The piecemeal evolution of writing

Olivier Morin

Accepted in Lingue e Linguaggio (last submitted version)

Max Planck Institute for Geoanthropology
10, Kahlaische strasse, 07745 Jena, Germany.
Institut Jean Nicod, CNRS, ENS, PSL University
29, rue d'Ulm, 75005 Paris, France.
morin@shh.mpg.de
ORCID: 0000-0002-6216-1307

Abstract. This paper argues that writing evolved gradually and in piecemeal fashion. Literacy as we know and use it is made up of at least three distinct features: it is a glottography (a notation of language), it is a generalist code that can note down anything we can say, and it is a form of asynchronous communication—a way of conveying information to other people across space and across time. This combination of features is uniquely powerful; but this does not mean the three features evolved together, or for the same reasons. Glottography, generality, and asynchronous use evolved out of pace with one another. Two huge lags separate, first, the invention of glottography from its generalisation beyond proper names, second, the existence of writing as a generalist tool from the routinisation of its asynchronous use. At each step the inventors of writing responded to distinct and specific pressures. The originators of glottography were not necessarily aware of their invention's potential beyond the notation of proper names. Those who developed writing into a generalist tool, capable of encoding anything that can be said, were unlikely to anticipate that the code they were using as an accompaniment to oral recitations, or as a reminder of the transactions they took part in, would come to be used in a quite different way—to store information for the benefit of distant recipients to whom the information would be new.

Keywords: Literacy; Cultural evolution; Proper names; Asynchronous communication; Archives.

1. Did writing evolve?[1]

[1] I thank Silvia Ferrara and Fabio Tamburini for initiating this special issue. The work leading to this paper has received funding from the "Frontiers in Cognition" EUR grant, ANR-17-EURE-0017 EUR, and from the Max Planck Society.

Did writing evolve? The question may seem trite, or empty. Of course, writing had forerunners. It did not appear overnight. But if we ask how gradually the notation of language emerged from the graphic symbols that preceded it, we may not always get a straightforward answer. One of the most authoritative books on the origins of writing (Houston 2004) provides two opposite answers from two different authors. Stephen Houston (Houston 2004: 5–6) claims that the evolution of writing was abrupt by archaeological standards, occurring over one generation at the longest. Houston is hardly alone in making this claim, echoed by other important work on the subject (DeFrancis 1989: 74). But Houston's book also hosted Bruce Trigger's contribution, which pushed the claim that writing acquired only gradually the capacity to encode language (Trigger 2004). The nearly twenty years that have elapsed since this work do not seem to have quite dispelled the ambiguity.

The community has several reasons to be wary of an evolutionary view of writing—some of them good, some bad. One of the good reasons is the rejection of the evolutionism that pervaded early work on writing such as Diringer (1953) or Gelb (1963). Evolutionism, as these authors defended it, was a linear scale of progress guiding civilisation from pictographic communication to hieroglyphs and on to the pinnacle of alphabetic literacy. This kind of evolutionism is closer to Spencer than to Darwin; it has been rightly criticised for arbitrarily valuing some ways of writing above others, and for overstating how continuous and one-directional cultural change could be.

A second argument could be that one cannot half-invent writing. Writing is usually defined as a glottography[2], that is to say, a notation of language, or a code that links its letters to the sounds of the language that it encodes. Ideographic or pictographic systems, which represent ideas or things directly, bypassing words, are not counted as writing proper (see Morin 2022 for a review of this idea). If we take this view, then the discovery of writing coincides with the discovery of the glottographic principle: the idea that one can inscribe anything that one may say, just by noting down the sounds of language. Once the glottographic principle is invented, it offers the possibility to encode a broad range of content with graphic symbols. From the moment people realised that pictures could convey sounds, using either acrophony or the rebus principle, they became virtually capable of applying the glottographic principle to any verbal message, even if they did not use this capacity.

This argument leaves out two important aspects of writing. These aspects are not implied by a strict definition of writing understood as the glottographic principle; this makes them no less difficult to ignore.

The first property is generality. Glottographic writing, as we use it today, is used pervasively and for a broad range of purposes. There are things that writing systems cannot easily encode, for which other graphic codes are preferred—emojis, musical notations, airport signs, etc. But

[2] In this paper I will use the adjective "glottographic" and "phonetic" interchangeably. In doing this I am glossing over a subtle distinction between glottography—the notation of language—and phoneticism—the notation of sound. I elaborate on this distinction elsewhere (Morin 2022), but for the purposes of the present argument, it may be left aside without much damage.

in literate societies today, the vast majority of graphic communication (that is to say, the use of permanent marks to encode information) involves glottographic writing. Still, glottographic writing was not always generalist in that sense. Yes, it can be argued that glottographic writing always had potential for generalist use—that glottography is a general-purpose graphic code *in nuce*. Yet this potential can remain untapped. Section 2 will review evidence that glottographic writing remained, for centuries after its invention, almost exclusively a tool for transcribing proper names. I will briefly speculate on the reasons for the link between glottography and proper names encoding, arguing that the received explanation for this link is deficient.

The second property is asynchronicity: the capacity to use a written message to convey a novel piece of information across time or space, to someone who does not already know it. Uses of writing that lack asynchronicity include mnemonic uses, where writing acts as a memory prop to help someone remember information they have already partly memorised. Also lacking asynchrony are messages that do not make sense without an oral gloss provided by an interpreter already acquainted with their meaning. Section 3 will review the evidence showing that purely asynchronous communication is a late and relatively rare development in the history of glottographic writing. Direct evidence consists in texts explicitly describing literacy as used chiefly for recitational purposes. Indirect evidence can be gathered from studying two conditions that have to obtain for writing to make asynchronous communication possible. Asynchronous communication requires texts that are self-contained (readily understandable out of context), as well as easy to consult and retrieve. I will argue that ancient texts were generally difficult to process asynchronously. Their content was not explicit enough; their storage and archiving were haphazard.

Together, these claims sketch a picture of writing's evolution where the key features of literacy evolved out of synch with one another. Glottography comes first, but for centuries the possibility to organise a generalist communication tool around it remains neglected. The use of writing for asynchronous communication was even longer in becoming routine.

