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WRITING *from* INVENTION TO DECIPHERMENT

EDITED BY

Silvia FERRARA

Barbara MONTECCHI

Miguel VALÉRIO

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Contributors

Ignasi-Xavier Adiego, PhD (1990) in Classical Philology, University of Barcelona, is Professor of Indo-European Linguistics at the University of Barcelona. Together with J. D. Ray and D. Schürr, he carried out the decipherment of the Carian alphabet. He has published extensively on Anatolian languages (including the book The Carian Language, 2007) and the languages of Ancient Italy (Etruscan, Oscan, Old Latin…) and on Romani linguistics.

Giorgia Baldacci is an Honorary Fellow in Aegean Archaeology at Ca' Foscari University of Venice. Her main research interests focus on pottery, craftsmanship, and the architecture of Minoan Crete. Since 2005, she has been a member of the Archaeological Mission of Phaistos and Hagia Triada, participating in the Mission's activities as a pottery specialist with expertise in the ceramic production of the Protopalatial Period.

Mattia Cartolano is a postdoctoral researcher at the Alma Mater Studiorum University of Bologna for the ERC project INSCRIBE – Invention of Scripts and their Beginnings. He holds a PhD in Archaeology (University of Liverpool) and carries out his research activity in the field of Neolithic and Cognitive Archaeology.

Paola Demattè is Professor of Chinese art and Archaeology at the Rhode Island School of Design, Providence, RI, USA. She holds a Laurea in Chinese Language and Literature from the Università degli Studi di Venezia (Venice, Italy) and an MA/PhD in Archaeology from the University of California, Los Angeles. She is the author of *The Origins of Chinese Writing*, Oxford University Press 2022.

Katja Diederichs has received an M.A. degree with a background in Information Science, Linguistics & Phonetics from the University of Cologne focusing on articulatory phonology, text mining methods, and historical and cultural information processing, as well as in Information and Library Science from the University of Applied Sciences in Cologne focusing on metadata descriptions of Maya texts, images and objects. From 2014 to 2022, she was a research assistant for the project "Text Database and Dictionary of Classic Mayan." Since 2022, she is research data and publication manager at ZB MED Information Centre for Life Sciences in Cologne.

Silvia Ferrara is Professor of Philology and Civilizations of the Aegean and Pre-Classical Mediterranean at the Alma Mater Studiorum, Università di Bologna. An expert on both ancient undeciphered scripts and the invention of writing, she is the author and editor of numerous books, including Cypro-Minoan Inscriptions (2012) and The Greatest Invention (2019). In 2017 she was awarded an ERC (European Research Council) grant for the project INSCRIBE (Invention of Scripts and their Beginnings).

Sarah Finlayson researches marking and meaning-making practices in the Bronze Age Aegean. She currently holds a NAWA ULAM research fellowship at the Faculty of Archaeology, University of Warsaw.

Louis Godart has studied the ancient scripts of the Aegean civilizations (Minoan and Mycenaean) and has assembled the various corpora of the Cretan hieroglyphic script, Linear A, the Phaistos Disc, and Linear B from Knossos, Thebes and Pylos. He is the author of 82 monographs and more than 300 scientific articles on the Mediterranean civilizations and their history, Europe, human rights, cultural heritage, and the Quirinale Palace.

Antje Grothe studied Pre-Columbian Studies, Classical Archaeology, and Prehistoric and Protohistoric Archaeology in Berlin. Since 2014, she has been engaged with the "Text Database and Dictionary of Classic Mayan" project. As an archaeologist and museologist, her expertise lies in the provenance research of artifacts of the Americas. She is also responsible for documenting Maya inscriptions, using advanced 3D scanning technology in her work.

Nikolai Grube is Professor of the Anthropology of the Americas at the University of Bonn, where he directs the project "Text Database and Dictionary of Classic Mayan." After completing his studies in Hamburg, he obtained a PhD in Pre-Columbian Studies, Anthropology, and Ancient Near Eastern Studies. Grube previously served as the Linda and David Schele Chair in Pre-Columbian Art and Writing at the University of Texas and has co-curated numerous exhibitions on Maya culture. He has been awarded an honorary doctorate from the Instituto Politécnico Nacional in Mexico. Grube's scholarly contributions have significantly advanced the fields of Maya epigraphy and archaeology, particularly through long-term archaeological field projects in Campeche, Mexico.

Aaron Koller is Professor of Near Eastern Studies at Yeshiva University. He has held visiting positions at Cambridge University, the Oxford Centre for Hebrew and Jewish Studies, the Hebrew University in Jerusalem, and the Albright Institute for Archaeological Research. Author of three books and editor of five more, Aaron is currently working on a cultural history of the alphabet. He lives in Queens, NY, with his partner, Shira Hecht-Koller, and their children.

Guido Krempel is PhD candidate at the department of Anthropology of the Americas, University of Bonn. Since 2019, he is a Research Fellow at the Text Database and Dictionary of Classic Mayan project, since 2017 in collaboration with Coordinación Nacional de Conservación del Patrimonio Cultural (CNCPC), Instituto Nacional de Antropología e Historia (INAH). His research interests encompass Pre-Colonial art and writing, Maya archaeology, epigraphy and iconography, particularly the study of artistic expressions, mortuary practices, and faunal representations in Maya art. His current research and dissertation subject is concerned with the monumental and architectural sculptures and courtly history of Tonina, Chiapas, Mexico.

Mallory Matsumoto is an archaeological and historical anthropologist whose research addresses questions of language, material culture, and religion in the Maya region of Mesoamerica during the Classic and early colonial periods. Currently an Assistant Professor of Religious Studies at the University of Texas at Austin, she earned her PhD in anthropology from Brown University in 2021.

Tobias Mercer completed his training as an IT specialist in application and web development and then studied Comparative Religion and Anthropology (B.A.) at the University of Bonn. He worked in IT administration at the Max Weber Stiftung and on data modeling and frontend development for the BMBF project "Die Sammlungen - Ein Kosmos". Afterwards, he managed and developed collection databases with the University of Bonn's collection coordination office. Since 2019, he has been working on the "Text Database and Dictionary of Classic Mayan" project, developing a research portal and digital sign catalog. He is also working on the art historical "Materi-A-Net" at the Cologne Center for eHumanities.

Barbara Montecchi is an archaeologist and philologist, currently focusing on museum studies. She holds an MPhil from the Italian School of Archaeology at Athens and a PhD from the University of Florence. She has published extensively on Aegean archaeology and epigraphy.

Christian M. Prager studied Anthropology of the Americas, Prehistoric and Protohistoric Archaeology, and Classical Archaeology at the University of Bonn, completing his doctoral dissertation on Classic Maya religion. Since 2014, he has been a research assistant and project coordinator for the "Text Database and Dictionary of Classic Mayan." A founding member of Wayeb, the European Association of Mayanists, he is also an editor for Mexicon. Prager has worked as a project epigrapher for the Pusilha Archaeological Project and collaborated with Frauke Sachse and John Weeks, leading to the publication of three colonial Maya calendrical manuscripts from the Guatemalan Highlands.

Miguel Valério is a postdoctoral researcher with the ASOME (Social Archaeoecology of the Mediterranean) research group at the Universitat Autònoma de Barcelona. His collaborative investigations into Bronze Age southeastern Iberia (2200–1550 BCE) earned him the III National Prize for Archaeology and Palaeontology from the Palarq Foundation (Spain) in 2023. He has published extensively on undeciphered scripts (Aegean, Cypriot, Paleo-Hispanic, and Polynesian) and on comparative approaches to early invented writing.

Cristina Vertan studied Computer Science and Statistics. In addition to her work in language technology, particularly multilingual applications, she has conducted research in Digital Humanities for over fifteen years, focusing on the modeling and annotation of historical languages and documents. She developed the first annotation models and tools for Classic Mayan and Classical Ethiopic. She worked at the Berlin-Brandenburg Academy of Sciences and Humanities on the Thesaurus Linguae Aegyptiae. Currently, she is a research associate in the field of digital research and information infrastructures at the Herder Institut, Marburg.

Alex de Voogt has a background in African linguistics and initiated the Idea of Writing symposia in 2005, for which he co-edited two volumes published in 2010 and 2012, and which continued for about ten years. He co-authored a book with Claude Rilly on the Meroitic Language and Writing System and, in addition, has shown a continued interest in nineteenth and twentieth century writing systems, in particular the Caroline Islands script, Maldivian Thaana, and Swahili-Arabic. At present, he is a Professor at Drew University in the United States.

Willemijn Waal (PhD 2010) is Director of the Netherlands Institute for the Near East (NINO) and Associate Professor at Leiden University. Trained as a classicist and

Hittitologist, her research focuses on the cross-cultural contacts between Late Bronze Age Anatolia and the Aegean, the materiality of writing, as well as literacy and orality in the ancient world.

Elisabeth Wagner is a Research Associate at the "Text Database and Dictionary of Classic Mayan" project, specializing in epigraphy and iconography. Wagner studied Anthropology of the Americas, Prehistoric and Protohistoric Archaeology, Ethnology, and Classical Archaeology. A talented freelance artist, Wagner specializes in stone sculpture and gemstone carving. As a doctoral candidate at the University of Bonn, Wagner's dissertation focuses on reconstructing and analyzing the sculptural program of the Classic Maya Funerary Temple, Structure 10L-18, in Copán, Honduras. Additionally, Wagner serves as an editor for the scholarly journal, Mexicon.

