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WRITING IN EARLY MESOPOTAMIA

The Historical Interplay of Technology, Cognition, and Environment

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Despite the fact that language is just one among the many manifestations of a given culture, it is usually considered one of its core features. In particular, writing (i.e., the visual representation of language) is regarded as one of the crucial inventions in the history of humanity because it dramatically enhances communication potential and promotes persistent cultural memory. Even today, the advent of writing is commonly accepted as the dividing line between history and prehistory.[1] The impact of writing is evident not only from the amount of data that philologists can recover from ancient inscriptions but also from the profound changes in cognition, society, and environment that it has brought about. In this sense, writing has been defined as a *Kulturtechnik,* which stresses the bond between its material representation, operative aspects, and transmission within a given cultural environment.[2] Writing effectively extends cognitive facilities by allowing the externalization of previously embodied meaningful information clusters in the form of linguistic symbols, which in turn can then be easily compared at a glance. For instance, the creation of indexes, catalogs, glosses in margins, or simple indentations may produce a superimposed hierarchy of sections, suggesting associations between chunks of text that would otherwise have no obvious relation to one another (see section 3). This quick nonlinear access to information is otherwise impossible in spoken language.[3] In this way, writing assists in identifying associations, shaping thought, and intensifying the cognitive apparatus in a reciprocal feedback process, which can produce cascade effects on other techniques and fields of knowledge. For instance, records of empirical observations may lead to the creation of a formalized institutional calendar, which in turn allows for a

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more precise management of environmental resources, as aptly demonstrated by the Mayas in Mesoamerica. This, in turn, can maximize production and thereby create a surplus, which encourages the development of structures for its management. Simultaneously, a more formally structured religious ideology seems to arise in response to the need for social stability generated by the productive system, which in Mesopotamia became increasingly asymmetrical in terms of labor and access to resources.[4] Going back to the impact of writing on cultural evolution, it is important to stress that this technology makes access to information possible regardless of whether the encoder of the information is physically present. Contrary to what typically happens in modern societies, this information access has usually been restricted to the social elite in antiquity. Nevertheless, under certain circumstances, writing could be displayed to a broadly illiterate audience to reaffirm the rank of those individuals within the social hierarchy who are able to access that message.

Because writing can be perennial, or at least stable, over long periods of time in particular forms, it is perceived as magic, sacred, or even taboo in many ancient societies, and the people associated with it inherit these qualities. As a consequence, writing is frequently invoked as a prime determinant for cultural change in modern theories of cultural evolution. In their earliest formulation,[5] these theories framed writing systems as originating and changing historically in a linear evolutionary sequence, beginning with a primitive stage based on the massive use of logography (i.e., word-signs) and progressing to a more "advanced" logosyllabic stage, followed by a fully developed alphabetic system, which is celebrated as the incarnation of Western democracy and scientific advancement. This alphabetocentric (ethnocentric) paradigm is nowadays obsolete due to advancements in several disciplines that intermingle with the study of writing (archaeology, history, philology, linguistics, semiotics, etc.), as well as clear counterexamples. (Written Japanese, one of the most sophisticated writing systems presently used, did not hamper technological advancements or social achievements, despite the difficulty in learning the system). Nevertheless, even today, there is a certain bias in evaluating the potential expressed by the invention and adoption of writing in ancient societies. This is no doubt due to the fact that people who study writing are (inevitably) literate; they are embedded in a deeply entrenched paradigm—the literate paradigm. After years of training, we take pride in using writing technology, just as ancient scribes certainly did. Hence, we tend to associate civilization with the use of writing—and barbarism with

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its absence—regardless of stubborn facts to the contrary. The Incas, who did not read or write, were as civilized as the Mayas, who did read and write. For reasons possibly linked to overspecialization and lack of imagination, certain aspects and functions of writing are therefore overemphasized, whereas other aspects or functions are neglected. Most of the duties performed by written records can be carried out by means of nonlinguistic symbolic systems and mnemonic devices. In addition, common misconceptions about the nature of writing, as well as the lack of a commonly accepted definition of it, blur the overall picture. In this chapter I address some of the issues concerned with early writing, especially its connection with culture and environment. In my view, one of the most overlooked factors in the analysis of early writing is how writing systems emerged in particular environments. To encompass this, I shall treat writing both as a material and immaterial technology, beginning with a detailed account of the historical evidence and then proceeding to evaluate the environmental, technological, and conceptual dependencies of the writing technique.

SCAFFOLDINGS FOR WRITING

In contrast to diffusion theories popular in the middle of the last century that assumed a single origin for writing, it appears that writing was independently invented several times in history. Grammatologists (those involved in the study of writing systems) use the evocative term *grammatogenesis* (or *grammatogeny*) to label this process. Modern scholars recognize four pristine (i.e., independently generated) grammatogenetical events that occurred in different cultures at different time periods and in distinct geographical contexts as the result of long incubations involving deep transformations in society and environment: (1) cuneiform script in southwestern Asia (~middle of the fourth millennium B.C.E.), (2) Egyptian hieroglyphic in northern Africa (~middle of the fourth millennium B.C.E.),[6] early Chinese script in Central Asia (late thirteenth century B.C.E.), and (4) Mayan hieroglyphics in Mesoamerica (~fourth century B.C.E.). Other scripts, interesting in their own right, can be seen as derived products of cultural contact between literate and illiterate societies. For reasons of space and personal competence, these scripts are referred to only marginally in this chapter.[7] The grammatogenesis of these pristine writing systems is not creation ex nihilo; they invariably relate to other visual systems for storing information, such as calculi, numerical tags, and calendrical systems.

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Of the four writing systems, cuneiform represents the best case for exploring the emergence of writing and its implications for cultural development, cognitive enhancement, social diversification, and environmental change. The available evidence is not only abundant but also covers the long period prior to the establishment of writing as the main technology for record keeping. Nevertheless, generalizations based on the cuneiform scenario are inherently risky. Writing is the product of a complex society and therefore is bound to a variety of intertwined factors standing in multilevel, superimposed, and asymmetrical relationships with one another. The hunt for universals in writing systems, while feasible to some extent, especially in terms of structural features shared by any representational system, is subject to considerations of language, culture, technological changes, sociopolitical developments, and environmental context. These diverse considerations hamper the creation of models of writing as scaffolding for the establishment of complex urban societies.[8] In this regard, it is worth noticing that writing is only one of several technological innovations that contributed to the emergence of the so-called urban revolution in Mesopotamia.

The label *urban revolution* is clearly a misnomer because the "revolution" lasted for roughly one millennium, but it is partly justified by its profound impact on the subsequent modes of human interaction. By the beginning of the third millennium B.C.E., Uruk (modern Warka, in southern Iraq) was a metropolis of 2.5 to 5.5 square kilometers in size (including the lower town), approximately twice the size of classical Athens (fifth century B.C.E.) and only half the size of imperial Rome (first century A.D.).[9] The city probably hosted forty thousand to fifty thousand people, an astonishing number, especially if compared with other settlements of this and subsequent periods. These figures, significant as they may be, only hint at the complexity that characterized urban life in the late fourth millennium B.C.E. The multiplicity of social niches attested to in both archaic written sources (especially the list of professions; see section 5) and archaeological data (monumental complexes, residential quarters, iconographic motives, etc.) is an outcome of prolonged anthropic contact with a variegated landscape, whose cyclical fluctuations in terms of water regimes made possible the development of different strategies for the exploitation of natural resources. The southern alluvium is an area rich in ecological diversity. The Tigris and Euphrates Rivers create a diverse landscape, alternating wetlands, marshes, steppe, plains, lagoons, seas, and wadis, as well as sandy and rocky desert.[10] It is within this landscape that the early urban society first made language visible.

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Tokens and Clay Envelopes

As for Uruk's technological background, we should consider the prehistoric developments that took place over a period of roughly five thousand years, from 8,500 to 3,500 B.C.E.[11] Small clay objects, shaped in a number of different ways, were found in several sites *scattered* over the whole area of southwestern Asia, from Iran to Turkey (Figure 10.1). These objects are referred to in modern literature as *tokens.* According to shape and other features, they may be classified into a threefold typology: simple tokens (shaped as disks, cones, spheres, and other basic geometric forms); derived simple tokens (simple geometric shapes but bearing one or two incisions);[12] and complex tokens (shaped in elaborate ways, bearing several incisions, perforations, painting, or other modifications). Their archaeological context is mostly unclear, but they can be dated with some confidence to this long phase before the advent of writing.

