreciate this kind of calligraphy, the reader is encouraged to watch the YouTube video <https://www.youtube.com/watch?v=...>

<sup>2</sup> We do not mention the UK separately because at that time it was still part of Europe, but yes, there were attendees from the UK.

<sup>3</sup> <http://conferences.telecom-bretagne.eu/grafematik/>



Figure 1: The cover of the 2018 Proceedings

[//www.youtube.com/watch?v=Fnhg5hKp4WY](https://www.youtube.com/watch?v=Fnhg5hKp4WY) where e<sup>4</sup> will realize the effort and suffering it takes to move a brush probably weighing over 20 kg in order to paint a 1.5 meter tall Chinese character. That calligraphy was chosen for the cover of the book because it is an artifact at the limits of writing, big, sublimely clumsy, hard to decipher, deeply human.

The book is published in OpenEdition mode, i.e., the PDF of the book is freely available on the publisher's Web site<sup>5</sup> and paper copies of the book can be bought on Amazon, printed on demand. Other books will follow, such as an important manifesto of grapholinguistics by Dimitrios Meletis (*The Nature of Writing: A Theory of Grapholinguistics*, [25]) and a major classic of the field: Gérard Blanchard's *Sémiologie de la typographie* [4]. Incidentally, both of these books started as PhD theses: the latter as a 1980 thesis at the Sorbonne in 1980, with Roland Barthes (and others) as advisor(s), and the former as

<sup>4</sup> We use Spivak gender-neutral pronouns: e = he/she, eir = his/her, cf. [https://en.wikipedia.org/wiki/Spivak\\_pronoun](https://en.wikipedia.org/wiki/Spivak_pronoun).

<sup>5</sup> <http://www.fluxus-editions.fr/>

2019 thesis at the University of Graz, with Christa Dürscheid (and Bernhard Hurch).

## 2.2 The 2020 Conference

The 2018 conference being a success, except perhaps from a geographical point of view (Brest is 600 km away from Paris), it was originally decided to organize the next edition of the conference in Paris, but now via video due to the global health situation, from June 17 to June 19. It seems that this was a wise decision because at the moment this text is written, more than thrice as many submissions have been received than for Brest in 2018.

To give the reader a better idea of what the conference is about, here is an annotated list of topics:

### 2.2.1 Epistemology of grapholinguistics: history, onomastics, topics, interaction with other disciplines

What should we call this discipline? (As strange as it may seem, the issue of naming the discipline is a hot one, as can be seen by the following anecdote: a very famous grapholinguist emphatically left the program committee of the 2018 conference because the program committee was not inclined to use a different term than “graphemetics”, as e suggested. . .) How is grapholinguistics located vs. other disciplines? Meletis [24, p. 12] notes that in contrast to phonology, phonetics is often considered as being a natural science—should we consider that graphetics is a natural science as well?

### 2.2.2 Foundations of grapholinguistics, graphemetics and graphetics

The first works on the foundations of grapholinguistics appeared in the eighties ([2] in France, [21] in Germany). This makes grapholinguistics a young discipline and there is still a lot to explore even on the foundational level.

### 2.2.3 History and typology of writing systems, comparative graphemetics/graphetics

Exploring writing systems gives one an Indiana-Jones-like feeling; they can be as exotic as the Rongorongo script of Easter Island, and as common and universal as the Latin script and its ramifications; it is always a thrill to gain insight and to compare. Not to mention marginal cases: what about sign writing? (We all agree sign language is a language, but what about writing it down? [13].) Or air writing of kanji characters? (“Air writing” is making a spontaneous

abstract gesture with the fingers to describe a kanji character [37].)

### 2.2.4 Semiotics of writing and of writing systems

How is meaning produced through writing? What are the main ways, and what are the alternatives of meaning production through this activity? As an example, the very interesting study [36] mentions a French flag with a circumflex accent in the middle. If you wonder what that is, it is actually two things: first transforming the circumflex accent as a symbol of the loss of values (after a spelling reform in 2016) and second using it as a graphical reminder of Petain's flag of Vichy (remember the Vichy water bottle Rick throws away after having killed Major Strasser in *Casablanca?*). The circumflex accent becomes an instrument of French nationalist propaganda.