Judith Weingarten, M. Litt. (Oxford), is author of numerous papers and monographs on Minoan-Mycenaean art, in particular glyptic art, and its implications for social, economic, and political relationships, and cultural interactions between the Aegean and East Mediterranean and Egypt. In addition, she has recently written several articles on early Aegean Bronze Age scripts (Arkhanes, Cretan Hieroglyphics). Books include *The Zakro Master and his Place in Prehistory*, *The Transformation of Egyptian Taweret into the Minoan Genius*, and (co-author) *Minoan Cushion Seals: Innovations in Form, Style, and Use in Bronze Age Glyptic.*

Introduction

Silvia Ferrara, Barbara Montecchi, and Miguel Valério

Inventing, Deciphering, and Interpreting Writing Systems

INSCRIBE is a project currently based at the University of Bologna and funded by the European Research Council. It is devoted to the investigation of the invention of writing and its beginnings from a global perspective. The acronym indeed stands for just that, the invention of writing and its beginnings. When the pandemic struck the world in 2020, the INSCRIBE team saw an opportunity to transfer all its research and outreach activities online, and, from this momentous pivot, the SCRIBO seminar series was born, with the last syllable standing for its original point of departure, Bologna.

The seminar series was a structured first attempt to offer an experience that was targeted to a wide audience, focused solely on the invention of writing. Our wish was to take the world of scripts—from its earliest records from five thousand years ago (China, Mesopotamia, Central America, Egypt, the Mediterranean), to more recent cases such as Easter Island, and other less-trodden instances of scripts, which are not the usual purview of general experts and particularly of non-experts—and open it to the public, thereby piquing curiosity and interest in a subject that has all too often been relegated to a small circle of specialists. Since much of what INSCRIBE does is work on decipherment techniques for ancient writing systems, with a focus on those from the Aegean, we also aimed to present the current trends in decipherment strategies, and the progress that has been made in better understanding undeciphered scripts.

The two aims intermingled: even scripts that we can read with confidence were discussed by our invited authors with a keen eye kept firmly on their shadow lines, their enigmatic corners, their unexplored ends. Almost nothing is 100 per cent proven in science, and this is quite evident when it comes to ancient writing of all sorts. In a way, our aim was to get into the untapped potential of these shadow lines and to bring them to the fore. To achieve all this, we invited specialists in linguistics, archaeology, epigraphy, anthropology, cognitive studies, and cultural evolution, who showed us how much creativity, originality, and imagination lie behind one of the greatest inventions in the world.

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The SCRIBO seminar series was held for four editions. This volume offers a condensed outcome of this successful endeavour, corralling the first two seasons of the series. The focus is wide but targeted: it runs from invention to decipherment, passing through state-of-the-art approaches in the ways in which we can reconstruct how ancient cultures experienced and gave value to the writing they created. Ultimately, these are complex phenomena to analyse today, thousands of years apart from their first settings, from the agents behind their creation, and from the receivers who made use of them.

The invention of writing is *per force* an opaque phenomenon, as are all origins, as are all things remote and detached from the present, embedded in the deepest recesses of time. Yet, it traditionally marks the beginning of what we call history, and as such it signals what is probably one of the most important points of departure and triggers a fundamental pivot of our being modern humans. At the same time, it is an intrinsically human phenomenon, human-made and artificial, with no discernible zero point in time, arguably the result of a progressive and gradual evolution, cultural and cognitive, yet undefined in its contours. If an invention is a process, processing the invention of writing is, thus, a complicated matter.

Equally so is decipherment. The history of decoding scripts and identifying their underlying messages in a way showcases the curiosity humans have always shown in enigmas and cryptic codes, the objective difficulties that are inherent in solving them, and the prowess and ingenuity that are necessary to break into them. Much as jigsaw puzzles, crosswords, and all manners of codes retain fascination, so undeciphered scripts carry a general allure shrouded in mystique and a patina of inaccessibility. Research on undeciphered scripts is flourishing today, and rigour and scientific method are part of the equation in this field as much as intuition and a modicum of serendipity.

Re-enacting and unravelling ancient perceptions of writing is not devoid of interpretative complications, as we glance backwards from a present standpoint. This implies that the contemporary perception of past perception may be too biased and prejudiced to carry any compelling validity. Such an obstacle, while obvious, becomes even more apparent when the focus of enquiry shifts from writing *per se*, and, instead, is directed towards one of the main reasons why texts do exist—namely, *to be read*. Once we turn our gaze onto the recipients, rather than the agents, things become even blurrier. This is even more poignantly patent when we think of the broad, and stratified, concept of literacy.

All three central focuses of this book, invention, decipherment, and perception, will be treated through different case studies of script invention and script practices, from different areas of the world and different periods of our history. The themes mirror the broad division into three sections, reflected in the structure of the book.

Structure of the Book

Part I, Beginnings of Writing, focuses on invention, but not according to mainstream lines of enquiry. The authors we have invited ponder over several cases of original and derivative creation of writing, and intentionally shy away from a traditional textbook narrative, in which Mesopotamia casts a long shadow over other inventions. Mesopotamia will be presented as a case study (*Mattia Cartolano*), but with a different, less-beaten foray into what we may call 'the precursors', and the gradual evolution of graphic codes, from a cognitive and iconographic perspective. A long *durée* view is espoused but this skirts the customary explanatory schemes that see tokens as the primary springboard to the proto-cuneiform phase.

A similar approach is taken in the chapter on the Chinese invention of writing (*Paola Demattè*), where the deepest layers of code-making behaviour since Neolithic times are considered. In a framework that antecedes writing by millennia, this chapter provides a backdrop that is strongly evidence based, but not necessarily tied to discernible patterns of specific linguistic notation. This view provides, quite compellingly, a welcome argument to quell any doubt that writing in China represents an original, pristine invention.

The two chapters that follow focus largely on the invention of the alphabet, while their points of departure, and of arrival, move from and towards different directions. The first of this dyad is concerned with the origin of the earliest form of alphabetic writing, whose corpus is very meagre and problematic (*Aaron Koller*). Claims of its revolutionary impact on society are redressed with sobering epigraphic takes on an unstable and, at times less than successful, experiment with a new script. The other chapter aims to 'close the gap' with the introduction of the Greek alphabet (*Willemijn Waal*), but moves from a Near Eastern perspective on literacy harking back to the second millennium BCE Aegean area and the Greek continent onwards. The large-scale survey encompasses reconstructions, often through indirect clues, of Linear B use on non-durable materials and speculates on a very early introduction of the Greek alphabet on the same assumption. What we cannot tangibly see may inform the positive evidence to surprising degrees.

The chapter on the Caroline Island scripts is an apparent outlier, presented as a close to this part of the book (*Alex de Voogt*). The use of a writing system in the far recesses of the Pacific mirrors the final contribution in Part II, where Rongorongo is considered. The indigenous writing system of the Caroline Islands, created in the late nineteenth century CE, is a good example of a script that does not often enter handbooks and popular works. In the author's vision, this Micronesian form of writing is a counterexample to the notion that administration and script are linked, and it is sure to fuel the debate surrounding proposals that link the origins of writing with statehood or social complexity.

Part II, The Future of Undeciphered Scripts, is devoted to exploring different approaches and methods applied to the study of undeciphered scripts. The first chapter (*Ignasi-Xavier Adiego*) leads us into the world of decipherment strategies and successful codebreaking achievements, with an overview and discussion of their features and processes. While presenting the state of knowledge over a wide range of decipherments, the chapter devotes attention to a few cases that closely involved the author, especially the decipherment of Carian, an Anatolian script of the first millennium BCE.

The family of the Aegean scripts of the second millennium BCE is a case in point when it comes to unreadable scripts, as it represents the least understood script family in the world. We have focused specifically on this family, as this represents one of the core research interests of the editors. Three scripts from the island of Crete will be considered, all placed within the same approximate chronological horizon: Cretan Hieroglyphic, Linear A, and the Phaistos Disc. These chapters can be read as a synergistic compendium that addresses issues concerning the graphic relations, use, and significance of these writing systems. All three contributions take an in-depth contextual stance, considering items of iconography and iconicity (*Judith Weingarten* and *Barbara Montecchi*, respectively) and material culture (*Giorgia Baldacci*) as prompts to encourage outside-the-box discussions, moving beyond matters of strict palaeographic or epigraphic interest.

One of the most discussed signs in Cretan Hieroglyphic is the focus of the first chapter in this triad of contributions; it suggests its interpretation as an acrophonic abbreviation or emblem for wool (*Weingarten*). The following chapter looks at one of the most celebrated and, at the same time, debated inscribed objects—the Phaistos Disc—from a strict archaeological perspective (*Baldacci*). The third one investigates Linear A picture-based phonetic signs by distinguishing those that seem to originate with Cretan Hieroglyphic from the ones that do not. Comparisons with both Aegean and Egyptian scripts and material culture shed new light on the origins of phonetic signs created in Linear A and the relationship between shapes and phonetic values (*Montecchi*).

The final chapter of this section (*Miguel Valério*) focuses on the typological nature of the Rongorongo script of Rapa Nui (Easter Island), the most recent invention of a script that we still cannot read and the problems of its decipherment. The most widespread view—namely, that Rongorongo is a syllabic script—is revisited, readdressing the most famous tablet in the corpus, Tablet C (known also as Mamari). It is argued that Rongorongo may be a logo-phonetic notation that largely omitted grammatical words, and whose signs represented polysyllabic morphemes. Readings of names of nights of the month, known from oral traditions, are also proposed, as well as some related phrases.