Examples from the first category (i.e., simple tokens) appear roughly at the same time as the domestication of plants and animals by early settlers (roughly 8,000 B.C.E.). Derived simple tokens and complex tokens are found only much later (4,500 B.C.E. in Uruk and 3,500 B.C.E. in Susa and Syria). The interpretation of these objects is still debated. On the basis of later evidence (e.g., the system of the bullae, described below), it seems reasonable—albeit not provable—that simple tokens were used to count some sort of goods.[13] Assemblages of simple tokens might have been put in leather bags or some other sort of perishable container that leaves no trace in the archaeological record. In this case, besides being used as calculi, they might have served the same function of later bullae, which are hollow balls of clay used as envelopes to enclose tokens. (They vary in size from a golf ball to a baseball.) Several details concerning the function of these enigmatic objects are still debated. Apparently, we lack several pieces of the puzzle because strings could have been added to these artifacts to hang the bulla or attach other perishable additional parts carrying information.[14]

Clay envelopes first appear in Uruk and the surrounding region around 3,500 B.C.E. and possibly slightly later in Susa (Iran).[15] The surface of these artifacts is usually covered in its entirety with impressions of cylinder seals, which are administrative devices usually made of stone (a rare material in Uruk, as well as in the whole southern Mesopotamian area), carved with iconographical motifs. These artifacts were rolled on fresh lumps of clay used to seal bullae, jars, rooms, and (later) cuneiform tablets.[16] Up to three different

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seals might be present on a single bulla, each functioning as a sort of signature of an official or an individual in contact with the local administration. The aim was to guard against the falsification of an envelope's content by covering the entire surface with impressions that are not easy to replicate, making any infraction evident.

The study of bullae is complicated by two factors. First, the total number of archaic bullae presently known is rather limited (roughly around 130 exemplars). Second, the content of most of these objects is unknown, since museums are rightfully unwilling to damage these precious documents to look for tokens contained inside. Recently, noninvasive techniques (such as axial tomography) have reached the necessary resolution to allow for the noninvasive study of bullae, but the data are still unpublished. Nevertheless, it seems clear that only simple tokens, or in a few cases derived simple tokens, feature inside the ancient clay envelopes. Derived simple tokens are few in number compared to the abundance of complex tokens. It seems therefore reasonable to conclude that complex tokens served a different function than simple tokens (e.g., complex tokens are possibly unrelated to accounting).[17] The situation is complicated by the fact that some complex tokens show striking similarities with protocuneiform signs found on actual tablets. Nevertheless, there is no correlation between the frequency of complex tokens and the frequency of the alleged corresponding signs. For instance, the sign for *sheep* (a circle with a cross in it) is exceedingly common on tablets, but the *corresponding* token is very rare. One may conclude that there was a shared set of symbols used by early accountants, but the system was fluid. More than one code was probably in use by different people involved (at various levels) in the early urban system.[18]

Returning to the features of bullae, it is remarkable that some of them show what appear to be numerical impressions on the surface, produced in a number of different ways, such as with tokens, fingers, or a reed stylus. The impressions on the outside may or may not correspond to the number of tokens contained inside the bulla. However, it is clear that these marks represent numbers, which are consonant with the metrological systems attested to on another type of document—namely, the numerical tablets found in Uruk, Susa, and Godin Tepe (western Iran on the Zagros Mountains, north of Susa), as well as with protocuneiform tablets of Uruk and Susa.[19] These metrological impressions are not randomly placed on the bulla's surface but instead respect some ordering principle, grouping numerical signs of the same kind in columns or lines. Keeping in mind that more than one code

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could have been in use at a given time, it seems that the ancient accountants impressed numbers representing larger units first and then added impressions for smaller units last. This implies an "advanced numerical syntax,"[20] which is impossible to express using simple tokens alone. One might even speculate that the need for clarifying this syntax in an environment where multiple codes operated brought about the practice of impressing numerical signs on the bulla's surface.[21] Alternatively, the impressions on the outside may serve to prevent (as much as possible) the necessity of breaking the artifact for inspection, at the same time obliterating its future validity. In other words, a quick look at the impressions on a bulla's surface may have been sufficient to retrieve the information concerning its content, thus making the bulla a "double document."[22] The existence of this syntax implies metrological standardization (still an ongoing process at this stage), as well as shared conventions that are transmitted within the frame of an incipient bureaucratic system.

From this short survey, we have seen that bullae are complex artifacts. Besides a clay envelope and tokens, they typically have seal impressions, numerical impressions, and (in some cases) strings passing through them. Only the first two features (envelopes and tokens) in this list are necessary, but in most cases all of them are present in a given bulla. The proper relationship between these elements is hard to ascertain, but later evidence (e.g., sealed contracts from the late third millennium onward) suggests that at least some sealed bullae served as legal documents, binding two parties in a mutual agreement, or as receipts for goods (typically grain or cattle). In case of litigation, or simply when the contract expired, one of the parties could break the bulla and inspect the contents. This situation happened in antiquity because a number of bullae have been found broken in situ.

Insight into the functions of these complex artifacts can be gleaned by examining a much later bulla, dated to 1,400 B.C.E., from the site of Nuzi (Yorghan Tepe, northern Iraq).[23] The document was found in a private house, together with a cuneiform tablet that sheds light on the use of this specific bulla, which contained forty-nine tokens. Both the bulla and the cuneiform tablet bear impressions from the same seal, as well as a cuneiform inscription in Akkadian. The inscription on the bulla appears to be a shortened and perhaps complementary version of the more elaborate inscription on the tablet. The text mentions "49 sheep and goats belonging to Puhishenni, the son of Musapu, which were given over to the care of Ziqarru, the son of Shalliya, the shepherd." It seems therefore that this clay envelope was part of a contract

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between the literate owner of the flock and an illiterate shepherd, who was to pasture the animals in the surroundings of Nuzi for a period of several months. The tablet was meant to protect the owner (e.g., against loss or the substitution of animals with less valuable ones) and remained with him, whereas the bulla was meant to protect the shepherd (e.g., against possible accusation of theft). The envelope possibly traveled with him, but in this exceptional case was returned together with the flock.

Generalizations on the basis of this unique example are not possible, especially since the bulla itself is inscribed with a cuneiform inscription. Nonetheless, it is reasonable to assume that the prehistoric bullae from Uruk and other sites share at least the character of accounting documents, and some of them also potentially have a legal character. This may explain the practice of sealing the entire surface of these objects.[24]

Numerical Tablets: A Space for Counting, a Space for Thought

As noted, numerical impressions are a feature shared both by bullae and "numerical tablets" that are mostly found in Uruk and Susa but also in other sites in Iran (Chogha Mish, Godin Tepe, Tepe Sialk), Iraq (Jemdet Nasr, Nineveh), and Syria (Mari, Nagar, Habuba Kabira, Jebel Aruda). Their proper dating is unclear, but the general consensus is that they probably appeared at the same time as the earliest bullae (3,500 B.C.E.) or possibly slightly later (3400 B.C.E.). The later dating is primarily dictated by reasons of convenience, as it is tempting to place bullae and numerical tablets in a linear "evolution" sequence, but the later dating finds some partial support in the stratigraphic evidence as well.[25]

It must be kept in mind, however, that bullae do not disappear with the advent of numerical tablets or with the rise of cuneiform documents, as proved by a bulla from Tepe Yahya roughly datable to 2,700 B.C.E.,[26] an unprovenanced Old Akkadian bulla (2,300–2,200 B.C.E.),[27] and the much later Nuzi bulla, dated to 1,400 B.C.E. (described above). The same holds true for simple tokens. A very recent find in Tushan (Ziyaret Tepe, southeastern Turkey) proves that these devices, first introduced in the eighth millennium B.C.E., were still in use in a provincial capital of the neo-Assyrian Empire toward the middle of the first millennium B.C.E.[28] Remarkably, several cuneiform tablets were also unearthed there, proving that full-fledged writing and archaic accountability systems coexisted over millennia due to different levels of literacy and bureaucratic demands, which implies that a variety of social niches were extant within the urban ecosystem.