### 2.2.5 Computational/formal graphemics/graphetics

Starting with Montague [26] and Chomsky [6, 7] in the late fifties and sixties, there have been many approaches to model language through mathematical structures. A first step in the formalization of graphemics in similar ways has been undertaken in 2001 by Richard Sproat [35]. This is a topic where much remains to be done.

### 2.2.6 Grapholinguistic theory of Unicode encoding

Whenever writing becomes digital, Unicode is involved. Browsing the Unicode charts one may have the impression that everything has been taken care of, and that one has the luxury of being able to write in any script of the world, whether current or extinct. But with great power comes great responsibility, and Unicode has made choices that will definitely affect writing systems for centuries to come. Therefore Unicode has to be studied as an agent in the grapholinguistics arena (e.g., [17]).

### 2.2.7 Orthographic reforms, theory and practice

Orthographic reforms are in the core of grapholinguistics since they change the way language is written (supposedly leaving oral language untouched but this ends up not being true<sup>6</sup>). Insisting on the fact that some spelling reforms (like the Greek monotonomic reform [16]) have been disasters is pointless.

<sup>6</sup> Moschonas in [27, p. 265] argues that the current tendency of pronouncing  $\nu\tau$  as /d/ rather than as /nt/, in the Greek language, may come partly from the fact that according to reformed hyphenation rules, this digraph is not broken.

But the story of how some populations managed to resist a reform and to return to the previous state of a writing system (cf. [22] for Malayalam) can be empowering. Studying the impact of a reform can prevent errors in future reforms.

### 2.2.8 Writing and art / Writing in art

Everybody knows Magritte's "Ceci n'est pas une pipe", a sentence written inside his painting "La Trahison des images" [the betrayal of images], underneath the image of a pipe. Writing inside painting is not new: Byzantine icons have done it for centuries. But writing also appears in comics, in movies, in sculpture (like the man-made-of-letters sculptures by the Catalan artist Jaume Plensa). And there is the use of typography in literature, as in the Dada or De Stijl movements, in Mallarmé's "Un coup de dès", Apollinaire's "Calligrammes" and in many other works. An endless source of knowledge and excitement.

### 2.2.9 Sinographemics

All about the Chinese script and its extended family: Japanese kanji, Korean hancha, Vietnamese chũ nônm and chũ hán. Sinographemics is an important topic of the conference because there is so much to say about the nature, structure and usage of Chinese characters, a script used by 1.3 billion people.

### 2.2.10 Typographemics, typographetics

The study of the printed representation of language. Typography is only half a millennium old, but it is in part responsible for the fabulous technological and social advances of this period. Typography has developed its own codes and, before creating  $\text{\TeX}$  and  $\text{\METAFONT}$ , Donald E. Knuth has studied typographe[mt]ics in depth [19, 20]. As a subdiscipline of graphe[mt]ics, typographe[mt]ics becomes a subdiscipline of linguistics: the creative power of typography, scrutinized with scientific methods.

### 2.2.11 Texting, latinization, new forms of written language

Technology always carries the cultural signature of its creator(s). Computer science has evolved in Latin-alphabet-language countries, programming languages use it, and hence the Latin alphabet has become a trademark of modernity (and some will say, globalization). No wonder that people (and especially young people) using modern technologies, modern communication media, social networks, etc., have a tendency to use the Latin alphabet to express their vision of the world, even though their native language uses some other script. This behavior is interesting

per se and raises the question of what will happen in the future.

### 2.2.12 ASCII art, emoticons and other pictorial uses of graphemes

Long before ASCII art, writing was used pictorially; see, for example, the wonderful anthology of type-writer art, by Barrie Tullett [38]. But there is also the opposite trend: instead of combining graphemes to form shapes (and graphical meaning), one can create new graphemes that encompass pictorial meaning; that is the case of emoticons and emojis. Are they graphemes? They sure are Unicode characters, and their emergence was very beneficial to the Unicode Consortium since they made it known to the masses.