Part III, Current Approaches to Early Writing and Reading, includes three contributions on how early writing systems have been perceived and received beyond their time: a state-of-the-art digital approach to the Maya script and new technologies applied to its understanding (*Christian Prager et al.*), and a two-pronged perspective on the readers (*Sarah Finlayson*), and the writers as part of the script-creation process in the Aegean Bronze Age. The Linear B scribes are a specifical class of writers considered contextually (*Louis Godart*).

The chapter on Mayan writing and language shows how current technologies can contribute to a systematic and interconnected investigation of text, image, and information devices from a digital perspective. The project *IDIOM*, based in Bonn, assembles, for the first time, a comprehensive text database and dictionary for Classic Mayan, which enables meticulous, detailed study of the literary language employed in the texts.

And, while deciphering ancient scripts is still a work in progress, reconstructing acts of reading and the practices of writing can be similarly problematic. Reading and writing are sides of the same coin, broadly to be subsumed under the capacious umbrella of *literacy*, which is not universal, nor is it monolithic. Shaped by culture, and moulded by cultural and social behaviour, it can be a contingent and elusive thing. The two chapters devoted to the Aegean problematize this two-sided phenomenon, placing emphasis on, and blurring the boundaries of, the agents and the receivers of writing. These chapters show us how the variability of context changes the picture we gain: from writing not intended to be formally read, with a sheer separation between agents and receivers, to a complete interchangeability of roles, whereby writers are not separate from readers, but one and the same category, best encapsulated in the inner-looking, navel-gazing Linear B class of administrators. In this case, reading and writing appear a deposit-oriented, almost forlorn, almost accidental exercise, an image that cuts a stark contrast with the potent ways in which writing and its many inventions elsewhere, even in the most isolated, recondite places, emerged from a place of inventiveness and creativity.

New Ways to Look at Writing Systems

A few words need to be spent on the principles we espoused when we conceived this volume. Research on ancient writing has increased in recent years, with important contributions. Yet, we believe that the lines of enquiry we have chosen to adopt for this book have not been explored from a global standpoint. Equally important, we contend, is that the state-of-the-art approach of novel theories and frameworks be presented in one single publication. These points serve also as a guiding principle for the present state of research, while at the same time casting an eye to the future path the studies of writing may take.

Two premises were, in our opinion, crucial. The first is a firm stance on *polygenesis*. Not long ago, books on early writing tended to focus on its birth in Mesopotamia, with a pervasive focus on the increasingly centralized administrative control as a prompt for the invention. Our goal from the beginning of this endeavour was to move beyond that and concentrate on the significant evidence for other original script inventions in other areas of the world, not obviously tied to bureaucracy (or not only). This is a pursuit ultimately linked to one of the big historical questions surrounding the origins of writing as hinted above—namely, whether its emergence—wherever it emerged—was tied to statehood or social complexity. The editors of this volume, as much as the scholarly community (e.g. Postgate et al. 1995; Diamond 1997; Houston ed. 2004; Wengrow 2008; Kelly 2018), have different views on this historical problem, from the notion that writing was not a centralized phenomenon to be equated with state administration or state formation to the idea that writing goes hand in hand with state structures, as the latter can take forms other than just bureaucracy and administrative devices. This is one reason that makes some of the texts in this book important contributions for the debate. The second premise is that we wanted this contribution to take a broad *global perspective*, capable of retracing a world history of writing in its idiosyncratic and less investigated features, that could be of interest to historians, archaeologists, and philologists of many areas of the world.

Two dimensions we aimed to showcase and emphasize are present in most, if not all, of the chapters gathered here, one being the interface of writing with iconography in its incipient phases. How was writing created in more than one independent sociocultural context? Building on images, do the earliest signs follow common trajectories from picture based to more schematic signs? These are crucial questions that shed light on first writing that is strongly implicated with images. Grasping the iconological principles at work and studying them systematically is still a prime *desideratum* in the field, which has the potential to offer notable insight into human cognition. This strand is an important that emerges from many pages of this book.

Another important guiding principle was to look at writing as a phenomenon embedded within, and emerging from, human cultural evolution and human cognitive behaviour. Along the traditional axis often used to explore writing in general, the role that writing played in our cultural evolution has not been probed to the extent that it should, and this book offers a few token samples of such an important line of investigation. It is just a stepping stone upon which the future scholarship of writing systems can draw inspiration for paths of research to come.

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PART I

BEGINNINGS OF WRITING

1

Cognition, Iconography, and Graphic Communication Systems on Portable Objects in the Near Eastern Neolithic

Mattia Cartolano

Introduction

Systems of communication in preliterate societies are diverse and difficult to trace in the archaeological record. While oral communication, gestures, and body language are common methods of information transfer not only with regard to the species *Homo sapiens* but also for hominids and primates (Botha and Knight 2009; Benítez-Burraco and Progovac 2021), it has been argued that, especially since the Upper Palaeolithic, human communities have come to rely more on visual systems of knowledge transmission involving geometric signs and depictions of realistic images (Bahn 2016; von Petzinger 2016; Braun 2018; Dutkiewicz et al. 2020). The production of these images and signs, which can be identified as symbols in the broader sense, occurs consistently in the Epipalaeolithic and Neolithic archaeological record (approximately from the twentieth to the fifth millennium BCE) through paintings, incised portable objects, 3D representations, and personal adornments (Roset 1984; Bailey 2005; Major 2018; Vasić 2020). The reliance on visuo-graphic productions and symbolic forms is one of the characteristics that distinguish our species (Deacon 1997). Although there is no agreement among researchers on what can be considered a symbolic or artistic representation in prehistoric objects (Hodder 1982; Wynn and Coolidge 2009), the fact that individuals continue to produce icons, schematic representations, and geometric incisions over millennia suggests a behavioural tendency to convey information, by imbuing images and objects with constructed cultural meaning (Sinclair 1995; Henshilwood and d'Errico 2011).

This chapter aims to highlight the importance of symbolic practices within the communication systems of preliterate societies through an analysis of portable objects. In the first section, it presents the social context of the Neolithic period in south-west Asia, in which a substantial production of visuo-graphic forms emerges. Neolithic communities grow and develop, establishing a solid system of

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networks and collaborative actions that manifests itself in the emergence of the first large villages and the construction of multifunctional public buildings in which shared cultural practices and exchange of objects take place. The new and intense group relationships and communicative efforts manifested by these communities indicate that communication strategies were also subjected to radical changes. In this regard, the second part of the chapter outlines a study of the representations on portable objects. The recurrences and associations of certain geometric and figurative forms indicate that mobiliary representations were not made only for decorative purposes. The data illustrated here are discussed in the last section of the chapter by considering important contributions on human cognition. It is argued that Neolithic marks on portable objects were part of a shared system of symbols that sustained and developed communication between different social entities.

The Social Context of the Neolithic Period in the Near East

The end of the Palaeolithic and the Neolithic periods represent one of the most important prehistoric transitions. Lasting from the tenth millennium to the mid-fifth millennium BCE, this phase is characterized by a series of radical socio-economic developments that transformed the human way of life, including the adoption of sedentarism, complex and structured political organization, and autonomous systems of food production involving the cultivation and management of animal and plant species (Banning 1998; Cauvin 2000; Özdoğan et al. 2011; Zeder 2011). The earliest evidence of these transformations is recorded in south-west Asia, an area known as the Near East. Particularly during the Pre-Pottery Neolithic period (hereafter PPN), which is dated approximately 9700–6600 cal BCE, prior to the extensive production and use of pottery, Near Eastern communities begin to construct large settlements, monuments, rectilinear and compartmentalized buildings, and storage facilities (Kuijt 2002; Watkins 2004; Duru et al. 2021).

Moreover, architectural and technological developments are accompanied by new forms of symbolic representation and rituals, including elaborated mortuary practices and other unordinary activities that might suggest religious beliefs (Hodder 2014; Dietrich and Notroff 2015), shamanism (Benz and Bauer 2015) and other cultural performances (Fagan 2017). The PPN is generally divided into two main phases. The early period spans from the tenth to the mid-ninth millennia BCE and is known as PPNA (9700–8500 cal BCE) according to the Levantine phases (Kenyon and Holland 1960). The second period of the aceramic Neolithic is further subdivided into Early (8500–8200 cal BCE), Middle (8200–7800 cal BCE), and Late/Final (7800–6900/6600 cal BCE) PPNB (see Goring-Morris and Belfer-Cohen 2011; Benz 2013). This chronology is based primarily on architectural innovations, lithic technology, and other socio-economic developments. The pace and occurrence of these developments in the Near East are not regular nor homogenous geographically and chronologically (see Özbaşaran and Buitenhuis 2002), so current interpretations of Neolithic social changes seem to follow polycentric and non-linear trends (Gebel 2004; Özdoğan 2010) despite some disagreements (Gopher et al. 2001; Edwards 2016). The spread and rhythm of socio-economic expansions in the Neolithic will not be addressed in this chapter, yet it is important to highlight here that during this prehistoric transition communities experienced a series of cultural and economic changes that varied across regions, including the adoption of diversified systems of visuo-graphic production (see Cartolano 2022).