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The label *numerical tablets* is motivated by the fact that only numerical impressions are found on these artifacts (i.e., they do not feature cuneiform signs). Similar to clay envelopes, their surface is usually covered with seal impressions. Contrary to bullae, tablets are not spherical and therefore cannot contain tokens. Contrary to proper cuneiform tablets (from 3,300 B.C.E. on), numerical tablets imply only a limited literacy. This consideration may explain the use of abnormal repetitions of numerical signs otherwise usually bundled together on a bunch of numerical tablets from Jebel Aruda (northern Syria) and other sites in the North. But this explanatory approach may derive from our tendency to rigidly systematize the available data.[29] It has been suggested that numerical tablets may serve the same function as bullae (albeit this is difficult to determine with certainty) but were more practical to produce in comparison to clay envelopes since they do not require shaping tokens or producing a spherical artifact. At Susa, some numerical tablets and bullae were found in the same room and even in the same container.[30] In addition, the same seal impressions are occasionally found on both tablets and bullae at both Uruk and Susa.[31] It is therefore tempting to consider the idea that, at least in some cases, numerical tablets served the same function as the much later Nuzi tablet, found together with the bulla and having the same seal impression. Rather than being an "evolution" of bullae, numerical tablets may therefore have been part of a complementary system of accounting. In any case, one should allow that the system was flexible: the absence of seal impressions on some documents suggests that they may have served a variety of different functions.

Although numerical tablets are not yet connected to spoken language, they represent an important step in the history of writing and, more generally, in the history of human cognition. Having two flat surfaces, they inherently arrange space into distinct parts: obverse, reverse, and edges. The information these tablets provide is thus embedded not only in the numerical signs per se but also in the position within the tablet where the signs occur. In other words, the writing space is *semanticized.* Interestingly, some numerical tablets also feature column division and arrangement into boxes (cases), which involved impressing lines on the surface.[32] This feature appears in protocuneiform and later tablets where there is a fully developed writing system. The advantage of flat "rectangular" tablets over bullae is also one of storage space and ease of filing. We know little about the original archival context of Uruk documents. Early tags (i.e., small perforated tablets) may have been attached with a rope to baskets containing tablets or other items,

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as is the case in later periods. We may also compare the practice of filing tablets on shelves, attested to in Ebla (Tell Mardikh, Syria, ~2,400 B.C.E.). There, some tablets bear inscriptions on the edges and mention the period of time covered by the individual accounts. These indicators apparently served as labels to quickly find documents within the archive, much like book titles in a modern library. Similar conventions had already manifested in a few numerical tablets, bearing numerical impressions on the edge, with or without other impressions on the obverse and reverse, but with seal impressions on the tablet's surface.

The interpretation of the numeric impressions is unclear, but it seems that the numbers on the edges are not sums of the numbers on the obverse or reverse. This tentative explanation may be true since in the earliest stages of protowriting the information space extends beyond the physical limits of the individual documents, allowing a mapping of textual groups and navigation within a possible archive. Whether or not this is operative already in Uruk is hard to say, but at least from the middle of the third millennium B.C.E., this appears to be the case.

These different forms of structuring information open up important cognitive possibilities. Access to data is not only effective but allows for quick comparison between various meaningful segments of information. The indexing in this archaic period ultimately resided in the decoder's mind.[33] For instance, parallel textual sections belonging to multiple texts can be easily compared, evaluating similarities and differences. Even though this process can be replicated in an illiterate society by committing the storage of information to mnemonic systems and nonlinguistic devices, the effort and time required make the task difficult to the point of being exceedingly impractical. In this regard, writing (even protowriting) works as a catalyzing agent for the cognitive process, scaffolding the organization of ideas in ways that are otherwise impossible for spoken language.

THE FIRST SIGNS

Shortly after the middle of the fourth millennium, more complex tablets appeared in Uruk (southern Iraq), Susa (eastern Iran), and Nagar (Tell Brak, northern Syria). These artifacts have been labeled *logonumeric* (or *numeroideographic*) tablets to stress the fact that they bear only one or two signs associated with numbers.[34] The signs presumably denote the items counted or perhaps refer to the individuals (or institutions) involved in the movement

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of goods. Some logonumeric tablets bear cylinder seal impressions. Whereas the signs in both Uruk and Susa tablets make use of the same formal conventions found on later tablets (e.g., signs depicting quadrupeds render the animal head only), the two Nagar tablets seem to use a different convention, representing whole animals.[35] This practice is most probably explained as a local deviation from southern standards; it reflects the fluid situation that characterizes early writing in the vast area of the ancient Near East.[36]

If we focus on differences in representational convention, one notes that numerical signs in Uruk are placed in front of the signs they refer to, whereas the opposite happens in Susa. Yet in both cases, the sign repertoire provided by the logonumeric tablets is rather limited. Nevertheless, it appears that already in this early stage of script development, nonpictographic (or noniconic, but possibly indexical) signs were introduced side by side with pictographic ones (e.g., signs representing jars, plants, birds, or body parts). One must be careful in this respect, though, because we may be unable to identify the right referents of ancient items due to cultural distance. Despite this caution, there is a clear tendency that suggests an intellectual effort to create conventions and possibly to borrow or adapt preexisting elements of the fluid symbolic systems discussed above.

Besides logonumeric tablets, roughly eighteen hundred protocuneiform tablets (including fragments) have been found in Uruk. Each is inscribed with several signs and usually framed in a set of several boxes (cases). These are the most archaic tablets presently known. They are labeled Uruk IV, from the name of the archaeological level of the site, and can be dated to approximately 3,300 B.C.E. A second, larger group (roughly forty-five hundred texts and fragments), labeled Uruk III, is dated to around 3,100–2,900 B.C.E. Unlike Uruk IV tablets, Uruk III tablets stem from many sites in southern Mesopotamia (Eshnunna, Kish, Larsa, Umma, Jemdet Nasr, Tell Uqair, Ur) and show a rather quick diffusion of the writing technology. The signs on protocuneiform tablets are arranged in rectangular cases (or boxes). Each case contains an administrative entry, composed by numerals, logograms (word-signs), or both. Within each case, numerals are grouped together in formalized sequences, respecting older conventions already found in bullae, whereas logograms (word-signs) are freely placed. That means that there is no "grammatical" order if two or more signs are present within the same case; this must be supplied by the decoder. The textual cases vary in size, but their mutual position is not random. Depending on tablet format, the division into columns and subcolumns allows the decoder to retrieve information

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on the relationship between the content of a given box and those that it surrounds. The writing space is thus semanticized into units that may relate to one another, such as in the case of balanced accounts or in texts showing rather elaborate summations.

This spatial syntax was already present in the numeric tablets, but it lacked the systematization found on Uruk IV and Uruk III tablets. Intriguingly, the dissemination of this writing technology corresponds to the end of the Uruk phenomenon. Contemporary to Uruk III in Susiana, an entirely different system was conceived *(proto-Elamite)*. It is mostly undeciphered because it died out shortly after its introduction. The proper archaeological context of most of the tablets from Uruk is both unclear—because the original excavators were not yet aware of stratigraphic methods—and disturbed—because they were found in dump areas. In addition, the content of protocuneiform texts is partly opaque to us due to their archaism. Regardless, it is clear that the documents fall into two distinct categories: administrative texts and lexical lists. Most documents belong to the former category,[37] which includes records of various kinds of commodities in relation to individuals and institutions, whereas lexical lists are documents listing thousands of words, mostly thematically organized: animals, cities, fish, food items, professions, metals, plants, vessels, garments, and wood objects (inter alia). On the basis of this evidence, there is little doubt that writing in Mesopotamia emerged in response to practical needs—namely, to keep track of the goods produced and moved within the early state.

SOME REFLECTIONS ON THE USE OF WRITING AND ITS COGNITIVE IMPLICATIONS

Lexical lists have often been described as the prime tool for the transmission of scribal knowledge.[38] Their great authority is evident from the fact that these documents were copied over and over again for centuries, with only minimal deviations from the original. The archaic list of professions is already attested to in Uruk IV (3,300 B.C.E.) and spread from there to most of the Mesopotamian world. It was still copied in Nippur, the most prestigious center for scribal education at that time, in the very heart of Babylonia, around 1,800 B.C.E. Despite the fact that lexical lists do not contain the totality of cuneiform signs observable in the documents of a given period, it is clear that they contributed to the stability and perpetuation of the writing system. This facilitated scribes in learning how to produce well-formed and meaning-

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ful signs, but it also had cognitive implications. Lexical lists promoted framing concepts within a visual, symbolic representation system. To some extent, cuneiform writing inherently generates a taxonomy, which in turn stimulates intellectual reflection on the world as perceived through the prism of written language. Lists are thus a new way of looking at the world, ordering reality into fixed architectures upon which scribal knowledge is structured.