2. Why did writing start as a mere tool for encoding proper names?

The first stumbling block in the history of writing was hit immediately after the invention of phonetic encoding—in some places at least. Some literate cultures, having found and applied the glottographic principle, used it to write down proper names, and stopped there—sometimes for generations, sometimes for ever.

2.1. Glottography was invented to encode proper names

There is a tight connection between the glottographic principle and the encoding of proper names—names of people, places, institutions, or lineages. This connection played a crucial role in decipherment, since the same proper names could be encoded by different writing systems, thus serving as a test case for the decipherers' hypotheses. All the documented

ancient inventions of writing, in Egypt, China, Mesoamerica, Sumer, and (if secondary inventions are included) Anatolia, start to notate at least some proper names phonetically as early as they acquire the capacity to encode sounds, usually through the use of acrophony or the rebus principle (Valério & Ferrara 2019). This is not true for most other parts of speech: verbs, adverbs, adjectives, connectors, etc. Put differently, glottographic graphic codes are always capable of encoding the parts of speech that designate particular people, institutions, or places. But the capacity to encode actions, the aspects or locations of things, or syntactic relations, is optional and emerges later, if at all.

Egypt. The first manifestations of phoneticism in Egyptian writing occur for the notation of proper names (of persons, places, or institutions), in sources such as Tomb U-j in Abydos, c. 3200 BC (Stauder 2010; MacArthur 2010; Baines 2007). Only much later do continuous sentences start being written down (in the Third or Fourth dynasty, i.e., after 2600 BC—Baines 2007: 39). Lengthy texts such as letters arrive even later (Baines 2007: 100, 128, 143). The lag is all the more striking since many Early Dynastic proper names consist of short sentences or noun phrases with a transparent semantics (e.g., "Horus the fighter", "He who brings the water"). In other words, the users of the writing system already had the resources to encode much linguistic material beside proper names; but for a long time, they did not.

Mesopotamia. Here again the invention and perfecting of the phonetic principle occurred first for personal names notations, c. 3000 BC (Gelb 1963; Schmandt-Besserat 2007); here again, the potential of phoneticism for encoding language beyond proper names remained untapped for centuries after its discovery. Grammatical affixes, for instance, do not appear to be encoded in writing until around 2800 BC (Cooper 2004). There is an even longer wait until continuous writing, encoding full sentences, starts to replace tabular writing (Nissen et al. 1993; Schmandt-Besserat 2007; Maiocchi 2019), and yet another lag before the appearance of long texts such as royal inscriptions or letters (Cooper 2004).

Meso-America provides yet another clear case of glottography being tied to proper name encoding. Early Mesoamerican writing, such as the first Maya writing inscriptions on the murals of the San Bartolo site (c. 400–200 BC) or the Olmec inscriptions of the first millennium BC, as far as we can tell in the absence of decipherments, used phoneticism (when they used it at all) to encode proper names (of persons, including their ranks, and deities), and the names of calendrical days (Justeson and Mathews 1990; Palka 2015). As for the Aztec writing system, not only does its use of the phonetic principle start with proper names encoding, it seems never to have been applied beyond proper names (Whittaker 2018).

China is the least clear of all four cases, due to the fact that Chinese writing appears in the archaeological record at a stage where the technology is already quite sophisticated and versatile. It is possible that seal emblems and Shang bronze vessel inscriptions represent a phonetic writing system, in which case the Chinese case would present a fourth case where the origins of phoneticism are linked with proper name encoding (Boltz 1993).

These examples suggest that phonetically encoding proper names is a constant feature of glottographic writing: all glottographic writing does this, and some glottographic writing does little else. Note that the kind of writing which uses phoneticism for proper names, but for nothing else, should still count as full writing, since it has the capacity, in theory, to encode anything that may be said in the target language. Names in many languages often consist of repurposed noun phrases or even full sentences (as we just saw with Egyptian). Nahuatl names, transcribed by the Aztec writing system, often consist of complete sentences. The Aztec writing system was capable of encoding names like *Xihuitltemoc*, a proper name translating as "A meteor has descended" (Whittaker 2018). It could easily encode similar phrases that are not proper names; but it did not. As we saw, Aztec writing is just an extreme example of a general trend: incipient writing systems remained restricted to a name-encoding function, sometimes for centuries.

2.2. How are proper names and glottography connected?

Why do glottography and proper names have this special link? The standard answer goes roughly this way. Proper names, compared to common nouns (like "tree", "water", "bushel of wheat", etc.) are difficult to represent iconically—that is to say, with motivated signs which resemble what they refer to. This prompted the inventors of writing to use phonetic shortcuts to encode proper names. This explanation is deficient for two reasons. First, many parts of speech are difficult to encode iconically: abstract words, conjunctions, prepositions, adverbs, etc., are also quite tricky to figure with pictographs—and yet glottography was not invented for them. Second, there are in fact many easy ways to represent proper names graphically without going phonetic. Heraldry is the clearest case, although there are many others. Heraldic codes represent individuals, lineages, clans, or institutions (including countries, cities, etc.) using abstract or figurative pictographs. The global flag system, or global commodity brands, are familiar example; European and Japanese family crests are the best documented historically (Morin and Miton 2018). The city emblems displayed on the coins of ancient city states share many of these properties: they often sufficed to identify the issuing city, without any other indication (Pavlek et al. 2019). Closer to the invention of writing, Mesopotamian or Egyptian seals or brands were often purely pictographic, altogether lacking in written inscriptions (Pitman 1994; Wengrow 2008). All these systems of marks encoded the identity of a person, a clan, or a place, without encoding sounds.

(Here, it might be objected that the rebus principle was often used in heraldry, usually in the form of visual puns (Pastoureau 2007). This is especially true for European heraldry, where a family name would sometimes be represented in this way—for instance, the arms of the Bowes-Lyon family sport bows and a lion ("canting arms"). This use of the rebus principle falls short of full glottography, however, because it was quite unsystematic. There was no codified constraint dictating that it should be used constantly, and in specific ways. Several distinct visual puns could encode the same sound, which could also be indicated without recourse to the rebus principle.)