Archaeological evidence for PPN developments is varied and abundant, involving changes in architecture, economy, and technology, which in turn imply more intense interrelationships between groups. Indeed, the employment of new procedural thinking in, for example, the construction of superimposed rectilinear structures or unprecedented large public buildings that require considerable optimization of workload (Sterelny 2015) involves a high degree of individual commitment and deeper awareness of other intentions (Tomasello et al. 2012). The appearance of unordinary buildings is attested as early as the PPNA through the case of the large enclosures of Göbekli Tepe, which were formed with tall T-shaped pillars, benches, and stone walls, the tower of Jericho, and other large semi-circular structures such as the O75 building at Wadi Faynan 16 (Kenyon and Holland 1960; Mithen et al. 2011; Schmidt 2012). Exchange of goods and increased networking practices are consistently observed throughout the PPN sequence in all regions. One very common piece of evidence is the production and trade of obsidian objects, generally produced in Anatolia in the areas around Lake Van and the Hasandağı volcano (Baird 2012: 441; Khalaily and Valla 2013). Traces of obsidian are recorded in most Near Eastern territories, showing how intense and frequent the interregional connection between communities was (Ibañez et al. 2015).

Furthermore, social interconnectedness is observed through the presence and possible import and exchange of other materials, such as chlorite vessels, mostly produced in the Upper Tigris, marine molluscs, beads, and other more 'exotic' materials such as malachite (Rosenberg et al. 2010; Alarashi 2016; Delage 2018). Such archaeological evidence strongly suggests that Neolithic societies were not isolated and did not communicate only with a restricted number of sites in a limited region, but rather had dynamic relationships that extended quite widely. This aspect is also observed in some cultural practices such as the detachment, manipulation, and burial of bones, particularly human skulls. Mortuary practices involving skull retrieval are mostly seen in southern Levant (Kuijt 1996). On the other hand, decoration and management of human crania are also observed in the northern territories of the Fertile Crescent and Anatolia (Bonogofsky 2006; Benz 2012; Croucher 2016), including early evidence of skull detachment at the

Epipalaeolithic site of Pınarbaşı in central Anatolia (Baird et al. 2013). Finally, it has been argued that social dynamics between groups may be recognized through craft expertise, such as pyrotechnology, with certain centres functioning perhaps as 'points of exchange' where individuals could meet and exploit certain manufacturing skills (Goring-Morris and Belfer-Cohen 2020: 13).

Increasing communicative efforts are also observed in the formation of extended settlements and the decoration of special buildings. A significant and non-linear increase of population has been hypothesized under the term of Neolithic Demographic Transition, in which early Holocene groups formed extended settlements adopting new techniques of food procurement and social organization (Bocquet-Appel and Bar-Yosef 2008). During the PPNA–PPNB transition, large sites appear for the first time in south-west Asia, covering more than 5 hectares, as reported, for example, at Abu Hureyra, Wadi Shu'eib, and Karahan Tepe (Moore et al. 2000; Çelik 2011; Makarewicz 2016). Moreover, some sites show a settlement layout consisting of a series of abutted buildings clustered together, suggesting a high density of occupational pattern (e.g. Aşıklı Höyük Level 2; see Esin and Harmankaya 1999; Özbaşaran et al. 2018). Considering several methodological issues in estimating population levels at prehistoric sites, absolute estimates of population size have been produced for some PPN phases of occupation based on architectural data and other archaeological and ethnographic proxies (Birch-Chapman 2017; Cartolano 2022: 95–127). Although most Early Neolithic sites are neither large nor densely occupied, large populations of hundreds (if not thousands) of co-resident dwellers might have occasionally existed for some time during the PPN.

Besides the number of structures, the typology of buildings can also be an indicator of the level of social interactions between groups. In addition to the above examples of monumental architecture, special buildings are encountered in all Near Eastern regions and Neolithic phases that have been largely investigated. These constructions are often interpreted as communal because of their size, installations, and decoration. The communal buildings at Jerf el Ahmar are an example of how special buildings were a place not only for socializing but also for storing goods and performing mortuary rituals, taking on a multifunctional role as observed in the presence of headless skeleton and compartmentalized rooms in building EA30 (Stordeur 2000). Similar large, decorated structures are also seen in the Upper Tigris, as in the case of the recent salvage excavation carried out at the PPN site of Gre Fılla (Ökse 2020). Dedicated areas where these buildings are located are clearly visible in some PPN settlements such as Aşıklı Höyük and Çayönü Tepesi. The idea that some of these special buildings were built for enhancing social cohesion and commemorating the past is evidenced by the extraordinary number of human bones buried in some structures, such as the Skull Building in Çayönü, the *Maison des Morts* in Djade, and Buildings 5 and 8 at Bestansur (Chamel 2018; Matthews et al. 2020). Intramural burial, which is a behavioural trait also protracted in later Neolithic settlements (e.g. Çatalhöyük), has been interpreted as an attempt to forge social identity and integration (Kuijt 1996; Benz 2010).

All of these and many other archaeological finds appearing during the Early Neolithic transition suggest a significant change in the social cognition of late hunter-gatherers and early farmers. It has been argued that Neolithic populations adopted new ways of managing an increasing number of face-to-face relationships that would otherwise have led to an inevitable dispersion of information and social divisions (Coward and Dunbar 2014). Such behavioural patterns have been identified as an establishment of sociocultural niches that have enabled communities to face challenges and risks emerging from the transforming environment of the Neolithic (Sterelny and Watkins 2015). Among the many approaches and techniques that Neolithic groups adopted in response to the novelty of the sedentary lifeway, it has been suggested that the deployment of symbolic figures has assumed a vital role in managing internal and external group relationships (Benz and Bauer 2013; Hodder 2013). Systems of communication in large extended communities involve a rich and varied use of figurative and non-figurative symbolic representation that can be seen, for example, in reliefs on large architectural installations (for example, pillars and slabs), figurines, vessels, painting, and sculptures. In this regard, the present work aims to investigate the signs depicted on portable objects of Neolithic communities and to discuss theories concerning the employment of a system of graphic codes aimed at facilitating communicative activities that could be interpreted as a writing system in a broader sense.

The Archaeological Evidence: Depictions on Portable Objects

Figurative depictions, geometric signs, and unidentified marks are attested in all prehistoric periods. The archaeological assemblage in the PPN is quite varied and includes artefacts made of different materials such as clay, plaster, limestone, basalt, chlorite, and other types of stones (see Schepens 2015). Decorated bones are also found, and it is not excluded that other perishable materials such as wood were used for manufacturing decorated artefacts. Realistic, geometric, and schematic representations are observed in most regions of the Near East from central Anatolia to the Zagros mountains. Most of these artefacts are found in regions that have been most investigated—namely, the Levant and northern Mesopotamia. While many animal and geometric images are engraved on monuments, pillars, slabs, or other architectural installations, this chapter will focus on the types of representation observed in marks and symbols on small portable items. Before the introduction of ceramics into the Neolithic economy (which is known to have influenced the number and typology of depicted images, as in the case of Çatalhöyük; see Hodder and Gürlek 2020), mobiliary representations in the PPN are incised, drawn, or painted. Very rarely recognizable depictions made with colourant are preserved in Neolithic archaeological deposits, while inscribed depictions are made with nails or thin pointed tools or chiselled.

In this study, 442 objects from 34 Neolithic sites have been collected for a cross-regional analysis of figurative and non-figurative representations (Figure 1.1 and Table 1.1). Depictions are found on tokens, tools, plaques, grooved stones, pestles, pebbles, pendants, fragments of figurines, and other small portable objects. The raw material used to produce portable objects is varied. Stone is the most commonly used material. A high number of occurrences of graphic representations are observed on pieces of chlorite (sometimes fragments of vessels), limestone, basalt, and sandstone. Incisions on bones, mostly animal remains, are also widely observed in many regions of south-west Asia. Few depictions are seen on materials that are less commonly used, such as steatite, greenstone, and shale.

With regard to the type of images depicted on the items, the most recurrent motifs are incisions of vertical or horizontal parallel lines (see Figure 1.2), which appear in all Near Eastern regions from southern Mesopotamia (e.g. Ali Kosh) to central Anatolia (e.g. Boncuklu). Rectilinear incisions are often thin and also appear in grid or in netting shape. Another very common mark is a series of notches. This type of incision varies, although many of the notches are vertical small parallel engravings, sometimes placed at the edges of the artefact. Zigzag, chevrons, V-shaped, and wavy lines are common decorations in the Levant and Anatolia. Crosses and oblique lines are less frequent but still a fairly widespread motif in several areas. The same observation is true for carvings of dots and cup-shaped decorations. Although much less abundant, figures of animals (more frequent), plants, and humans (very rarely seen on portable objects) are also represented and often in combination with geometric signs. There are sixty-seven objects with figurative and schematic signs from nine sites located in Anatolia and the Levant. The animals depicted are birds, reptiles, and herbivores. These iconographic representations are particularly common in northern Mesopotamia and south-eastern Anatolia (Benz and Bauer 2013). Snakes and birds are the most frequent figures and are often stylized. It is difficult to determine whether there is a significant relationship between the type of artefact and the motifs, as many objects are fragmented and have little or no contextual information. It is important to note that such an array of motifs is not only visible on small portable objects. Rhomboidal, rectangular, zigzag shapes, and other geometric forms are also seen on wall paintings, for example, at Dja'de el Mughara and Çatalhöyük (Coqueugniot 2014; Hodder and Gürlek 2020) as well as on slabs and other architectural installations (e.g. Göbekli Tepe and Jerf el Ahmar). In addition, very similar geometric patterns of the decorated plaques and tools are observed on stone vessels at Tell ʿAbr 3, Tell Qaramel, Demirköy Höyük, and Körtik Tepe.