This willingness to classify and order the cosmos is also evident in the effort to establish standards for weights and measures—a crucial concern of any administration. This segmentation of reality into discrete units (an early "digitalization process") led to the artificial division of a day into twenty-four hours and a month into thirty days. Administrative time was born. This was essential to calculate things such as the workforce needed and the grain rations to be disbursed for construction work or some similar task, as possibly recorded on several Uruk tablets. The metrology of these archaic texts is indeed rather intricate. Several systems were in use at the same time, depending on what was being counted. Besides area and time measures, one finds two different sexagesimal systems used to count dairy products and textiles, on the one hand, and dead animals and jars, on the other. Two bisexagesimal systems were used to count different grain products, cheese, and fish disbursed as rations. As for the cognitive implication of this standardization, it seems relevant here that "slaves" appear to be treated according to the same metrological conventions that apply to animals. They are also represented on cylinder seal motifs.

Despite the fact that this practice is primarily bureaucratic in nature, there is little doubt that it contributed to the mental process of self-identification within the literate part of society in terms of a contrast with its subordinate. The emergence of writing is of little impact in promoting empathy as a structural feature of cooperative behavior, except perhaps among those who share the technology.[39] Instead, the application of this technology seems to stimulate social stratification, especially in terms of the enslavement of foreign people, which Lévi-Strauss had already concluded for cultures in South America.[40] In his words:

> Si mon hypothèse est exacte, il faut admettre que la fonction primaire de la communication écrite est de faciliter l'asservissement. L'emploi de l'écriture à des fins désintéressées, en vue de tirer des satisfactions intellectuelles et esthétiques, est un résultat secondaire, si même il se réduit pas le plus sovent à un moyen pour renforcer, justifier ou dissimuler l'autre.[41]

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This provocative position seems too extreme when applied to the origin of writing in Mesopotamia. Writing technology emerged there as a consequence of accountability needs that were not immediately related to enslavement. It is difficult to state with certainty a "primary function" for this writing technology, but it is possibly most tightly connected to the prediction of future events within the productive system on the basis of past accounts. This seems to be a contrastive element of writing as opposed to other mnemonic devices used in early city administration. The difference lies not just in the fact that a full-fledged writing system is capable of expressing any message, whereas other systems, such as the bullae, do not. In more practical terms, the difference is that writing enormously facilitates the quantification and statistical prediction of future recurrent events based on recorded history. In conformation with this view, it is worth noticing that many of the protocuneiform texts have recently been interpreted as contingency tables, such as a means for estimating the amount of grain to be harvested in the forthcoming season based on data recorded in previous seasons.[42] In addition, writing surpasses other solutions for retaining information when reporting to a higher authority. A well-structured bureaucratic apparatus necessitates the rigid verbalization of written records.[43]

It is worth stressing that our modern perception of writing as a pervasive phenomenon within contemporary society has little to do with ancient evidence. Scribal knowledge was limited to a few individuals belonging to the urban elite. Additionally, it took roughly seven hundred years for Mesopotamian scribes to conceive and create a document that was not either administrative or lexical in nature. Thus, the domain of writing remained restricted to city administration for a very long period of time, proving that there is no obvious evolutionary progression in the history of writing. It is only close to the twenty-sixth century B.C.E. that literary texts appear as a different genre, possibly as a result of the prolonged contact between Sumerian and Akkadian cultures in the South.

ENVIRONMENT AND WRITING: THE CASE OF MESOPOTAMIA

When dealing with the invention of cuneiform writing, most authors hold that clay was chosen as a medium because it was cheap and abundant in Mesopotamia. This explanation is rather simplistic because clay was also abundant in the environments where other pristine writing systems emerged but

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other media were preferred.[44] In Egypt, the earliest writing is attested to on bone and ivory tags; only later is it found on stone and papyrus.[45] In China, turtle shell or bone was used in addition to bamboo strips.[46] In Mesoamerica, Mayan scribes wrote on animal skin, bark paper, vessels, and stone.[47] In light of these facts, clay is not so obvious a choice in Mesopotamia despite its wide availability. Instead, the choice of clay is better explained in terms of the existence of the bullae system, which in turn makes sense only in the variegated environment hinted at above (see section 2).

The alternating wet and dry areas in southern Mesopotamia promoted the emergence of what has been labeled a *dimorphic* society, where seminomadic human groups coexisted with permanent settlers in a mutually dependent relationship that was established over a long period of progressive climatic drying.[48] The dynamics of social interactions between these two groups are not always easy to ascertain because of biases in the available documentation. Seminomad pastoralists leave few traces in the archaeological record and are seldom mentioned in the written sources concerned with urban bureaucracy.[49] This is especially true for fourth millennium Uruk because the site was only partly excavated, and the relatively few cuneiform texts unearthed there are not completely understood due to their very archaic nature. It is risky to use data from much later periods (e.g., the end of third and the beginning of second millennia B.C.E. Mesopotamia) as a basis for projecting back to the situation toward the end of the first urbanization phase. What can be observed from later sources is that permanent settlers progressively developed a production system based heavily on cereal monocultures, which were mass produced thanks to technological innovations first introduced in the period of incipient urbanization (e.g., seeder plow, threshing sledge, water canalization, short-field irrigation), as well as social stratification (e.g., organization of labor to work and maintain the fields or dig canals). The seasonal contact between settlers and seminomads occurred right after harvesting, when the flocks were taken to graze fields in a mutually beneficial situation: the animals fertilized the soil while using up the remainder of plant stalks as fodder.

The social boundaries between the "movable" and "immovable" parts of this society were not rigid. "Settlers" could certainly transit in and out of "seminomadic" clans and vice versa.[50] How much this applies to Uruk everyday life is difficult to state, in part because the city's economy seems to have relied not only on agriculture and animal husbandry but also on the exploitation of marsh resources, such as fish and reed, which were abundant

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in this period. However, it seems reasonably certain that animal husbandry was mostly performed outside the cities, regardless of the proper social connotation of the local human groups involved in seasonal large-scale movements. According to both epigraphic and iconographic evidence (e.g., cylinder seal motifs), domesticated animals (mostly sheep, goats, oxen, and pigs) were exploited in Uruk as alimentary resources (meat and dairy products), for the production of goods (wool, sinew, etc.), and possibly as draft animals (though this practice is rarely attested to in the earliest documents).[51] When settlements grew in size and complexity, institutions in charge of the management of surplus cattle and grain emerged within the newly established urban society. This created a need for an accounting system, whose development over millennia can be traced as described above.

The bullae system was likely invented within this scenario and perhaps subsequently adapted to account not only for animals and grain but also other goods and labor, but this remains speculative. Clay envelopes operated as points of contact between an increasingly literate social group belonging to the city administration and an illiterate one deeply embedded in and circulating around the rural landscape. The ecological factor, intertwined with cultural development and environmental exploitation, was crucial for the development of an accountability system that propelled writing into the *Kulturtechniken* expressed in ancient Near Eastern societies while freely borrowing a number of features from other preexisting solutions. Clay was chosen as a medium not only because of its availability but also because of the habit of producing sealed documents and the need to continue doing so. Clay is well suited as a sealing medium, providing a continuous surface that can also bear identifying marks (e.g., seal impressions), and is much more durable and less expensive than textiles, leather, or other containers. Additionally, the materiality of bullae might depend on much older practices, such as the production of pottery and bricks. From this point of view, the choice of writing medium was one of the most deeply entrenched features in the process of knowledge transmission, which depended on ecological circumstances that nurtured processes of cultural evolution and facilitated the origin of writing and subsequent transformations in human cognition.