To summarise, the graphic notation of proper names does not require a phonetic encoding; and even if it did, proper names are not the only parts of speech that can be conveniently represented in this way. How then do we explain why phonography would be restricted to the encoding of proper names?

My favoured answer is that proper names, compared to other linguistic expressions, are difficult to decompose into basic morphological, syntactic, or semantic components (Langendonck and Velde 2016). A phrase like "the woman in the sky-blue pullover" can be decomposed into syntactic and morphemic components, whose meaning can be defined. But the name "Patricia Paige Smith", beyond the decomposition between first, middle, and last name, lacks an internal morphological or semantic structure. An ideographic notation may succeed in encoding "the woman in the dark green cargo pants" with a series of pictograms (e.g. [woman] + [dark + green] + [cargo + pants]), each of which might be understood on its own. Encoding "Patricia Paige Smith" with ideographs cannot be done in the same way, because words like "Patricia" lack the kind of internal structure that is readily found in other parts of language[3].

Two basic solutions are possible: either to create a specific, idiosyncratic graphic identifier that refers to the individual Patricia Paige Smith, or to encode the phonemes of her name (/p/, /a/, /t/, etc.). The first option comes with a mnemonic burden: one needs to learn as many symbol-person associations as the number of proper names one needs to encode. The second option, phoneme-encoding, does away with this constraint. One only needs to remember graphic signs for a limited number of phonemes, making it possible to encode a vast range of

[3] This answer needs to contend with an obvious objection, raised by one of this article's reviewers. Proper names in many languages can be formed from phrases that are quite transparent—as we just saw in the case of Egyptian or Nahuatl, among others: "A meteor has descended" (*Xihuitltemoc*), "Small sandal" (the nickname *Caligula*), "Sitting Bull" (*Tȟatȟáŋka Íyotake*), or "Fight the good fight of faith" (a religious hortatory name the kind of which New England Puritans were partial to). It is obvious that they derive from natural language phrases that can be decomposed at multiple levels. This seems to contradict what I just wrote. Even a seemingly opaque name like "Patricia Paige Smith" is based on words that have (or used to have) a precise meaning: "Smith" is someone who works with metal, "Patricia" is the feminine of Patricius (nobleman)[3]. This, however, is not relevant to the meaning of "Patricia Paige Smith" as a proper name. The word "Smith" in Patricia Paige Smith does not mean "someone who works with metal", just like "Caligula" does not mean "small sandal". The name *Smith* and the substantive *smith* should be treated as cases of polysemy: two words with a shared history but completely distinct meanings. "Smith" simply means the proper name Smith. In this respect it is just as opaque as any other last name. Likewise, to gloss "Patricia" as "noblewoman" does not tell us anything about its meaning in the context of the name "Patricia Paige Smith". One cannot translate "Patricia Smith" as "Noblewoman working with metal"—this does not in any way help convey the meaning of that name, which is the identity of the person it refers to.

proper names with a very limited set of signs. This crucial advantage of the glottographic principle applies far beyond proper names, but it is especially useful when applied to them, because of their relative opacity and lack of structure.

Yet, as we just saw, the ideographic option is by no means impossible, and it is widely practiced in pictographic communication. How then can the memory burden be sustained? Two things lighten it. First, even though proper names typically show less morphological regularity compared to the rest of the lexicon, this varies. The name "Count Alexey Kirillovitch Vronsky" can be decomposed as two personal identifiers (Alexey and Kirilov), a suffix indicating that Alexey is the son of one Kirilov, and an aristocratic title. Morphological expressions like the suffix "-ovitch" may be encoded with one invariable graphic device, which can be re-used for other individuals. Second, the use of ideographic emblems does not require one person to know how to produce the emblems of many individuals. An emblem tends to be produced mostly by the person it identifies (or members of their household), to sign documents, mark possessions, etc. Others merely need to recognize this emblem, not to produce it. For complex graphic symbols, recognition memory is much less demanding than production memory. Our production memory for many everyday symbols is notoriously deficient: most Americans would not know how to reproduce, without looking, the design of the US one penny coin (which side does Lincoln face?) (Nickerson and Adams 1979). This does not prevent those symbols from carrying information. Not only are emblems memorisable, they may also encode information that proper names miss. A coat of arms may encode genealogical ties or marital relationships, etc., which proper names or titles do not necessarily reflect. A national flag can carry religious or political symbols going beyond the state's name. This goes some way towards explaining why emblems may be preferred to glottographic notations, even in literate societies, at least for certain uses (Pim, Yatsenko, and Perrin 2010).

We should thus expect ideographic personal emblems to be the option of choice in relatively decentralized systems where each individual need only know how to produce their own emblem, and recognize those of other individuals of interest (not necessarily many of them). Conversely, we should expect glottographic encodings to arise when a limited group of people take up the task of producing documents that encode a broad variety of names. The communicative needs that led to the invention of glottography appear to have been quite specific to the encoding of proper names, under very specific circumstances. Nothing about proper names demands a glottographic encoding in all circumstances—numerous systems of emblems attest to this. The rise of glottography thus occurred in response to a rather specific need—the need for a small group of people to remember and produce a large number of emblems, if my speculations are on the right track. Once this single function was fulfilled, no further step seems to have been taken for centuries.

3. Asynchronous communication: Getting a message across space and time

A second major property of writing arguably evolved gradually, and later than glottography: pervasive asynchronous use. The possibility of asynchronous use is a crucial feature, not just of writing, but of graphic codes in general (Morin *et al.* 2020). To communicate asynchronously is to transmit information to someone else across time or across space (often both), without a human intermediary. Until the advent of recent inventions (irrelevant to archaeologists), graphic codes were the only reliable means of achieving that. Yet graphic codes are not always used in this fashion. On the contrary, some graphic codes serve to communicate in a way that is almost exclusively synchronous. Pictographies used as repositories for incantations assist shamans in reciting chants that they have in large part already memorised (Severi 2019; Hoffman 1888; Déléage 2013). The audience for these chants (who may not always understand or pay attention to them) does not gain information directly from the pictographs, but from the shaman; the shaman themselves can only make sense of the pictographs because they have memorised the chants that the pictographs encode—chants that they know either by personal invention or from oral transmission. This is but one example of a very general phenomenon: graphic marks may be used as memory props to help remember speeches that have been orally transmitted, rather than communicate a novel piece of information to someone not already in possession of it. Aside from shamanic chants, historical records (Mallery 1886), missives, even shopping lists (Croft 1949), could be encoded pictographically, but only if their content was also memorised.