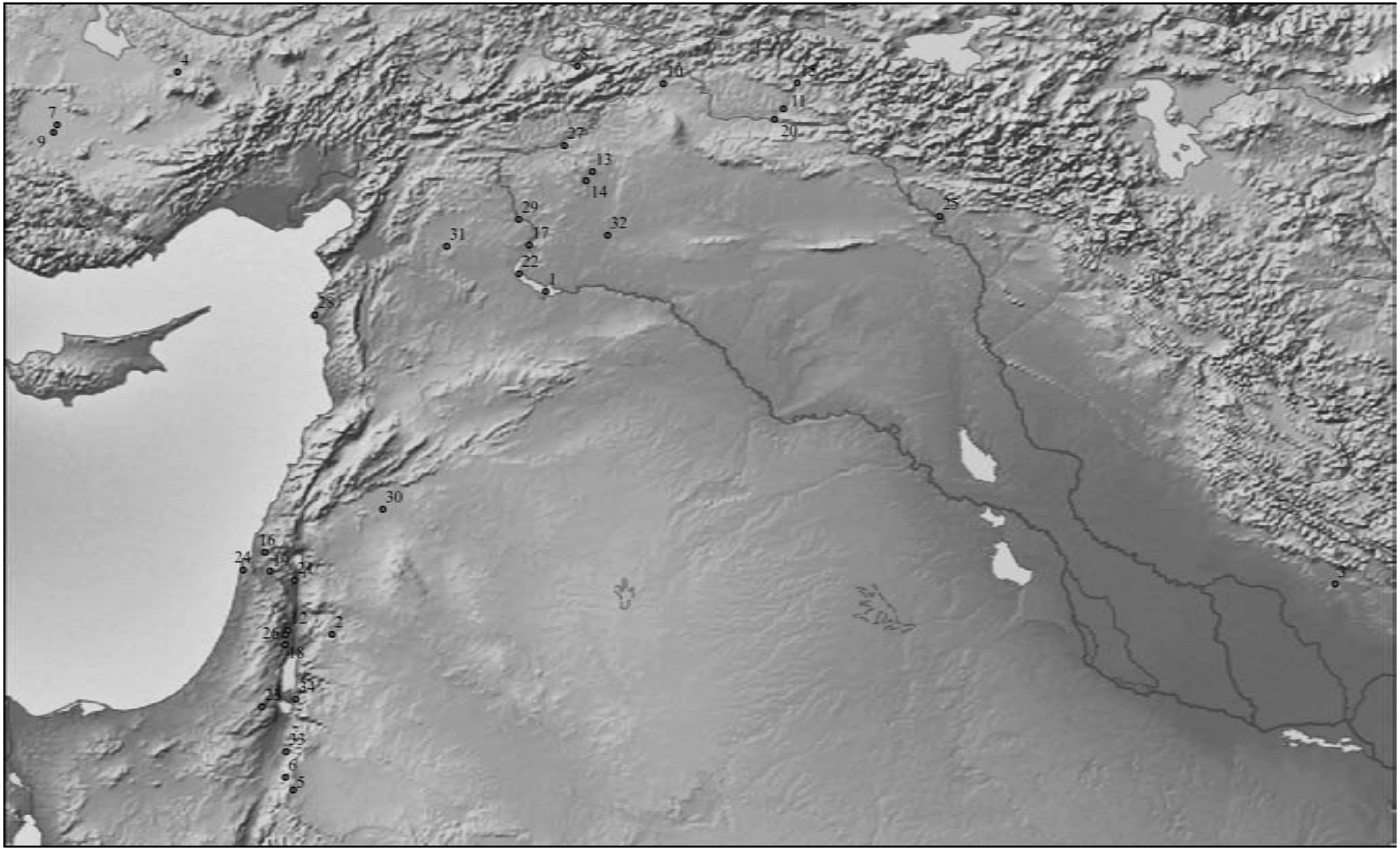

Figure 1.1 Map of the PPN sites considered in this study: 1. Abu Hureyra; 2. ʿAin Ghazal; 3. Ali Kosh; 4. Aşıklı Höyük; 5. Basta; 6. Beidha; 7. Boncuklu Höyük; 8. Cafer Höyük; 9. Çatalhöyük; 10. Çayönü Tepesi; 11. Demirköy Höyük; 12. Gilgal I; 13. Göbekli Tepe; 14. Gürcütepe; 15. Hallan Çemi; 16. Horvat Galil; 17. Jerf el Ahmar; 18. Jericho; 19. Kfar HaHoresh; 20. Körtik Tepe; 21. Munhata; 22. Mureybet; 23. Nahal Hemar; 24. Nahal Oren; 25. Nemrik 9; 26. Netiv Hagdud; 27. Nevalı Çori; 28. Ras Shamra; 29. Tell ʿAbr 3; 30. Tell Aswad; 31. Tell Qaramel; 32. Tell Sabi Abyad II; 33. Wadi Faynan 16; 34. Zahrat adh-Dhraʾ 2.

Table 1.1 Presence and absence of geometric and figural patterns on portable objects (n = 442) in selected Neolithic sites in the Near East

	circumline	concenline	cross	cupule	dashline	dot	grid	netting-shape	notch	obline	paraline	radline	rectangle	rhombus	U-shape	V-shape/chevrons	wavyline	zigzag	plant	animal	No. of objects	References
Boncuklu	x		x	x		x	x	x	x	x	x			x	x	x		x	x	x	97	Baird et al. (2012) and unpublished data
Tell Qaramel		x	x			x	x	x		x	x	x			x	x	x	x		x	70	Mazurowski and Kanjou (2012)
Cafer Höyük			x	x			x				x			x		x					4	Cauvin et al. (1999)
Nahal Oren		x		x							x										5	Noy (1991)
Munhata							x	x	x		x			x							39	Gopher et al. (1995)
Mureybet			x	x					x	x	x	x				x	x	x			12	Cauvin (1977); Lebreton and Stordeur (2008)
Wadi Faynan 16						x	x			x	x		x		x		x	x			12	Shafirey (2007); Finlayson et al. (2009); Mithen et al. (2011)
Ras Shamra							x			x	x										3	de Contenson and Blot (1992)
Netiv Hagdud											x						x			x	3	Bar-Yosef et al. (1991)
Körtik Tepe	x	x		x		x			x	x	x			x			x	x	x	x	41	Özkaya et al. (2011); Özkaya and Coşkun (2011)
Hallan Çemi			x	x					x								x	x		x	11	Rosenberg and Davis (1992); Rosenberg (2011)
Nemrik 9						x			x	x	x										10	Mazurowski et al. (1997); Kozłowski and Zych (2002)
Tell Aswad			x				x				x										6	de Contenson and Anderson (1995)
Çatalhöyük				x					x							x		x			27	Russell and Griffitts (2013

Basta					x		x			x											10	Nissen et al. (1987, 1991); Hermansen and Gebel (1996)
Kfar HaHoresh																					1	Goring-Morris et al. (2008)
Demirköy Höyük																x					1	Algaze et al. (1991); Rosenberg and Peasnall (1998)
Tell ʿAbr 3	x	x	x	x		x	x				x					x	x	x		x	30	Yartah (2013)
Ain Ghazal							x														3	Rollefson et al. (1991)
Jericho									x												2	Kenyon and Holland (1982)
Göbekli Tepe	x					x			x		x			x		x		x		x	7	Beile-Bohn et al. (1998); Dietrich et al. (2012, 2014); Schmidt (2012)
Nahal Hemar							x		x							x					1	Bar-Yosef and Alon (1988); Noy (1991)
Horvat Galil									x		x										4	Gopher (1989)
Ali Kosh											x										1	Hole et al. (1969)
Tell Sabi Abyad II				x																	2	Verhoeven (2000)
Abu Hureyra			x				x		x			x				x					4	Moore and Hillman (1975); Moore et al. (2000)
Jerf el Ahmar	x	x	x		x	x	x		x		x				x		x	x		x	11	Stordeur et al. (1997); Stordeur (2000); Stordeur and Abbès (2002); Yartah (2013)
Gürcütepe							x														1	Schmidt (2012)
Nevalı Çori	x																x				2	Schmidt (1988)
Çayönü Tepesi									x		x							x			12	Davis (1982)
Gilgal I							x														2	Hershman and Belfer-Cohen (2010)
Zahrat adh-Dhraʾ 2							x		x		x										4	Edwards and House (2007)
Aşıklı Höyük									x	x	x				x						3	Özbaşaran (2012)
Beidha				x					x												1	Kirkbride (1966)
TOTAL COUNT	6	5	9	10	1	9	15	4	17	8	21	3	1	5	5	10	9	11	2	8	442	