In this chapter I intentionally avoided applying the term *evolution* to writing systems.[52] This is partly due to my expertise, which is limited to the field of ancient Near Eastern studies, but also reflects a common practice within

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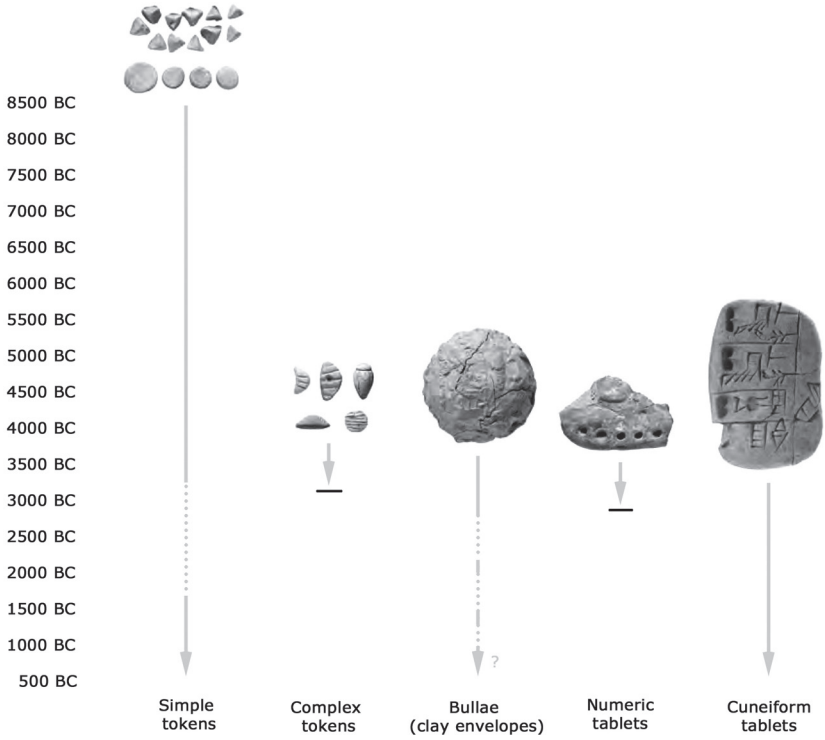

Figure 10.1. Distribution through time of accounting devices and written documents. Modified after Woods (2010) to include new data published by MacGinnis et al. (2014) and Monaco (2014).

this field that prefers more neutral terms, such as *change, transformation, development,* or *adaptation* of the system. This practice originated as a reaction to the *Ex oriente lux* paradigm, a reformulation of the once fashionable diffusion theory, according to which civilization first appeared in Mesopotamia and spread from there. Even taking the term *evolution* as a metaphor, few modern scholars are willing to consider protocuneiform tablets as evolving from the bullae system since the former is glottographic (i.e., it conveys meaning and words, as expressed in a given language), whereas the latter is semasiographic (i.e., it conveys meaning without expressing a specific language). This distinction is functional, but it masks an important shared feature in the fluid development of accountability systems, which constitutes a fundamental step in the construction of both material and immaterial structures that are manifestations of the cultural evolution process.

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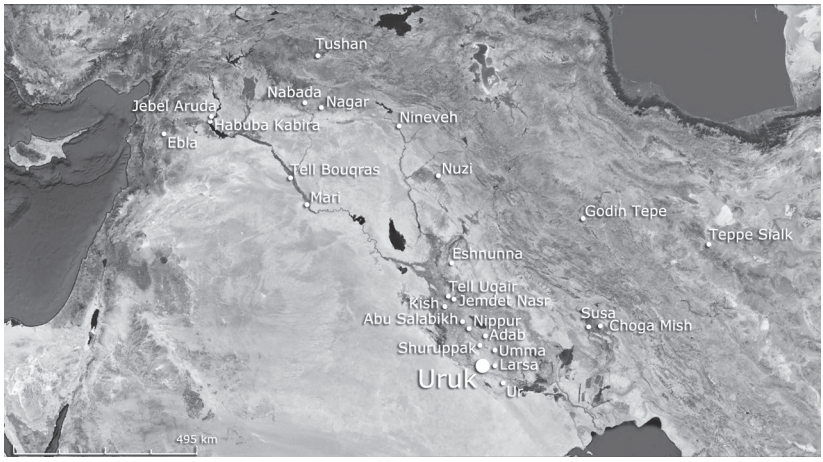

Figure 10.2. Map of the ancient Near East showing the sites mentioned in this chapter. Map data: Google; DigitalGlobe.

Without arguing explicitly for a linear evolutionary path from bullae to cuneiform tablets, it is worth keeping in mind that the numerical systems expressed in bullae are consonant with those appearing in protocuneiform tablets. In addition, bullae may share some of the functions expressed by cuneiform documents, such as their possible legal nature. There is no clear-cut boundary between writing and nonwriting within the cuneiform evidence; for a long period of time, tablets expressed extremely limited linguistic information (i.e., they were *mostly* semasiographic in nature). Most notably, clay as a medium for both systems stands out as a deeply entrenched feature in the development of the early Mesopotamian writing system. In light of these considerations, it seems useful to reconsider parallel attempts in the creation of tools for the maintenance of early city bureaucracy (sealing practices, tokens, bullae) and interpret them as scaffolds for the emergence of protocuneiform, rooted in a varied environment that exhibits the primary factors accounting for the existence of the writing technology. The need for managing a surplus created within the first urban societies stimulated the advent of writing as a technology for the more efficient exploitation of natural and human resources. In turn, this promoted cognitive developments, intellectual achievements, social diversification, craft specialization, and the possibility of more effective preservation, transmission, and intensification of knowledge, which we now perceive as one of the most important features of our own civilization.

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NOTES

1. To a contemporary historian, this is clearly an exaggeration. First, there is obviously a "history before history"; modern archaeological techniques make available large amounts of data that rival in size, and often complement, what is known from written records. Second, depending on the definition adopted, writing may be considered either as an invented technique or as a slow development that emerged over several centuries. In addition, important ancient civilizations, such as the Inca in Mesoamerica, may or may not be acknowledged as literate, which invites us to reflect on how fragile modern definitions can be when applied to complex systems. Finally, we should consider that several undeciphered scripts, no matter how sophisticated they may appear, may or may not turn out to be actual writing (e.g., Rongorongo on Easter Island or the Indus script).

2. Cancik-Kirschbaum (2012, 131–32).

3. It is worth noticing here that the exploitation of associative capabilities is a built-in feature of all pristine writing systems, which are nonalphabetic in nature. An in-depth treatment of the typologies of writing systems and of their structural features is not possible here. It suffices to say that logographic systems, which are based on logograms—i.e., word-signs, invariably combine basic graphemes in order to be able to express large amounts of words with a limited repertoire of signs. For instance, in cuneiform the sign for *female worker, female slave,* read /geme/ in Sumerian (probably the underlying language of early cuneiform), is obtained by juxtaposition of the signs for *woman* and for *mountain, foreign land,* read *munus* and *kur,* respectively. The resulting sign thus suggests the para-etymology *foreign woman, woman from the mountains* for female slave, which is just not there in spoken language (cf. also the discussion on *creative etymology* in Glassner [2003, 54]). Again, for reasons of economy, in order to contain the total number of signs to be learned by the encoder, logographic systems exploit the so-called rebus principle: words that sound similar are written down with the same sign. For instance, the sign for *garden,* read *sar* in Sumerian, is also used to express the word *to write,* again pronounced *sar.* Not surprisingly, the goddess of writing is primarily connected with vegetation in the Sumerian pantheon. The application of the rebus principle thus connects otherwise semantically unrelated words. Thus, the visual nature of written language promotes indexicality and associations of otherwise poorly connected ideas.

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4. It is not possible to explore here the details of the development of religious thought in early Mesopotamia. It suffices to say that the joint efforts of the workforce under the supervision of a central authority, combined with technological innovations and favorable environmental conditions, produced a large surplus. However, the producers were required to deliver such surplus to organizations embedded in a system primarily devoted to accumulation and redistribution—a painful process for the producers, which requires an ideological explanation ultimately residing in religious thought via divine legitimization of the elite. Cf. Liverani (2006, 33).

5. Gelb (1952).

6. Whether Egyptian hieroglyphics resulted from a stimulus-diffusion process with cuneiform is still debated. The absolute chronology of the earliest Uruk evidence is not well established, so it may or may not turn out to be older than Egyptian hieroglyphics. However, the inclusion of the latter as distinct is granted by the fact that the system is radically different from cuneiform, even if cultural contact with Mesopotamia promoted its invention.