There is, in other words, no automatic link between the presence of a graphic code in a given culture, and its capacity to sustain communication across long distances of time or space. A society that masters a complex graphic code does not *ipso facto* become able to engage in remote trade, in epistolary correspondence without intermediaries, or in the maintenance of elaborate archives.

What does glottography change about this? In theory, it could change a lot; in practice, it may have changed nothing at all. The potential of writing for asynchronous communication may remain untapped for centuries, if not more. The fact that writing can be used to communicate asynchronously across space and time, doing away with the constraints of orality, is what makes it precious to us today. But how can we gauge the extent to which writing, once developed, was used for asynchronous communication? Reconstructing the past uses of a graphic code in a remote era is a tall order: most of the evidence has to be indirect or retrospective. The challenge is to show that messages were accompanied by oral recitations, or that they reminded the reader of content that had already been memorised, as opposed to conveying novel information to a novel person without the support of an oral gloss. Two kinds of evidence can be mustered in favour of this view.

3.1. Evidence that early written communication was synchronous

Direct evidence can be obtained when a text directly mentions the fact that this text, or texts like it, are made for synchronous communication. Two kinds of synchronous uses should be singled out. On the one hand, many ancient literary genres were inseparable from an orally learnt and orally sustained art of memory (Carr 2005). This is a synchronous use of writing

because the text does not, by itself, convey novel information to novel recipients: it serves as a memory prop for someone who is already supposed to know the content (difficult though it may be to recall it without the prop). This use of writing is what Eric Havelock (1977: 372) described as "recitation literacy", characterising societies where

> "the skill [of literacy] is one of decipherment rather than fluent reading. The use of the written word is very restricted, and any reading of it is regarded as ancillary to the central function of culture, which is (…) to recite and memorise (…)."

Direct evidence of recitation literacy comes from explicit mentions of memorisation being a mandatory part of a literate curriculum, and the most valued one. Such mentions are abundant in the Mesopotamian, Jewish, and Hellenistic literate traditions (Carr 2005). Greek epic poetry or Biblical texts are the most prototypical example of literary genres whose transmission relied extensively on oral tradition even after they had been written down for centuries.

Other genres are based on synchronous use because they consist of documents designed to accompany a face-to-face oral interaction, which they describe. A clear example of this is a letter that mentions the fact that it is being read aloud by a messenger (a ubiquitous practice, abundantly documented: see e.g. Wearne 2021; Stock 2012). By itself the practice of reading aloud does not mean the messenger is reciting a partly memorised text (although, in a culture otherwise dominated by recitation literacy, that would be likely); but it does mean that the audience gains access to the novel information conveyed by the letter through oral means, not directly through writing. Another family of documents that bear the mark of mostly synchronous use consists in all the texts that record a ritual after it took place, or make plans for the performance of a ritual. One example among others: the texts written by the scribes of Babylonian and Assyrian kings to plan for the ritual conclusion of an alliance between sovereigns (Charpin 2019). In most of these texts, the written word served to note (usually in draft form) the oaths that were to be pronounced publicly by a sovereign and his messenger (acting as a stand-in). Evidence that most of these texts had no use but that of script for a ritual interaction is given by the fact that alliance oaths did not have to be written down in order to be valid, that alliances concluded by the two kings meeting "live" in the same location were not usually written down, and that the transcription of the oaths on durable material fit for public display and long-term archiving was far from systematic.

The kind of direct evidence for synchronous uses of writing that was just listed is only available for texts that are elaborate enough to inform us about the conditions of their own use. This is hardly always the case for early written documents. The conditions of their use must then be inferred based on indirect cues.

3.2. Decontextualisation and storage: Two preconditions of asynchronous communication

Two things at least seem required for a text to be legible, out of its context of production, by a reader not already acquainted with its content.

Decontextualisation: The first ingredient of asynchronous communication is information supplied by the text itself: any piece of information that a text contains is information that does not need to be supplied by the reader's memory, or by an oral gloss. A message is self-contained to the extent that it can be understood with little such contextual information. Self-containment is a matter of degree, not an all-or-nothing property. Linguists have argued for the existence of a trade-off between the information that is contained within a message and that which context supplies (Wray and Grace 2007; Winters, Kirby, and Smith 2018). Registers of speech vary on this dimension: loose speech encodes less information and leaves more to context than sustained speech, which tends towards the explicit and the copious. (It has been suggested that entire languages can be sorted along this dimension, some being more suitable for decontextualized communication than others—Trudgill 2011; Winters, Kirby, and Smith 2015.) Asynchronous communication is impoverished communication, in that it lacks contextual cues that can only be provided in a face-to-face setting (Morin, Kelly, and Winters 2020). Written texts make up for this by being more explicit and self-contained than speech would be. Not all written texts do this, to be sure, and some registers of speech can be highly decontextualised too. Legal or political discourse in complex societies come to mind; in small-scale societies too, we find genres of formal speech fit for a relatively broad and impersonal audience (Bloch 1975). Nonetheless, the need for decontextualization is likely to be greater, all else being equal, if a message is to be communicated asynchronously.

Storage: The second ingredient is the possibility for readers to consult the texts that are relevant to them, after the time they were produced, or away from the place where they were. From the time it is produced, an asynchronous message is in danger of being lost to its recipients—through material destruction, misplacement, or forgetfulness of its location. Using writing successfully for asynchronous communication requires making sure that texts survive long enough to be consulted (durability), as well as storing them in accessible and reliable repositories, or alternatively ensuring their delivery to relevant recipients (retrievability). A simple if expensive way of achieving this is monumentality: an inscribed stela is permanent and conspicuous enough to be easily read by anyone literate. Yet another way to make writing work asynchronously are archives, understood as the organised, permanent storage of documents. Without solutions like these, a written message that is easily destroyed or readily misplaced cannot be used many times to impart new information to someone not already acquainted with its content. It can still be used to impart information, but only on a limited number of occasions, in conjunction with oral glosses, or as a mnemonic prop.