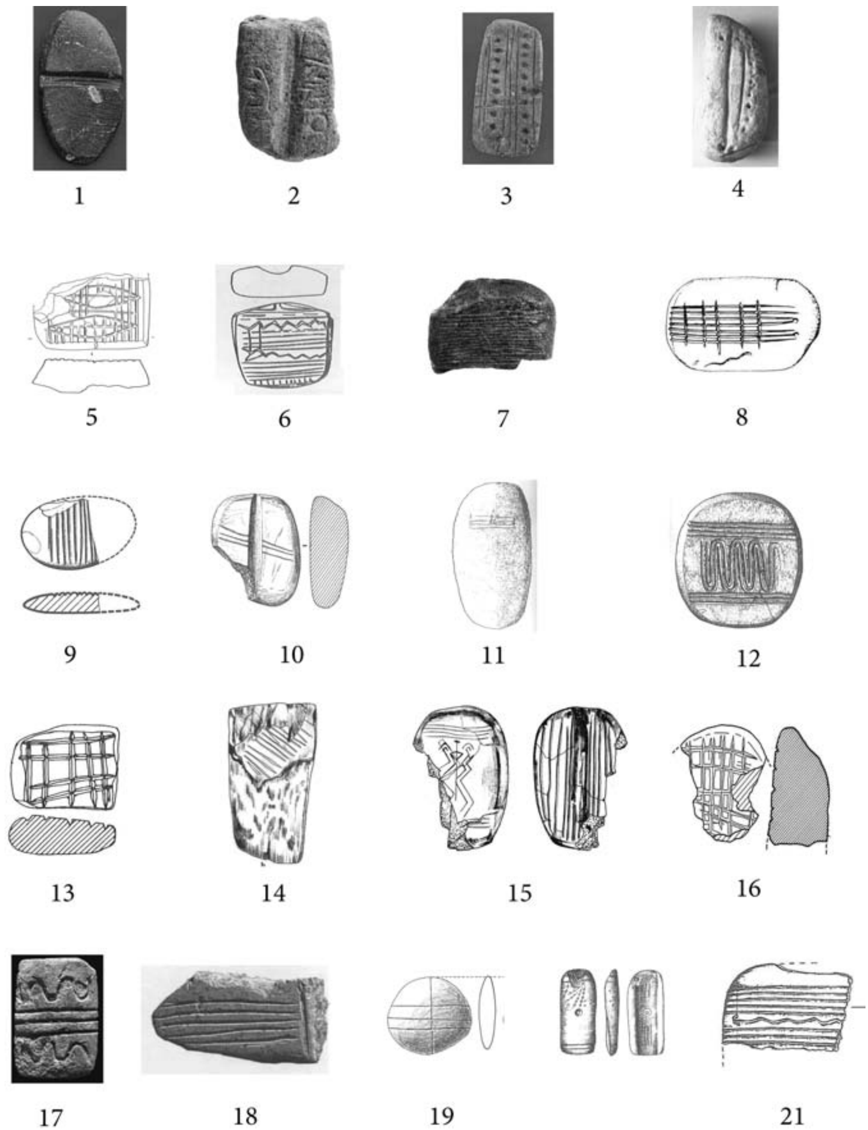

Figure 1.2 Incisions of parallel lines and other linear engravings on portable objects (not scaled) in selected PPN sites. 1. Körtik Tepe (after Özkaya et al. 2011: 335); 2. Göbekli Tepe (D-DAI-IST-GT-2013-NB-9759); 3. Abu Hureyra (unpublished, courtesy of Andrew MT Moore); 4. Basta (after Nissen et al. 1991: 39; courtesy of Hans Georg K. Gebel); 5. Cafer Höyük (after Cauvin et al. 1999: 68); 6. Çayönü Tepesi (after Davis 1982: 145); 7. Horvat Galil (after Gopher 1997: 215); 8. Jerf el Ahmar (after Stordeur et al. 1997: 284); 9. Munhata (after Gopher et al. 1995: 162; illustration by D. Ladiray); 10. Mureybet (after Lebreton and Stordeur 2008: 627); 11. Nahal Oren (after Noy 1991: 560); 12. Netiv Hagdud (after Bar-Yosef et al. 1991: 417); 13. Ras Shamra (after de Contenson and Blot 1992: 135); 14–15. Tell ʿAbr 3 (after Yartah 2013: 175–85); 16. Tell Aswad (after de Contenson and Anderson 1995: 128); 17. Wadi Faynan 16 (after Finlayson et al. 2009: fig. 6); 18. Zahrat adh-Dhraʾ 2 (after Edwards and House 2007: 9; courtesy of Phillip C. Edwards, La Trobe University); 19. Ali Kosh (after Hole et al. 1969: 201); 20. Nemrik 9 (after Kozłowski and Zych 2002: pl. CLXXII); 21. Tell Qaramel (after Mazurowski and Kanjou 2012: 215).

An important aspect of Neolithic graphic representation is the repetition of engravings and logical concatenation of symbols that could suggest a meaningful system of marks. It has been noted how common certain forms such as grid, parallel lines, and notches are in the Neolithic repertoire. Also, realistic depictions, such as birds, snakes, and animal pawns, are represented on portable objects in sequence, as illustrated in Figure 1.3. A linear series of figures is clearly observed here. On a stone bowl fragment from Körtik Tepe (Figure 1.3: 2), a series of birds and stylized snakes alternates with concentric circles and wavy lines. These same symbols are visible on a grooved stone at Tell ʿAbr 3 (Figure 1.3: 1). Associations and concatenations of both figurative and non-figurative signs are also characterized by strong stylistic similarities and thematic choices. Paws of possible felids or reptiles are engraved multiple times vertically in the decorated portable objects of Tell ʿAbr 3 and Tell Qaramel (Figure 1.3: 7–8). These paws are neatly drawn in the same manner on other objects (Figure 1.3: 5–6, 9). At three different sites (Körtik Tepe, Göbekli Tepe, and Jerf el Ahmar), linear sequences of snakes, birds, and other schematic signs are similarly represented (Figure 1.3: 11–13).

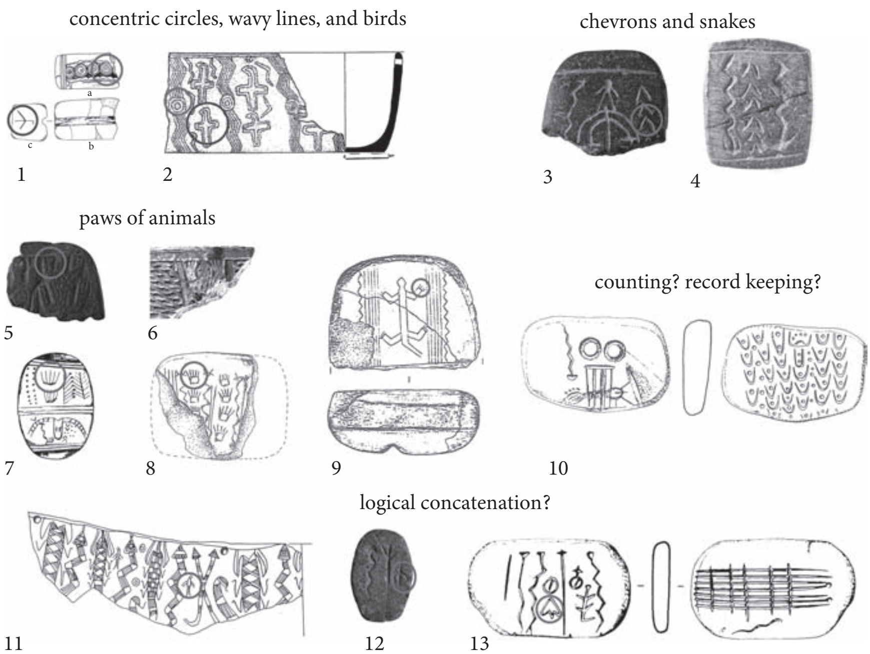

Figure 1.3 Figurative and geometric symbolism on portable objects (not scaled) in selected PPN sites, with circles highlighting similarities and logical associations of the signs: 1. Tell ʿAbr 3 (after Yartah 2013: 182); 2. Körtik Tepe (after Özkaya 2004: 598); 3. Tell ʿAbr 3 (after Yartah 2013: 198); 4. Göbekli Tepe (D-DAI-IST-GT-2011-NB-7045); 5. Tell ʿAbr 3 (after Yartah 2013: 198); 6. Jerf el Ahmar (after Yartah 2013: 214); 7. Tell ʿAbr 3 (after Yartah 2013: 167); 8–9. Tell Qaramel (after Mazurowski and Kanjou 2012: 216–20); 10. Jerf el Ahmar (after Stordeur et al. 1997: 284); 11. Körtik Tepe (after Schmidt 2012: 178); 12. Göbekli Tepe (D-DAI-IST-GT-2002-IW-00017); 13. Jerf el Ahmar (after Stordeur et al. 1997: 284).

This interconnection and association of different signs may indicate a sequence of individual entities that alternate with each other to delineate a specific scene or to convey a message. Finally, another important feature is observed in the incisions on both sides, front and back, of plaques. This practice suggests that graphic representations were placed on multiple visuo-spatial sectors, especially in those objects where repeating motifs such as U-shaped depictions and parallel lines are drawn in linear sequence as if to keep track on things that might be related to the subjects represented on the opposite side of the plaques (Figure 1.3: 10, 13). Since figurative forms and geometric depictions are sometimes presented together and the same series of graphic forms are widely repeated at different sites, it can be suggested that these figures and symbols were not only intended to decorate artefacts. Such recurrences of markings may have constituted a communication system comparable to writing as argued by Morenz (2014; also Dietrich et al. 2019).

Cognitive Models, Graphic Communication in Preliterate Societies, and their Relation to Writing

There are many definitions of writing (Kelly and Iyengar 2020). The standard definition refers to a conventional system of visual communication representing spoken language (DeFrancis 1989). This is meant to differentiate writing from other systems of graphic communication, but the distinction is much more complex than it seems, especially in relation to early forms of writing (Stauder 2010: 137). In fact, other scholars define writing in a much broader sense. Daniels (1992: 84) argues that writing is 'a system of more or less permanent marks representing an utterance in such a way that it can be recovered more or less exactly without the intervention of the utterer'. Elizabeth Hill Boone (2004: 313) proposed an extended definition of writing as 'the communication of relatively specific ideas in a conventional manner by means of permanent, visible marks'. Such an expanded concept of writing is the result of ongoing discussion on the origins of early scripts, acknowledging that communication could be performed not only through visual but also through tactile perception (e.g. *khipu*; see Urton 2017).