7. The grammatogenesis of nonpristine systems is complex and includes nuances such as the basic idea of making language visible and that a certain set of systemic features may pass from one side to the other in the interaction process. In most cases, a certain linguistic competence and proficiency in reading and writing by the inventor of the new system is implied, as well as ideological motivations. The phenomenon is therefore labeled *sophisticated* grammatogenesis (Daniels 1996a, 579–85), as opposed to writing systems produced by individuals with no previous training in reading and writing. An example of an unsophisticated grammatogenesis is provided by the alphabet (eighth century B.C.E., eastern Mediterranean coast). It is best conceived as a case of imperfect transmission of knowledge between a literate Phoenician and an illiterate Greek (Gnanadesikan 2009, 208–28). This is different from the internal development of a script, which is a much slower process that happens within a given literate entity, such as a scribal school, and thus subject to conservative rules.

8. The term *complexity* is sometimes abused in modern literature (see chapter 13; Verhoeven 2010). The complexity of the ancient Uruk urban system does not derive merely from the increase in the total number of people settling this site, which can be conceived as nodes in a network diagram, or by counting the number of possible interactions within the extended group of individuals (edges connecting the nodes). Social life in Uruk is complex

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in the sense that the interactions belong to different systemic elements, which include administrative entities that are hierarchically organized in addition to social groups and nuclear and extended families. The existence of such a complex network of material and immaterial relationships (e.g., the exchange of goods, services, knowledge, ideas, and ideology) is an identifying mark of cities as opposed to villages and towns (cf. Liverani 2006, 20–22).

9. Estimates vary on the actual size of Uruk at the very end of the fourth millennium B.C.E. due to the fact that the site is only partly excavated (cf. Nissen 1988, 71–72; Finkbeiner 1991, 193–94).

10. For a more detailed description of the water regimes and ecology of southern Iraq, see Pournelle (2013, 13–23, 28–29).

11. See Schmandt-Besserat (2010) and Michalowski (1993). The discussion here is limited to possible direct antecedents of writing, but several other crucial technical developments, such as the domestication of plants and animals, techniques for storing alimentary items (pottery), maximizing production (clay sickles, seeder plows, or threshing sledges), and processing food (grindstones and ovens) appear over this long period. These important innovations underpinned the possibility of accounting and writing and therefore may be regarded as scaffolds for scaffolds.

12. Englund (2006, 17); Monaco (2014).

13. What kind of goods exactly remains unclear. Due to the vast geographical extension of the token system, it seems improbable that only one code was in use. Tokens of a given typology were probably used to count different items in different areas, or possibly even among different human groups in the same area. The interpretation of tokens as calculi was put forward by Amiet (1966) and further developed by Schmandt-Besserat (1992, 1995, 2012; for a critical review, see Zimansky 1993 and Michalowski 1993). The practice of tallying (and possibly of basic arithmetic operations) is rooted in a much more distant past when other products of the human symbolic mind first emerged, including the practice of inhumation, jewelry making and wearing, and painting. The earliest tally sticks, such as the Lebombo bone (43,000 to 41,000 B.C.E.) and the Ishango bone (18,000 to 20,000 B.C.E.), stem from Africa and Western Asia. The interpretation of the latter is controversial. It is possible that this artifact was used not just for counting (e.g., keeping track of time elapsed from a certain event, such as the last new moon) but to perform simple mathematical calculations (the addition of numbers up to sixty and division by two). For an overview of the development of a symbolic repertoire in ancient Near Eastern art and material culture, see

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Stordeur (2010). All these and similar objects deserve more attention than can be given here.

14. Woods (2015).

15. Cf. Englund (2004, 28n7) for a possible attribution of early unprovenanced bullae to the sites of Umma and Adab, respectively some 40 and 120 kilometers north/northeast of Uruk.

16. Cylinder seals replaced the much older stamp seals, first attested in Syria (Tell Bouqras and other sites) around 6,500 B.C.E. These objects apparently cover a number of different functions and can also be interpreted as amulets (Porada 1993).

17. Zimansky (1993) makes the point that at least some of these objects are better classified as beads.

18. Michalowski (1990, 1993).

19. Englund (2006, 21).

20. Englund (2006, 22).

21. A similar extension of the capability of the bullae's representational system is found on the Nuzi bulla, whose cuneiform inscription specifies what kind of animals (male and female, adult or not) are to be overseen by the shepherd. These details are otherwise not expressed by the undifferentiated tokens inside this specific clay envelope.

22. Lieberman (1980, 352).

23. Abusch (1981).

24. According to Dittmann (1986), the seal impressions replace actual personal names, as found in later tablets.

25. Cf. Englund (1998, 56) for a tentative reconstruction of the Susa stratigraphy. Nothing certain can be said for the situation in Uruk.

26. Englund (2006, 16).

27. Monaco (2014).

28. MacGinnis et al. (2014).

29. See, for instance, Englund (1998, 51, Figure 13).

30. Schmandt-Besserat (1992, 132n38).

31. Schmandt-Besserat (1992, 154); Englund (1998, 56).

32. Cf. the text W 6245,c in Englund (1998, 52).

33. Library catalogs exist from the period of the Third Dynasty of Ur (2,150–2,000 B.C.E.), though they are rare.

34. *Logonumeric* is preferred here because in later cuneiform tablets signs represent actual words and not just vague ideas or concepts (see also Cooper 2004).

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35. Finkel (1985, 187–89).

36. The other possible explanation is that these tablets represent an earlier stage of writing, but this is not provable because of the disturbed stratigraphic context. Also, this idea is bound to the old and outdated view of Uruk colonies in the North. The Uruk presence there is complicated (cf. Stein 2002). This seems to be yet another "gray zone" of writing, which should be added to the array of possible outcomes of cultural contact between Uruk and indigenous cultures, including the imitation and the shallow adoption of writing according to local standards (Nagar?), sophisticated grammatogenesis (proto-Elamite script in Susa, contemporary with Uruk III), and reluctant attitudes to accept writing (Lamberg-Karlovsky 2003, 63). In the latter case, the explanation for the missed dissemination of the writing technology probably lies in the fact that rural areas, where dry agriculture is largely possible, are less likely to necessitate writing, as there is no need for canalizations, which in turn imply workforce management, storage, and the transformation of surplus. All these practices seem to be the prime movers for the invention of writing in southern Mesopotamia.

37. The proportion of lexical to administrative texts varies through time. Less than 1 percent of Uruk IV tablets are lexical, but the figure rises to 20 percent for Uruk III material (cf. Englund 2006, 28).

38. Veldhuis (2006).

39. Mullins, Whitehouse, and Atkinson (2013, 147–48).

40. Lévi-Strauss (1955, 354–55).

41. "If my hypothesis is correct, it would oblige us to recognize the fact that the primary function of written communication is to facilitate slavery. The use of writing for disinterested purposes, for the sake of intellectual and aesthetic pleasure, is a secondary result, and more often than not it may even be turned into a means of reinforcing, justifying, or dissimulating the other (i.e. its primary function)."

42. Woods (2015).

43. Steinkeller (2003, 2004).

44. The initial steps in the development of writing systems in ancient Egypt, China, and Mesoamerica are not as well documented as in Mesopotamia. It is therefore more difficult to assess, for instance, whether there was a primary medium used to write those scripts (Postgate, Wang, and Wilkinson 1995). Space constraints prevent a more detailed description of later script phases for individual writing systems and the possible implications for the consequent development of the relative media.

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45. Baynes (2004); Stauder (2010).

46. Bagley (2004); Boltz (1986); Bottéro (2004); Shaughnessy (2010).

47. Houston (2004, 287–88); Palka (2010).

48. Cf. preliminary remarks in Rowton (1977).

49. As far as Mesopotamia is concerned, privileged epigraphic sources for the study of the seminomadic component within the urban scenario are the archives of Mari (Tell Hariri), on the Middle Euphrates, dated to the early second millennium B.C.E. (cf. Charpin and Durand 1986; Durand 2004).

50. Porter (2009).

51. Englund (1995; 1998, 94–95).

52. One can describe the development of writing systems as a purely Darwinian process (cf. Lock and Gers 2012). Although the family tree of writing systems' typologies is a useful tool, it does not do justice to the fact that no system is "pure" (as already acknowledged by Gelb [1952]). For instance, a syllabic or logosyllabic script under circumstances such as the case of writing foreign names or loanwords may use syllable-signs that are meant to represent only the consonantal part (the last vowel remains silent). Within cuneiform, certain archives, such as the merchant letters of Old Assyrian entrepreneurs in Anatolia (1900 B.C.E.), are written mostly syllabically and with a limited repertoire of signs. Regardless of its simplicity, this system did not spread, likely for reasons of prestige associated with the old tradition and politics. A logoconsonantal script, such as Egyptian hieroglyphics, has the built-in capability of a consonantal alphabet but remains mostly unexploited. Conversely, written English is alphabetic but has a remarkable tendency to maintain historical spellings that only loosely represent their spoken counterparts at a phonemic level. As for scripts, it is true that scribal hand can be transmitted over generations, but the fitness of a script depends on both material (the availability of media, pupils, etc.) and immaterial factors (politics, culture, esthetic appeal, etc.). If dual-inheritance theories are reformulated to fit the script scenario, then they must take account of this complex and heterogeneous environment.