Self-contained texts and organised archives: these two things are preconditions for the asynchronous use of writing, but they do not constrain the development of writing, if writing is understood as a generalist, glottographic code. Self-contained texts and organised archives determine to what extent written texts can be used autonomously, that is to say without the intermediation of an oral gloss, without a great deal of contextual knowledge, without pre-existing memorised knowledge of the text's content. But writing, when it first evolved, was

not usually put to this kind of use. Some authors have argued for a strong connection between writing and the storage of decontextualised information (e.g. Goody 1977). Here, I take the opposite view.

Making texts self-contained

How self-contained were messages? How easily consulted? Answering the first question requires us to know how difficult it is to make sense of a piece of writing taken out of its context of production. Palaeographers and archaeologists are in the best position to know how difficult this can be. They also know how much the answer varies depending on sites, periods, and types of material. Still, we can find a general basis for comparison in the length of texts. All else being equal, a longer text contains more information than a shorter one; length may thus be a proxy for the degree to which texts were self-contained or self-interpretable. As far as I know, no general comparative study of text lengths across areas and time periods has been pursued, and doing so on a document-by-document basis would no doubt raise daunting technical difficulties. However, if we consider the genre of early written documents, and ask which kind of text tends to evolve first, the answer seems relatively clear. Some genres are inherently limited in length or in content, while others are much more conducive to comprehensive, self-contained messages. A cartouche used as label, a seal inscription, an inscription marked on a drinking vessel or a postherd, are intrinsically short. Their extreme concision suggests that such notes only carried little information by themselves, and could only be made sense of in a very precise context, by people who knew something about the relevant interactions underlying it. In contrast, full letters, chronicles, epic poems, or legislative compilations, are much easier to understand on their own: they just contain more information.

Looking at the four areas where a pristine invention of writing occurred, not one of them shows full letters, chronicles, or legislative compilations appearing earlier than shorter genres like pottery inscriptions, seals, or identifying tags. In Egypt the priority of identifying tags and pottery inscriptions is clear (Baines 2007). Likewise, in Mesopotamia, accounting tablets predate documents such as letters, narratives, or legal texts, by centuries at least (Nissen et al. 1993; Maiocchi 2019). Lexical lists, which can be fairly long, are the sole exception to this pattern, arising shortly after accounting documents (Watson 2013; Wagensonner 2010), and no one doubts that they were used as mnemonic tools, not as ways to impart novel information by writing alone. The Mesoamerican data follow the same pattern, showing only very brief texts (always less than a few hundred signs, except for some late Maya inscriptions—Justeson and Mathews 1990). As for China, its written record emerges fully armed (so to speak) from the archaeological record, with Shang oracle bone inscriptions already providing lengthy and self-contained narratives; the contention that the emblems found on earlier bronze vessels were an ancestor of Shang inscriptions would, if true, validate my claim, but it is unclear whether these constitute writing in the proper sense (i.e., glottography: Postgate, Wang, and Wilkinson 1995; Boltz 1993). Overall, the archaeological record is consistent with a gradualist account of the appearance of long, self-contained texts.

Storing and retrieving writing

The second ingredient of asynchronous communication is that documents should be easily consulted outside of their context of production, which requires durability and retrievability. When assessing the durability of early written documents, we are faced with one obvious problem: the archaeological record filters out durable material (Perreault 2019), erasing evidence of less durable texts. Two points can nonetheless be made with relative confidence.

First, the amount of perishable documents produced by the four areas that invented writing was probably massive compared to durable texts (preserved or lost) (Cooper 2004; Postgate, Wang, and Wilkinson 1995; Wang 2014). Haicheng Wang devotes large sections of his (2014) book to making this case. His main argument consists in showing that, in all four areas, permanent inscriptions frequently alluded to records that are entirely lost but must have been abundant and consistently maintained (see also Baines 2007: 115). Another important argument is direct written, pictorial, or fossil evidence for perishable notation systems, such as Egyptian wooden boards or Chinese bamboo strips. A third argument is the claim, presented by Steinkeller (2003; 2004), that Mesopotamian accounting tablets were inscribed after the transactions that they describe took place, drawing on information that was either held in memory or inscribed on memory props such as accounting sticks or calculi. (Steinkeller sketches a similar argument for ancient Egyptian wooden boards: 2004, fn. 16.) Some of this material was durable on the scale of a human lifetime, although it was perishable on an archaeological scale; but not all of it was. Wax or clay tablets are easily erased, for instance. The amount of written information that got jettisoned in this way (think of schoolchildren wiping a slate) is impossible to assess. Still, the arguments just summarised invite us to think of durable records as the exception rather than the norm. Even durable, monumental inscriptions were not necessarily fit for asynchronous communication, since many were invisible (because they were placed too high to be read, or walled inside a tomb, or enclosed in a talisman, etc., Egyptian funerary inscriptions being a case in point—Baines 2007).

Perishable messages could have supported some amount of asynchronous communication, but not large amounts of it, unless they were produced in great quantity, which was extremely difficult and expensive until texts were produced in industrial or proto-industrial conditions. Adding to the difficulty, a text can only support asynchronous communication if its addressees come across it, which they can only do when texts are stored and ordered in the right ways—the problem of retrievability.

A set of written documents ordered and stored for future consultation is what is commonly known as an archive; but whether or not what archaeologists call archives really had all these properties is by no means uncontroversial. The term as commonly used (e.g. by the contributors of Brosius et al. 2003) seems to have a weaker meaning: the label seems applicable to any repository of documents (be they written text or mere accounting documents) in a palace or temple setting. Which of these repositories actually served as archives in the full sense of the word, and to what extent they did, remains a puzzle. Two

diametrically opposed takes on this matter are provided by Christopher Eyre's *The Use of Documents in Pharaonic Egypt* (2013) and Haicheng Wang's *Writing and the Ancient State* (2014). The two authors came to divergent conclusions while surveying overlapping material (Eyre's work being focused on Egypt but making frequent reference to Mesopotamia, while Wang's is a comparative study encompassing all four pristine inventions of writing, including Egypt).