Much of the understanding on how writing emerged stems from cognitive studies about the cerebral functions related to the recognition of written texts. From the fovea to the visual cortex, mental processes concerning reading and writing involve multiple stages in the acquisition and transmission of knowledge, recognizing that physical engagement with material objects also contributes to some extent to learning processes (Malafouris 2013). Recent work on the visual cortex area located in the occipital–temporal region of the brain has shed light on the wide range of cognitive developments involved in the visual perception of images, such as objects and faces (Grill-Spector and Malach 2004; Khan and Hofer 2018). In particular, the visual word form area (VWFA) is known to be the region specialized for letter strings (Dehaene-Lambertz et al. 2018). Considering the ongoing debate on this topic (see, e.g., Dien 2009), it seems that the VWFA does not only identify letters, words, and line texts but also codifies their structural composition (Hannagan et al. 2021). In this regard, it has been argued that the VWFA assumed a vital role in processing information visually through 2D written shapes by significantly improving the connectivity of the cerebral regions related to language and vision (López-Barroso et al. 2020). Furthermore, it has been hypothesized that the VWFA was previously dedicated to similar cognitive functions (for example, object recognition) in preliterate societies and subsequently 'recycled' for letter and word recognition (Dehaene and Cohen 2007). The importance of the VWFA is also supported by neuroimaging experiments with Palaeolithic engravings triggering the leftward activation of the visual cortex (Mellet et al. 2019), although such tests are based on modern living individuals.

The nature and developments of reading and writing acquisition from an evolutionary point of view are still debated. Dehaene (2009) argued that writing evolved 'to fit the cortex'—in other words, the selection of the signs that compose a script depends on the visual elementary forms that the mind perceives and chooses to express thoughts. This selection of elementary forms essentially matches the forms of the objects found in natural scenes (Changizi et al. 2006). Therefore, it can be hypothesized that the way humans represent symbols reflects the way the mind harnesses the external world via affordances and constraints in the perception of natural shapes, lines, and forms. On the other hand, the plasticity of the brain follows pathways beyond cortical constraints, as human cognition can be subjected to a variety of internal and external environmental influences that allow for diverse sets of methods of knowledge acquisition (Menary 2014).

The fact that geometric or abstract representations are common in the repertoire of prehistoric depictions (Major 2018; Dutkiewicz et al. 2020) suggests that this type of representation is selected because it is better suited to human perception and favours the clarity that the symbolic message embeds (Tylén et al. 2020). Moreover, humans manifest a higher sensibility to geometric shapes regardless of their education, cultural background, and visual experiences (Dehaene et al. 2006; Heimler et al. 2021; Sablé-Meyer et al. 2021). A particular inclination to discriminate between parallel and perpendicular shapes has been demonstrated in experimental studies (Dillon et al. 2019). Furthermore, experimental semiotic tests have shown how cooperative units interacting with depictions employ cultural selection, through which a given sign is adopted as a symbol based on how successful it becomes within the pre-existing communication system of a society (Fay et al. 2010, 2014; Garrod et al. 2010; Tamariz et al. 2014). In fact, repetitive activity and interactive grounding processes are key aspects in the adoption of written signs, as symbols are created based on how group members use and understand them (Garrod et al. 2007). Over time, signs become compressed and integrated as part of a more standardized communication system. From this perspective, it can be argued that preliterate societies that were in relatively frequent contact may have adopted an array of easy-to-grasp figurative and non-figurative shapes for communicative purposes, which become richer and more extensive as the social system develops and community interaction increases and becomes more complex.

From a cognitive point of view, it can be hypothesized that in preliterate societies the selection of graphic motifs, including iconographic images and geometric shapes, occurs to sustain complex and growing communicative interchanges. The repetitive depiction of parallel lines, notches, and other simple shapes could have been used to express specific meanings, without necessarily implying that such forms of representations are linguistic. On the other hand, graphic symbols made to express constructed meanings might be sought as semasiographic signs—namely, sets of marks aimed at conveying specific messages, logically arranged. This can be inferred given the recurrences of the same graphic forms in many portable objects. As illustrated before, a series of motifs appear in meaningful visual contexts. Animal paws, concatenated series of snakes, birds, and other schematic shapes indicate an understanding of the visual communication structured in a logical setting shared by different community centres. Therefore, it is possible that these communities increasingly rely on the same shared system of marks to foster and sustain their social connections and cooperation.

Portable Objects and Systems of Communication in the PPN

Understanding the significance and role of symbols in prehistory primarily depends on the value and use of the artefacts in which the marks appear. Incisions are observed in a relatively wide range of portable objects, as previously described, and understanding the typology and contextual framework of the artefacts can shed light on the possible specific meanings and functions that signs might have assumed. Traditionally, tokens and other clay objects have been associated with administrative purposes (Schmandt-Besserat 1992) although they might have taken on other functions, including gaming (Bennison-Chapman 2018; Palka 2021). Pestles, grooved stones, and other handheld tools are clear examples of items used for utilitarian purposes, such as processing food, hunting, and tool manufacturing. Perforated pebbles, beads, and other pendants have often been interpreted as body adornment, considering a wide range of archaeological and ethnographic evidence (Borić and Cristiani 2019; Vasić 2020). Much more challenging is identifying the role that decorated portable objects, such as plaques, assumed in prehistory, as the recognition of their utilitarian aspects is far from clear. Many of the inscribed objects are part of this broad category of decorated portable objects, which are less than 20 cm long and have no clear-cut functional role. Most interpretative attempts to reconstruct the meaning of these artefacts stem from ethnographic examples and experimental studies. Plaques have been interpreted as mnemonic devices, as heirlooms, or as associated to systems of notation like Palaeolithic engravings (d'Errico 1995). In other cases, a heraldic function has been proposed for certain inscriptions on stone plaques that were perhaps intended to record genealogies (Lillios 2008: 170–6). It is also reasonable to interpret all these as emblems of social identities, markers of social status or items meaningful for afterlife or social memory, as many are found in mortuary contexts (e.g. Körtik Tepe; see Benz et al. 2018).

A further key implication concerns the life history of such prehistoric items—namely, the varied use and roles that objects could have assumed during their 'life', from the moment they are manufactured to the moment they are ultimately discarded. In prehistory, objects are often recycled, including portable ones, and present a varied and difficult-to-reconstruct life history that ultimately ends in debris, out of their original context or buried within architectural features or in tombs. Archaeological evidence of multi-use of such artefacts is seen on some decorated objects such as jewellery or pendants that are first worn and then deliberately deposited. Many have been found in tombs not only in the Near Eastern Neolithic but also in other regions and time periods (Welsh 2004). Acknowledging that objects can embed different functions and connotations, considering portable objects as inert objects that are used, moved, and acquire meaning only because they are produced and managed by humans fails to acknowledge the richness of the relationships between the objects and their users (Meirion Jones et al. 2016).

Finally, knowing that several very similar shapes are seen on portable objects, it can be suggested that the most common motifs not only are marks created for mnemonic purposes but may involve further communicative intentions, especially when observing the confluence of figurative and non-figurative images on the same object. Considering that a substantial number of portable objects have not been published or preserved or have been looted, one might suggest a much wider extensive use of both iconographic and geometric representations. In fact, proposing observations from published material alone, a quite remarkable number of portable objects found in a cluster of sites belonging to the so-called Golden Triangle region (e.g. Tell ʿAbr 3, Jerf el Ahmar, and Tell Qaramel; see Kozłowski and Aurenche 2005) present the same stylistic forms, such as stylized animal drawings and parallel or zigzag lines. Rather than conceiving the repetition of notches and other small linear engravings as simple representation of numeracy (see discussion in d'Errico 1995), it is reasonable to think that the representational system in the PPN reflects a much more complex system of interactions between individuals and communities experimenting with new forms of communication that are not restricted to counting. Symbols and systems of communication are adopted for different motives (personal identity, trades, exchange, and political or religious reasons) and further archaeological and ethnographic investigations are needed to assess the role of certain portable objects that appear to have no evident utilitarian function.

Concluding Remarks

The archaeological evidence suggests that Neolithic communities in the Near East engaged in increasing communicative interchange through a wide array of strategies. Large decorated and multifunctional buildings, settlements consisting of densely abutted domestic structures, trade, and exchange of objects and similar technological practices across vast regional areas all indicate that Neolithic people were in frequent contact and communicated on a large scale. Previous research has highlighted the importance of ritual practices in the social life of Neolithic communities (e.g. Kuijt 2002), which suggest shared forms of communication across Neolithic groups, often expressed through figurative depictions on stone monuments and mobiliary art similar in style and content. Moreover, it is known that organized and highly active communicative interaction through visual media is not confined to the chronological framework of the Neolithic but is also consistently attested in later prehistoric phases. This suggests that the graphic communication systems developed from the tenth millennia BCE onwards present key threads that most likely contributed to shaping later prehistoric Near Eastern cultures and their social networking strategies.