REFERENCES

Abusch, T. 1981. "Notes on a Pair of Matching Texts: A Shepherd's Bulla and an Owner's Receipt." In *In Honor of Ernest R. Lacheman on His Seventy-Fifth Birthday, April 29, 1981,* edited by M. A. Morrison and D. I. Owen, 1–9. Stud-

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ies on the Civilization and Culture of Nuzi and the Hurrians 1. Winona Lake, Ind.: Eisenbrauns.

Amiet, P. 1966. "Il y a 5000 ans les elamites inventaient l'ecriture." *Areheologia* 12:16–23.

Bagley, R. W. 2004. "Anyang Writing and the Origin of the Chinese Writing System." In Houston 2004, 190–249.

Baynes, J. 2004. "The Earliest Egyptian Writing: Development, Context, Purpose." In Houston 2004, 150–89.

Biggs, R. D. 1967. "Semitic Names in the Fara Period." *Or NS* 36:55–66.

Boltz, W. G. 1986. "Early Chinese Writing." *World Archaeology* 17:420–36.

Bottéro, F. 2004. "Writing on Shell and Bone in Shang China." In Houston 2004, 250–61.

Buccellati, G. 2013. *Alle origini della politica: La formazione e la crescita dello Stato in Siro-Mesopotamia.* Milano: Jaca.

Cancik-Kirschbaum, E. 2012. "Writing, Language, and Textuality: Conditions for the Transmission of Knowledge in the Ancient Near East." In *The Globalization of Knowledge in History,* edited by Jürgen Renn, 125–52. http://www.edition-open-access.de/studies/1/toc.html.

Cavigneaux, A. 1989. "L'écriture et la réflexion linguistique en Mésopotamie." In *Histoire des idées linguistiques, tome 1: La naissance des métalangages en Orient et Occident,* edited by S. Auroux, 99–118. Liège, Belgium: Mardaga.

Charpin, D., and D. Durand. 1986. "Fils de Sim'al: Les origines tribales des rois de Mari." *Revue D'Assyriologie* 80:141–83.

Christy, T. C. 1989. "Humboldt on the Semiotic of Writing." In Rauch and Carr 1989, 339–46.

Civil, M. 1973. "The Sumerian Writing System: Some Problems." *Orientalia* 42:21–34.

Cooper, J. 2004. "Babylonian Beginnings—The Origin of the Cuneiform Writing System in Comparative Perspective." In Houston 2004, 71–99.

Damerow, P. 1998. "Prehistory and Cognitive Development." In *Piaget, Evolution, and Development,* edited by J. Langer and M. Killen, 247–70. Mahwah, N.J.: Lawrence Erlbaum.

Damerow, P. 2006. "The Origins of Writing as a Problem of Historical Epistemology." *Cuneiform Digital Library Journal* 1:1–10.

Damerow, P. 2012. "The Origins of Writing and Arithmetic." In *The Globalization of Knowledge in History,* edited by Jürgen Renn, 153–74. http://www.edition-open-access.de/studies/1/toc.html.

Copyright 2019 by the Regents of the University of Minnesota

Daniels, P. T. 1992. "The Syllabic Origin of Writing and the Segmental Origin of the Alphabet." In *The Linguistics of Literacy,* edited by P. Downing, S. D. Lima, and M. Noonan, 83–110. Typological Studies in Language 21. Amsterdam: John Benjamins.

Daniels, P. T. 1996a. "The Invention of Writing." In Daniels and Bright 1996, 579–86.

Daniels, P. T. 1996b. "The Study of Writing Systems." In Daniels and Bright 1996, 3–17.

Daniels, P. T., and W. Bright, eds. 1996. *The World's Writing Systems.* Oxford: Oxford University Press.

Dittmann, R. 1986. "Seals, Sealings, and Tablets." In *Ǧamdat Naṣr: Period of Regional Style?* (Beihefte zum Tübinger Atlas des Vorderen Orients, reihe B 62), edited by U. Finkbeiner, and W. Röllig, 332–66. Wiesbaden, Germany: Dr. Ludwig Reichert.

Durand, J.-M. 2004. "Peuplement et sociétés a l'époque amorrite (I) Les clans bensim'alites." In *Nomades et sedentaires dans le Proche-Orient ancien: Compte rendu de la XLVIe Rencontre Assyriologique Internationale (Paris, 10–13 juillet 2000),* edited by C. Nicolle, 111–98. Amurru 3. Paris: Editions Recherches sur les Civilisations.

Englund, R. K. 1995. "Late Uruk Period Cattle and Dairy Products: Evidence from Proto-cuneiform Sources." *Bulletin of Sumerian Agriculture* 8:33–48.

Englund, R. K. 1998. "Texts from the Late Uruk Period." In *Mesopotamien: Späturuk-Zeit und Frühdynastische Zeit,* edited by J. Bauer, R. K. Englund, and M. Krebernik, 15–233. Orbis Biblicus et Orientalis 160/1. Göttingen, Germany: Vandenhoeck and Ruprecht.

Englund, R. K. 2004. "Proto-Cuneiform Account-Books and Journals." In *Creating Economic Order: Record-Keeping, Standardization and the Development of Accounting in the Ancient Near East,* edited by M. Hudson and C. Wunsch, 23–46. Bethesda, Md.: CDL Press.

Englund, R. K. 2006. "An Examination of the 'Textual' Witnesses to Late Uruk World Systems." In *A Collection of Papers on Ancient Civilizations of Western Asia, Asia Minor and North Africa,* edited by Yushu Gong and Yiyi Chen, 1–38. Oriental Studies Special Issue. Beijing.

Finkbeiner, U. 1991. *Uruk, Kampagne 35–37, 1982–1984: Die archäologische Oberflächenuntersuchung (Survey).* AUWE 4. Mainz: von Zabern.

Finkel, I. 1985. "Inscriptions from Tell Brak 1984." *Iraq* 47:187–201.

Gelb, I. 1952. *A Study of Writing: The Foundations of Grammatology.* Chicago: University of Chicago Press.

Copyright 2019 by the Regents of the University of Minnesota

Glassner, J.-J. 2003. *The Invention of Cuneiform: Writing in Sumer.* Baltimore: Johns Hopkins University Press. Translation of *Ecrire à Sumer: L'invention du cunéiforme.* Paris: n.p, 2000.

Gnanadesikan, A. 2009. *The Writing Revolution: Cuneiform to the Internet.* Chichester, UK: Wiley-Blackwell.

Houston, S. D., ed. 2004. *The First Writing: Script Invention as History and Process.* Cambridge: Cambridge University Press.

Krebernik, M. 1998. "Die Texte aus Fāra und Tell Abū Ṣālābīḫ." In *Mesopotamien. Späturuk-Zeit und Frühdynastische Zeit,* edited by J. Bauer, R. Englund, and M. Krebernik, 237–427. Orbis Biblicus et Orientalis 160/1. Fribourg, Switzerland: Fribourg University Press.

Lamberg-Karlovsky, C. C. 2003. "To Write or Not to Write." In *Culture through Objects: Ancient Near Eastern Studies in Honour of P. R. S. Moorey,* edited by T. F. Potts, M. Roaf, and D. L. Stein, 59–75. Oxford: Griffith Institute.

Lévi-Strauss, C. 1955. *Tristes tropiques.* Paris: Plon.

Lieberman, S. J. 1980. "Of Clay Pebbles, Hollow Clay Balls, and Writing: A Sumerian View." *American Journal of Archaeology* 84:339–58.

Liverani, M. 2006. *Uruk The First City.* London: Equinox. (Original Italian edition 1998.)

Lock, A., and M. Gers. 2012. "The Cultural Evolution of Written Language and Its Effects." In *Writing: A Mosaic of New Perspectives,* edited by E. Grigorenko, E. Mambrino, and D. Preiss, 11–35. New York: Psychology Press.