The case for ancient archives functioning as efficient tools for storing and consulting written information has important pieces of evidence in its favour. First of all, the repositories themselves: important stores of documents found in places where they would have been of obvious relevance to palace or temple officials. Even if the archives found in public places often were a mix of private and public documents (Eyre 2013; Fales 2003), at least a good fraction of them would have been useful to the administration's operations. There is also the occasional evidence (whose quality varies from one site to the next) of indexing techniques like the clay tags affixed to the cuneiform clay tablets preserved at Ebla (Wang 2014: 245–7), the hieratic inscriptions on the side of the tablets found at El Amarna (Parkinson and Quirke 1995: 60), or the titles inscribed on the outside of papyrus rolls (ibid.: 60). The quality of the archiving techniques tends to increase with time, document collections becoming larger and more systematic until the age of classical libraries. Internally, documents become easier to consult with practices like indexing and tables of contents slowly emerging (they were still rudimentary and rare in classical Rome—Riggsby 2019). Early on, we find some occasional evidence of archived documents being consulted long after they were first assembled (Charpin 2019: 120–121; Eyre 2013: 94), supporting the basic idea that some very ancient archives at least were deliberately assembled for later consultation, and served this purpose, at least on occasion.

On the other hand, a case can be made against seeing ancient archives as efficient tools for the frequent consultation of well-kept records, even for relatively late historical periods like Hellenistic Egypt, Classical Egypt, or even late medieval England (Eyre 2013; Thomas 1992; Clanchy 1993). The same arguments recur in all three books. First, the scarcity of evidence for systematic and continuous storage and preservation of documents (as would be evidenced by the existence of accurate annals or chronicles recorded systematically over long stretches of time), as distinct from the accumulation of documents on an *ad hoc* basis. This is an important theme in Eyre's book, which offers radical reinterpretations of documents usually thought to be records, which in his opinion are better seen as working documents not intended for future reference for anyone beside a handful of scribes (see Fales 2003 for a similar point of view on Neo-Assyrian archives). In the same light, he stresses (even late into the Hellenistic period) the poor organisation of documents, both in the content of the texts (consistency of subject matter, elementary division of parts, etc., being often absent), and in the way they were stored. Thomas on classical Greece and Clanchy on late medieval England paint similar pictures. One last reason to doubt that archives were routinely and efficiently consulted by bureaucracies is their relative lack of legal standing: in the periods and areas covered by Eyre, Thomas, and Clanchy, greater weight of evidence was given to oral sources compared to written ones. A testimony borne by a witness to a transaction often carried at

least as much weight as a written record, suggesting that written documentation was not emancipated from oral and mnemonic supports. The mixing of private and personal documents in the archives found in palatial settings (Eyre 2013; Fales 2003), along with the use of privately held documents with no publicly available copies, also suggests a paucity of abundant, well organised public archives.

To summarise, there is evidence that writing enabled small amounts of asynchronous communication as soon as it was invented; but this needs to be balanced with equally strong evidence for two limitations that held asynchronous uses back. First, the amount of information contained in a single piece of text was often insufficient to make it suitable for decontextualized interpretation; second, documents were often lacking in durability or retrievability, meaning that they could only support a few instances of asynchronous communication. These two roadblocks were lifted quite gradually, and then only for some uses of writing. Today, many forms of literacy are almost exclusively synchronous, coexisting with asynchronous uses of writing, often within the same culture. For instance, the knowledge of Biblical Hebrew that a practising Jew needs to recite the Torah at a Bar Mitzvah uses the written word as a memory prop; the same person uses their literacy in English asynchronously when writing emails, reading books, etc.

4. Conclusion

The combination of feathers and flight is an obvious evolutionary success story; feathers allow birds to control their flight, and to improve their aerodynamic profile. Yet, feathers and flight evolved (in dinosaurs, then in birds' ancestors) at different times, pushed at first by entirely different functional pressures (Clarke 2013). Several species have (or had) one without having the other; several species had both, but used them for entirely different functions (flight for locomotion, feathers for thermal regulation or display). Only in the avian lineage was the potential of feathers as flight facilitator fully realised; elsewhere, feathers served other functions. The evolution of feathered flight was piecemeal. Realising this helped zoologists studying feather evolution avoid a number of pitfalls. In particular, they realised that the reasons why flying with feathers is adaptive today may not have been the reasons why flying with feathers evolved. Niko Tinbergen would have said that questions concerning a trait's evolutionary history should be strictly dissociated from questions concerning its adaptive function (Tinbergen 1963).

Just like feather-powered flight, the evolution of writing was piecemeal. Literacy as you and I know and practice it is made up of at least three distinct features: glottography (the notation of language), the availability of a generalist code that can note down anything we can say, and asynchronous communication—the ability to get a message to other people across space and across time. The connection between these three features is not, in my view, accidental. I have argued elsewhere that glottography was the only way (at least until recently) to arrive at a generalist graphic code (Morin, 2022); that writing was uniquely suited for asynchronous communication (Morin, Kelly, and Winters 2020). But this does not mean the three features

evolved together, or for the same reason. This paper argued that glottography, generality, and asynchronous use evolved out of synch with one another. Two huge lags separate, first, the invention of glottography from its generalisation beyond proper names, second, the existence of writing as a generalist tool from the routinisation of its asynchronous use. At each step, the inventors of writing responded to distinct and specific pressures. The inventors of glottography were not necessarily aware of their invention's potential beyond the notation of proper names. Those who developed writing into a generalist tool, capable of encoding anything that can be said, were just as unaware of the future of writing. They were unlikely to anticipate that the code they were using as an accompaniment to oral recitations, or as a reminder of transactions they took part in, would come to be used for the most part in a quite different way: to store information for the benefit of distant recipients to whom the information would be new, with no need for an oral gloss or an art of memory.