### 2.2.13 The future of writing, of writing systems and styles

Futurology is a very exciting field because in the last decades its predictions have repeatedly been proven wrong. Will the future will be bright like in the movie *Bicentennial Man*, or post-apocalyptic like in *Mad Max*? And what about writing? Will our descendants, in a century or so, use only emojis, like Xu Bing in his book [3]? Or will Unicode make ours the best possible world, where every minority will safely preserve and nourish its own language and writing system, while English and the Latin alphabet become the de facto communication tool?

### 2.2.14 Graphemics/graphetics of science fiction and astrolinguistics

How did science-fiction authors imagine alien communication, or human communication in the future? What about signals from extraterrestrials, as in the movie *Contact*? Science fiction is just fiction, but there is a scientific discipline, namely *astrolinguistics*,<sup>7</sup> that takes the issue seriously: the reader can consult the book [29], which describes a logical approach to communication with other living entities. After all, we had better be ready before they arrive.

### 2.2.15 Graphemics/graphetics and font technologies

We now enter into more technical issues. Font technologies have always interested T<sub>E</sub>X users, since T<sub>E</sub>X has survived them all: GF, PK, PFB, TTF, OTF, . . . (see [14] for more).<sup>8</sup> Fonts are bridges between char-

acters and glyphs, between graphemes and graphs. They deserve a careful grapholinguistic study.

### 2.2.16 Graphemics/graphetics in steganography and computer security

Steganography is a cryptographic method whereby the very existence of a hidden message in a text is hidden: the goal is to transmit the message “under the nose” of a third person. Graphetic methods have been used for this, for example by adding supplementary line segments between connected letters in Arabic text, by moving around dots [34] or by varying keshideh widths [1], etc. Phishing can occur on the Unicode level, when homographic characters are used (characters with identical glyphs, such as Cyrillic ⟨a⟩ or Greek ⟨o⟩).

### 2.2.17 Graphemics/graphetics in experimental psychology and cognitive sciences

You probably have heard of dyslexia — there are special fonts for people suffering from it. How are they created, evaluated, used? [32] More generally, what can reading/writing and its deficiencies teach us about the way our brain works? [23] Can you imagine the pathology where a patient can draw Chinese characters without problem, but is unable to read them once written? And besides pathologies, there are many question about education: how should reading/writing be taught? Syllable-wise or letter-wise? Does the Joyo Kanji progression of kanji characters taught in school make sense? [31] And how does it affect the knowledge of Japanese language by the hundreds of millions of Japanese people who learned it that way?

### 2.2.18 Grapholinguistic applications in natural language processing and text mining

Last but not least comes computer science and the way it processes language. Until now, Natural Language Processing has paid very little attention to graphemes. It considers that data have an atomic level, namely the (Unicode) character. Glyphs do not matter, neither do styles (bold, italic, underline) or font sizes. This attitude will not last: texts are written by humans and artificial intelligence aspires to extract as much information as possible from them. Humans use glyphs and styles and font sizes. A text

and even though we use modern font technologies we aspire to more, and METAFONT is definitely more, an ideal still to be reached.

<sup>7</sup> Not to be confused with *astroarcheology*, which is another pseudo-science. A fascinating one, but nevertheless not obeying scientific rules.

<sup>8</sup> But we shouldn’t forget that a lion needs a lioness, and that the Great Master created T<sub>E</sub>X to work in a binary system: T<sub>E</sub>X and METAFONT. The lioness’s genes flow in our blood

written in Comic Sans does not carry the same information as a text written in Monotype Ehrhardt. Sooner or later NLP will acknowledge this fact, and the conference may help to make this happen.

### 3 What has Grapholinguistics to do with T<sub>E</sub>X?

In his infinite creativity and productivity, Donald E. Knuth has not created, in T<sub>E</sub>X, simply a program for typesetting. He modeled the whole process of written document production. In grapholinguistic terms, he modeled graphs and graphemes (called “glyphs” and “characters” in T<sub>E</sub>X jargon), one-dimensional graphemic sequences (called “character strings” or “glyph strings”) which he placed into abstract recipients called “hboxes”, and two-dimensional graphemic sequences (“vboxes”). He also modeled grapholinguistic processes such as kerning, hyphenation, line breaking, page breaking, and so on.