MacGinnis, J., M. W. Monroe, D. Wicke, and T. Matney. 2014. "Artefacts of Cognition: The Use of Clay Tokens in a Neo-Assyrian Provincial Administration." *Cambridge Archaeological Journal* 24:289–306.

Michalowski, P. 1990. "Early Mesopotamian Communicative Systems: Art, Literature, and Writing." In *Investigating Artistic Environments in the Ancient Near East: Essays Presented at a Symposium Held in April 1988 at the Arthur M. Sackler Gallery,* edited by A. C. Gunter, 53–69. Washington, D.C.: Smithsonian Institution.

Michalowski, P. 1993. "Tokenism." *American Anthropologist* 95:996–99.

Michalowski, P. 1994. "Writing and Literacy in Early States: A Mesopotamian Perspective." In *Literacy: Interdisciplinary Conversations,* edited by D. Keller-Cohen, 49–70. Cresskil, N.J.: Hampton Press.

Michalowski, P. 1996. "Mesopotamian Cuneiform: Origin." In Daniels and Bright 1996, 33–36.

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Michalowski, P. 2008. "Sumerian." In *The Ancient Languages of Mesopotamia, Egypt, and Aksum,* edited by R. Woodard, 6–46. Cambridge: Cambridge University Press.

Monaco, S. 2014. *Archaic Bullae and Tablets in the Cornell University Collections.* Cornell University Studies in Assyriology and Sumerology (CUSAS) 21. Bethesda: CDL Press.

Mullins, D. A., H. Whitehouse, and Q. D. Atkinson. 2013. "The Role of Writing and Recordkeeping in the Cultural Evolution of Human Cooperation." *Journal of Economic Behavior & Organization* 90: 141–51.

Nissen, H. 1986. "The Archaic Texts from Uruk." *World Archaeology* 17:317–34.

Nissen, H. 1988. *The Early History of the Ancient Near East, 9000–2000 B.C.* Chicago: University of Chicago Press.

Nissen, H., P. Damerow, and R. Englund. 1993. *Archaic Bookkeeping: Writing and Techniques of Economic Administration in the Ancient Near East.* Chicago: University of Chicago Press. (Original German edition 1990.)

Palka, J. 2010. "The Development of Maya Writing." In Woods, Teeter, and Emberling 2010, 225–29.

Porada, E. 1993. "Why Cylinder Seals? Engraved Cylindrical Seal Stones of the Ancient Near East, Fourth to First Millennium B.C." *Art Bulletin* 75:563–82.

Porter, A. 2009. "Beyond Dimorphism: Ideologies and Materialities of Kinship as Time-Space Distanciation." In *Nomads, Tribes, and the State in the Ancient Near East: Cross-Disciplinary Perspectives,* edited by J. Szuchman, 201–25. Oriental Institute Seminars 5. Chicago: Oriental Institute of the University of Chicago.

Postgate, N., T. Wang, and T. Wilkinson. 1995. "The Evidence for Early Writing: Utilitarian or Ceremonial?" *Antiquity* 69:459–80.

Pournelle, J. R. 2013. "Physical Geography." In *The Sumerian World,* edited by H. Crawford, 13–32. London: Routledge.

Rauch, I., and J. Carr, eds. 1989. *The Semiotic Bridge.* Approaches to Semiotics 86. New York: Mouton de Gruyter.

Rowton, M. B. 1977. "Dimorphic Structure and the Parasocial Element." *Journal of Near Eastern Studies* 36:181–98.

Schmandt-Besserat, D. 1992. *Before Writing. Volume I: From Counting to Cuneiform.* Austin: University of Texas Press.

Schmandt-Besserat, D. 1995. "Record Keeping Before Writing." In Vol. 4 of *Civilizations of the Ancient Near East,* edited by Jack M. Sasson, 2097–106. New York: Charles Scribner's Sons.

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Schmandt-Besserat, D. 2010. "The Token System of the Ancient Near East: Its Role in Counting, Writing, the Economy and Cognition." In *The Archaeology of Measurement, Comprehending Heaven, Earth and Time in Ancient Societies,* edited by C. Renfrew, 27–34. Cambridge: Cambridge University Press.

Schmandt-Besserat, D. 2012. "Tokens as Precursors of Writing." In *Writing: A Mosaic of New Perspectives,* edited by E. Grigorenko, E. Mambrino, and D. Preiss, 3–10. New York: Psychology Press.

Shaughnessy, E. L. 2010. "The Beginning of Writing in China." In Woods, Teeter, and Emberling 2010, 215–24. Oriental Institute Museum Publications 32. Chicago: Oriental Institute of the University of Chicago.

Stauder, A. 2010. "The Earliest Egyptian Writing." In Woods, Teeter, and Emberling 2010, 137–47.

Stein, G. 2002. "Colonies without Colonialism: A Trade Diaspora Model of 4th Millennium BC Mesopotamian Enclaves in Anatolia." In *The Archaeology of Colonialism,* edited by C. Lyons and J. Papadopoulos, 26–64. Los Angeles: J. Paul Getty Museum.

Steinkeller, P. 2003. "Archival Practices in Babylonia in the Third Millennium." In *Ancient Archives and Archival Traditions: Concepts of Record-Keeping in the Ancient World,* edited by M. Brosius, 37–58. Oxford: Oxford University Press.

Steinkeller, P. 2004. "The Function of Written Documentation in the Administrative Praxis of Early Babylonia." In *Creating Economic Order: Record-Keeping, Standardization, and the Development of Accounting in the Ancient Near East,* edited by M. Hudson and C. Wunsch, 65–88. Bethesda: CDL Press.

Stordeur, D. 2010. "Domestication of Plants and Animals, Domestication of Symbols?" In *The Development of Pre-state Communities in the Ancient Near East: Studies in Honour of Edgar Peltenburg,* edited by D. Bolger and L. C. Maguire, 123–30. Oxford: Oxbow Books.

Veldhuis, N. 2006. "How Did They Learn Cuneiform? Tribute/Word List C as an Elementary Exercise." In *Approaches to Sumerian Literature: Studies in Honour of Stip (H. L. J. Vanstiphout),* edited by P. Michalowski and N. Veldhuis, 181–200. Cuneiform Monographs 35. Leiden: Brill.

Veldhuis, N. 2012. "Cuneiform: Changes and Developments." In *The Shape of Script: How and Why Writing Systems Change,* edited by S. D. Houston, 3–24. Santa Fe: School for Advanced Research Press.

Verhoeven, M. 2010. "Social Complexity and Archaeology: A Contextual Approach." In *The Development of Pre-state Communities in the Ancient Near*

Copyright 2019 by the Regents of the University of Minnesota

East: Studies in Honour of Edgar Peltenburg, edited by D. Bolger and L. C. Maguire, 11–21. Oxford: Oxbow Books.

Wimsatt, W. 2014. "Entrenchment and Scaffolding: An Architecture for a Theory of Cultural Change." In *Developing Scaffolds in Evolution, Culture, and Cognition,* edited by L. Caporael, J. R. Griesemer, and W. Wimsatt, 77–105. Cambridge, Mass.: MIT Press.

Woods, C. 2006. "Bilingualism, Scribal Learning, and the Death of Sumerian." In *Margins of Writing, Origins of Culture,* edited by S. L. Sanders, 91–120. Chicago: Oriental Institute of the University of Chicago.

Woods, C. 2009. "New Light on the Sumerian Language." *Canadian Society for Mesopotamian Studies Journal* 4:77–85.

Woods, C. 2010. "The Earliest Mesopotamian Writing." In Woods, Teeter, and Emberling 2010, 33–84.

Woods, C. 2015. "Contingency Tables and Economic Forecasting in the Earliest Texts from Mesopotamia." In *Texts and Contexts: The Circulation and Transmission of Cuneiform Texts in Social Space,* edited by P. Delnero, J. Lauinger, 121–42. Studies in Ancient Near Eastern Records 9. Boston: De Gruyter.

Woods, C., E. Teeter, and G. Emberling, eds. 2010. *Visible Language: Inventions of Writing in the Ancient Middle East and Beyond.* Oriental Institute Museum Publications 32. Chicago: Oriental Institute of the University of Chicago.

Zimansky, P. 1993. "Review of Schmandt-Besserat D. 1992, before Writing." *Journal of Field Archaeology* 20:513–17.