Writing evolved, and its evolution may have been longer and more gradual than commonly thought. Evolutionary approaches of writing, today (see e.g. Lock and Gers 2012), do not owe anything to the outdated approaches that, for some, had made it synonymous with naïve teleology or with ethnocentrism. On the contrary, an evolutionary perspective can help us correct a number of functionalist biases that may orient our view of writing's history, and help us appreciate how unlikely and contingent this invention may have been.

References

Baines, John. 2007. *Visual and Written Culture in Ancient Egypt*. Oxford: Oxford University Press.

Bloch, Maurice. 1975. *Political Language and Oratory in Traditional Society*. London; New York: Academic Press.

Boltz, William G. 1993. *The Origin and Early Development of the Chinese Writing System*. New Haven, Conn: Amer Oriental Society.

Brosius, Maria, ed. 2003. *Ancient Archives and Archival Traditions: Concepts of Record-Keeping in the Ancient World*. Oxford: Oxford University Press.

Carr, David M. 2005. *Writing on the Tablet of the Heart: Origins of Scripture and Literature*. Oxford: Oxford University Press.

Charpin, Dominique. 2019. *« Tu es de mon sang » : Les alliances dans le Proche-Orient ancien*. Paris: Les Belles Lettres.

Clanchy, M. T. 1993. *From Memory to Written Record, England 1066-1307*. Oxford; Cambridge, USA: Blackwell.

Clarke, Julia. 2013. 'Feathers Before Flight'. *Science* 340 (6133): 690–92.

Cooper, J. 2004. 'Babylonian Beginnings: The Origin of the Cuneiform Writing System in Comparative Perspective'. In *The First Writing*, edited by Stephen Houston, Cambridge: Cambridge University Press, 71–99.

Croft, Kenneth. 1949. 'Graphic Mechanisms of Communication in Native North America'. *Indiana Magazine of History* 45 (4): 339–52.

DeFrancis, John. 1989. *Visible Speech: The Diverse Oneness of Writing Systems*. Honolulu: University of Hawaii Press.

623 Déléage, Pierre. 2013. *Inventer l'écriture Rituels Prophétiques et Chamaniques Des Indiens*
624 *d'Amérique Du Nord, XVIIe-XIXe Siècles*. Paris: Les Belles Lettres.
625 Diringer, David. 1953. *The Alphabet: A Key to the History of Mankind*. London:
626 Philosophical Library.
627 Eyre, Christopher. 2013. *The Use of Documents in Pharaonic Egypt*. Oxford: Oxford
628 University Press.
629 Fales, Frederick Mario. 2003. 'Reflections on Neo-Assyrian Archives'. In *Ancient Archives*
630 *and Archival Traditions: Concepts of Record-Keeping in the Ancient World*, 195–229.
631 Oxford: Oxford University Press.
632 Gelb, Ignace J. 1963. *A Study of Writing*. Chicago: University of Chicago Press.
633 Goody, Jack. 1977. *The Domestication of the Savage Mind*. Cambridge England; New York:
634 Cambridge University Press.
635 Havelock, Eric A. 1977. 'The Preliteracy of the Greeks'. *New Literary History* 8 (3): 369–91.
636 Hoffman, W. J. 1888. 'Pictography and Shamanistic Rites of the Ojibwa'. *American*
637 *Anthropologist* 1 (3): 209–30.
638 Houston, Stephen D. 2004a. 'Overture to The First Writing'. In *The First Writing: Script*
639 *Invention as History and Process*, edited by Stephen D. Houston, 3–16. Cambridge
640 University Press.
641 ———. 2004b. *The First Writing: Script Invention as History and Process*. New York:
642 Cambridge University Press.
643 Justeson, John S., and Peter Mathews. 1990. 'Evolutionary Trends in Mesoamerican
644 Hieroglyphic Writing'. *Visible Language* 24 (1): 88–132.
645 Langendonck, Willy van, and Mark van de Velde. 2016. 'Names and Grammar'. In *Oxford*
646 *Handbook of Names and Naming*, edited by Carole Hough. Oxford: Oxford University
647 Press, 17–38.
648 Lock, Andy, and Matt Gers. 2012. 'The Cultural Evolution of Written Language and Its
649 Effects: A Darwinian Process from Prehistory to the Modern Day'. In *Writing : A*
650 *Mosaic of New Perspectives*, edited by Elsa Grigorenko, Elsa Mambrino, and David
651 Preiss, 11–36. Psychology Press.
652 MacArthur, Elise V. 2010. 'The Conception and Development of the Egyptian Writing
653 System'. In *Visible Language: Inventions of Writing in the Ancient Middle East and*
654 *Beyond*, edited by Geoff Emberling and Emily Teeter, 115–37. Chicago: Oriental
655 Museum Publications.
656 Maiocchi, Massimo. 2019. 'Writing in Early Mesopotamia: The Historical Interplay of
657 Technology, Cognition, and Environment'. In *Beyond the Meme: Development and*
658 *Structure in Cultural Evolution*, edited by Alan Love and William Wimsatt, 395–424.
659 Minnesota Studies in the Philosophy of Science 22. University of Minnesota Press.
660 Mallery, Garrick, and Smithsonian Institution Bureau of American Ethnology. 1886.
661 *Pictographs of the North American Indians: A Preliminary Paper*. Washington: Govt.
662 Printing Office.
663 Morin, Olivier. 2022. 'The Puzzle of Ideography'. *Behavioral and Brain Sciences*, 1–69.
664 Morin, Olivier, Piers Kelly, and James Winters. 2020. 'Writing, Graphic Codes, and
665 Asynchronous Communication'. *Topics in Cognitive Science,* 12: 727–743.
666 Morin, Olivier, and Helena Miton. 2018. 'Detecting Wholesale Copying in Cultural
667 Evolution'. *Evolution & Human Behavior* 39 (4): 392–401.
668 Nickerson, Raymond S., and Marilyn Jager Adams. 1979. 'Long-Term Memory for a
669 Common Object'. *Cognitive Psychology* 11 (3): 287–307.
670 Nissen, Hans J., Peter Damerow, Robert K. Englund, and Robert K. Englund. 1993. *Archaic*
671 *Bookkeeping: Early Writing and Techniques of Economic Administration in the*
672 *Ancient Near East*. University of Chicago Press.