Thus, besides being a programming language and a program, T<sub>E</sub>X is also an abstract model of the graphemic level of language. It is no wonder that the community of T<sub>E</sub>X aficionados has contributed much to the study of written language, even if the terminology used was not the one of grapholinguistics as it has emerged in the last thirty years.

Adapting T<sub>E</sub>X to various languages and writing systems has led to grapholinguistic studies of these languages and writing systems. As a simple example: the fact that ligatures between components of German words have to be broken (as in “Auflage”) has been known in the T<sub>E</sub>X community at least since the 1980s [30] (and maybe even earlier). In grapholinguistic lingo, this becomes a principle: “ligatures are an intergraphemic but intramorphemic phenomenon” [17]. It should come as no surprise that grapholinguistic studies such as [28] cite T<sub>E</sub>X-related publications (such as the French *Cahiers GUTenberg*) among their references.

T<sub>E</sub>X is at the forefront of studies on the written language, and some day its contribution to the emerging discipline of grapholinguistics will be duly examined and acknowledged.

### 4 Why should T<sub>E</sub>X users attend the *Grapholinguistics in the 21st Century* conference?

T<sub>E</sub>X conferences are great places to meet people and exchange information. They are unforgettable events attracting pilgrims from all over the world. T<sub>E</sub>X conferences have a great advantage which is also their disadvantage: they deal mainly with T<sub>E</sub>X, its descendants and its applications. Linguists, historians, psychologists, educators, artists will occasionally

visit T<sub>E</sub>X conferences, but mostly because they are themselves T<sub>E</sub>X users or developers. The *Grapholinguistics in the 21st Century* conference has a goal that goes beyond T<sub>E</sub>X meetings, namely to attract scientists and practitioners from various horizons, to discuss writing.

Of course, *Grapholinguistics in the 21st Century* also gathers people we are used to seeing in T<sub>E</sub>X meetings: typographers, font designers, Unicode aficionados. All in all, this conference aims to use grapholinguistics as the common ground for all kinds of people interested in the written word to exchange ideas. It is an interdisciplinary conference (and this is both a gift and a curse, as Mr. Monk would say) based on the principle that somebody interested in writing will be interested in writing in their own domain but also in other domains, and therefore will be interested in meeting people dealing with writing in different ways. How many places on Earth are there where an historian of writing will meet a font designer, a linguist specializing in punctuation will meet a psychologist studying second-language learning in a different writing system, or an artist having invented a writing system and engraved it on the roof of the library of the Sidgwick campus of the University of Cambridge? None, in fact.

And speaking of places on Earth, the *Grapholinguistics in the 21st Century* goes a step farther and also considers writing outside our good old planet: Jessica Coon, one of the three keynote speakers of the conference, has been the linguistic advisor of the well-known science-fiction blockbuster *Arrival* by Denis Villeneuve, a \$47M budget and \$203M box office movie that was the first one in history to have a linguist in the leading role. This is a nice revenge on Saussure since the movie shows aliens communicating with humans through a dynamic writing system. (Aliens are heptapods throwing ink to a glass barrier between their liquid environment and a human-friendly environment, ink forms moving patterns that are analyzed by the linguist — the exceptional Amy Adams — who manages to communicate with them.) Unlike SF movies of the sixties where the whole universe is unsurprisingly speaking English, here a sophisticated writing system is used by aliens and we witness Amy Adams’ efforts to decipher it. Jessica Coon is the (real-world) linguist who made this movie scientifically sound, and she will share her thoughts about *The Linguistics of Arrival: What an alien writing system can teach us about human language* with us.

Therefore the answer to the question “Why should T<sub>E</sub>X users attend the *Grapholinguistics in the 21st Century* conference?” is simply: “for the fun

of it”. Because T<sub>E</sub>X users<sup>9</sup> share an intimate love and care for the written word, and the conference will gather exactly this kind of people, now from all horizons.

Obviously, love and care for the written word is not restricted to T<sub>E</sub>X users. Therefore, oh gentle reader of this text, whether a T<sub>E</sub>X user or not, join us!

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<sup>9</sup> See [15] for a description of the way T<sub>E</sub>X acts on people using it.

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