673 Palka, Joel. 2015. ‘The Development of Maya Writing’. In *Visible Language: Inventions of*
674 *Writing in the Ancient Middle East and Beyond*, edited by Geoff Emberling and Emily
675 Teeter, 225–31.
676 Parkinson, Richard B., and Stephen Quirke. 1995. *Papyrus*. London: British Museum Press.
677 Pastoureau, Michel. 2007. *Traité d’héraldique*. 5e édition. Paris: Editions A & J Picard.
678 Pavlek, Barbara, James Winters, and Olivier Morin. 2019. ‘Ancient Coin Designs Encoded
679 Increasing Amounts of Economic Information over Centuries’. *Journal of*
680 *Anthropological Archaeology* 56: 101103.
681 Perreault, Charles. 2019. *The Quality of the Archaeological Record*. Chicago, IL: University
682 of Chicago Press.
683 Pim, Joám Evans, Sergey A. Yatsenko, and Oliver T. Perrin. 2010. *Traditional Marking*
684 *Systems: A Preliminary Survey*. London: Dunkling Books.
685 Pitman, Holly. 1994. ‘Towards an Understanding of the Role of Glyptic Imagery in the
686 Administrative Systems of Proto-Literate Greater Mesopotamia’. In *Archives before*
687 *Writing: Proceedings of the International Colloquium Oriolo Romano, 1991*, 177–
688 204. Torino.
689 Postgate, Nicholas, Tao Wang, and Toby Wilkinson. 1995a. ‘The Evidence for Early Writing:
690 Utilitarian or Ceremonial?’ *Antiquity* 69 (264): 459–80.
691 Riggsby, Andrew. 2019. *Mosaics of Knowledge: Representing Information in the Roman*
692 *World*. Classical Culture and Society. Oxford, New York: Oxford University Press.
693 Schmandt-Besserat, Denise. 2007. *When Writing Met Art: From Symbol to Story*. Austin:
694 University of Texas Press.
695 Severi, Carlo. 2019. ‘Their Way of Memorizing: Mesoamerican Writings and Native
696 American Picture-Writings’. *Res: Anthropology and Aesthetics* 71–72 (January): 312–
697 24.
698 Stauder, Andréas. 2010. ‘The Earliest Egyptian Writing’. In *Visible Language: Inventions of*
699 *Writing in the Ancient Middle East and Beyond*, edited by Geoff Emberling and Emily
700 Teeter, 137–49. Chicago: Oriental Museum Publications.
701 Steinkeller, P. 2003. ‘Archival Practices at Babylonia in the Third Millennium’. In *Ancient*
702 *Archives and Archival Traditions: Concepts of Record-Keeping in the Ancient World*,
703 edited by Maria Brosius. Oxford: Oxford University Press.
704 ———. 2004. ‘The Function of Written Documentation in the Administrative Praxis of Early
705 Babylonia’. In *Creating Economic Order: Record Keeping, Standardization, and the*
706 *Development of Accounting in the Ancient Near East,* edited by M Hudson and C
707 Wunsch, 65–88. University Press of Maryland.
708 Stock, Markus. 2012. ‘Letter, Word, and Good Messengers: Towards an Archaeology of
709 Remote Communication’. *Interdisciplinary Science Reviews* 37 (4): 299–313.
710 Thomas, Rosalind. 1992. *Literacy and Orality in Ancient Greece*. Key Themes in Ancient
711 History. Cambridge: Cambridge University Press.
712 Tinbergen, N. 1963. ‘On Aims and Methods of Ethology’. *Zeitschrift Für Tierpsychologie* 20
713 (4): 410–33.
714 Trigger, Bruce G. 2004. ‘Writing Systems: A Case Study in Cultural Evolution’. In *The First*
715 *Writing: Script Invention as History and Process*, edited by Stephen D. Houston, 39–
716 71. Cambridge University Press.
717 Trudgill, Peter. 2011. *Sociolinguistic Typology*. Oxford: Oxford University Press.
718 Valério, Miguel, and Silvia Ferrara. 2019. ‘Rebus and Acrophony in Invented Writing’.
719 *Writing Systems Research* 11 (1): 66–93.
720 Wagensonner, K. 2010. ‘Early Lexical Lists Revisited. Structures and Classification as a
721 Mnemonic Device’. In *Language in the Ancient Near East*, 1:1:285–312. Proceedings
722 of the 53e Rencontre Assyriologique Internationale. Winona Lake: Eisenbrauns.

Wang, Haicheng. 2014. *Writing and the Ancient State: Early China in Comparative Perspective*. Cambridge University Press.
Watson, Rita. 2013. 'Archaic Lists, Writing and Mind'. *Pragmatics & Cognition* 21 (3): 484–504.
Wearne, Gareth. 2021. 'The Role of the Scribe in the Composition of Written Correspondence in Israel and Judah'. *R. Ast, M. Choat, J. Cromwell, J. Lougovaya &; R. Yuen-Collingridge (Eds), Observing the Scribe at Work. Scribal Practice in the Ancient World.*, January.
Wengrow, David. 2008. 'Prehistories of Commodity Branding'. *Current Anthropology* 49 (1): 7–34.
Whittaker, Gordon. 2018. 'Aztec Hieroglyphics: A Name-Based Writing System'. *Language & History* 61 (1–2): 60–76.
Winters, James, Simon Kirby, and Kenny Smith. 2015. 'Languages Adapt to Their Contextual Niche'. *Language and Cognition* 7 (3): 415–49.
———. 2018. 'Contextual Predictability Shapes Signal Autonomy'. *Cognition* 176 (July): 15–30.
Wray, Alison, and George W. Grace. 2007. 'The Consequences of Talking to Strangers: Evolutionary Corollaries of Socio-Cultural Influences on Linguistic Form'. *Lingua* 117: 543–78.