This chapter highlights the high frequency of very similar marks depicted on portable objects that were found in many sites during the Early Neolithic transition. Such preference for depicting similar shapes may be due to a cognitive tendency to select certain geometric and realistic images for expressing thoughts and for communicative purposes. In fact, experimental semiotic tests have shown that graphic representations evolve into symbolic representation through interactive grounding processes among collaborative groups. Representations become increasingly efficient for communication purposes when direct interactions between individuals are maintained over time through progressive simplification and compression (see Morin et al. 2020). In addition, neurobiological studies have shown that image and text recognition involve regions of the brain located in the lateral occipital–temporal gyrus. Different but nevertheless deeply connected brain areas are activated when individuals visually perceive images, iconic representations, letters, and schematic signs. Thus, the same cortical functions used in reading and writing might previously have been employed in preliterate societies for understanding symbols and their embedded messages. This could explain the preference and repetitive use of shapes such as grids, parallel lines, notches, V-shaped signs, chevrons, and other images that may be associated with trends in the cultural selection in which certain signs are adopted to assume specific meanings.

Seeing writing as a human characteristic that is either present or absent in given cultures hampers an adequate understanding of the socio-cognitive processes and trajectories leading to the invention and implementation of writing systems. Schmandt-Besserat's theory (1992) on tokens and their relation to the emergence of writing in Mesopotamia has shown how certain administrative practices are not phenomena that evolve in a relatively short period of time. Moreover, the idea that the invention of writing is bound to the formation of certain socio-economic contexts (for example, statehood), which would allow for the adoption of this type of communicative approach, is increasingly disregarded, as the inventions of writing around the world appear in different social environments (Houston 2004; de Voogt 2021). From a cognitive standpoint, the employment of iconic and geometric signs and schematic representations as methods of storing and transmitting information implies a reorientation of the cortical processes that is unlikely to have developed in a few generations. Before reaching a structured configuration of graphic codes aimed at recording language and spoken words, systems of permanent markings undertake a series of evolutionary trajectories that begin with the use, recognition, and manipulation of figures representing objects, faces, and geometric lines—in other words, symbolic forms. Therefore, it can be argued that systems consisting of graphic symbolic forms were created to satisfy a growing need for large-scale communication and to facilitate social activities in increasingly large and mutually dependent social entities, contributing to the long non-linear development of cognitive skills involved in the use of graphic codes.

2

The Origins of Chinese Writing

Paola Demattè

According to prevailing narratives, inscriptions on shell and bone (*jiaguwen* 甲骨文) dating to the Late Shang dynasty (*c*.1250–1045 BCE) and excavated from the area of the last Shang capital, Yinxu (Anyang, Henan) are the earliest form of writing from China (Boltz 1994) (Figure 2.1).[1] This is only partially true. Inscriptions on shell and bone are the earliest readable texts, but earlier evidence in the form of single graphs or short sequences of characters of difficult interpretations does exist. Early and Middle Shang (*c*.1500–1450 BCE) ritual vessels were sometimes inscribed with names or emblems, and shorter inscriptions and/or single graphs are known from Shang and even pre-Shang ceramic, bones, pottery, and even jades from sites near Anyang and beyond (Chang Kuang-yuan 1991a, 1991b; Song Guoding 2003). Furthermore, signs that share elements with the Late Shang script have been documented also on pottery, jade, and bone artefacts from Middle and Late Neolithic contexts in the Yellow and Yangzi River valleys and coastal areas (Cheung Kwong-yue 1983; Demattè 1999, 2010; Cao Dingyun 2001).

The wide distribution of Late Neolithic graphs, in addition to raising the issue of an earlier origin of Chinese writing, questions the theory of a single focus of origin in the middle-lower Yellow River valley, and evokes the possibility of additional sources in the Yangzi River valley and coastal areas. Archaeological remains show that in the late prehistoric period a variety of signing systems coexisted over a wide area of China and that in time these systems may have contributed to the birth of the Shang script. These early signs are associated with ritual objects (vessels, jade implements, or weapons) and contexts (offering pits, altars), introducing the possibility that Chinese writing may have originated in connection with the ritual recording needs of Late Neolithic societies.

Although it is agreed that mature writing records with various degrees of approximation an underlying spoken language, writing did not originate specifically for that purpose. The earliest sign systems that are at the base of all primary writing were developed to record quantities, materials, and identities, not language. For these reasons, they are known as proto-writing or non-glottographic

[1] In English, these texts are generally known as 'oracle bone inscriptions' or by the acronym OBI. However, since these inscriptions also include material that is not strictly related to divination, I use 'shell and bone inscriptions', which is a literal translation of the Chinese *jiaguwen*.

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Figure 2.1 Late Shang dynasty divinatory inscription on cattle shoulder bone
Source: Heji, 137.

writing. In the specifics of this case, recognition of these prehistoric recording systems permits the delineation of the development of Chinese writing from its Neolithic non-glottographic ancestors into the mature writing of the Bronze Age (Late Shang, *c.* thirteenth century BCE).

The presence of these earlier graphic signs proves that shell and bone writing did not originate suddenly without precursors during the Late Shang dynastic period but emerged as the result of a long evolution. This fact is also clear from the characteristics of *jiaguwen*, which, unlike other early writing systems, appears fully developed and capable of recording with clarity the underlying language of the time: its texts adopt grammar and syntax similar to those of received classical sources and the script includes all categories of speech (nouns, adjectives, verbs, adverbs, pronouns, prepositions, conjunctions, modal particles) and features a variety of sign types, ranging from pictographs (semantographs), to semanto-phonetic compounds, to phonetic loans (Chen Mengjia 1956: 85–134; Norman 1988; Takashima 2004).

The complexity of the vocabulary and the ability to record specific aspects of the Chinese language indicate that by 1250 BCE the Shang script was solidly in the glottographic stage. This means that graphs were associated with words and were no longer non-linguistic visual signs or pictographic symbols.[2] These characteristics of the script cannot be explained by sudden invention and imply that some other event contributed to this development: either some earlier form of writing preceded *jiaguwen* or writing was imported by diffusion. Since there is no evidence of external transmission and the characteristics of *jiaguwen* graphs indicate that it was tailored to the Chinese language, it is most likely that writing in China developed locally from earlier Neolithic and Bronze Age signing systems.

Neolithic Signs

The earliest graphic signs and pot-marks that have been linked to the origins of Chinese writing appear among some settled agricultural communities during the Neolithic (*c*.8000–2000 BCE). During this period, the territory of today's China was characterized by the presence of several regional clusters of sites with comparable material culture. The most important were distributed in the Yellow River valley, Liao River valley, Yangzi River valley and delta area, and in the Chengdu basin.

The meaning and function of graphic signs from the Early to Middle Neolithic contexts (*c*.6000–4000 BCE) are uncertain, and in general it appears that they may not be directly related to writing. The situation changed in the Late Neolithic (*c*.3000–2000 BCE), when signs formally comparable to Shang graphs started to appear in the archaeological record of eastern central China and the coast, areas that played key roles in the emergence of Bronze Age state societies at the beginning of the second millennium BCE.

Early to Middle Neolithic Signs

Tallies, painted or incised graphic signs, and three-dimensional jade tokens have been discovered in sixth-, fifth-, and fourth-millennium BCE contexts throughout China. The appearance of these recording and symbolizing activities may have been connected with the growing socio-economic complexity of some societies. The most significant sign systems are those from the sites of Jiahu, Banpo, Jiangzhai, and Dadiwan in north, west, and central China and those from Hemudu and Shuangdun in south central China (Figure 2.2).

[2] Glottographic refers to writing systems that record speech making use of puns to write words for which no pictorial representation exists (rebus principle). This practice marks the beginning of a process that eventually led to the organization of signs according to the grammatical structure of an underlying language (Robertson 2004).

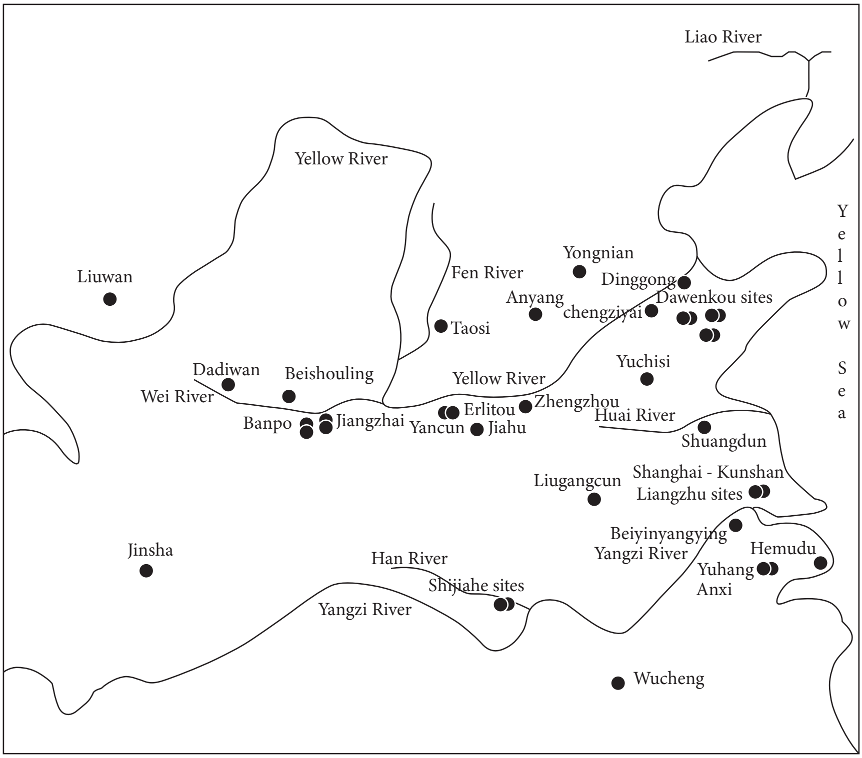


Figure 2.2 Map of sites with graphic evidence

The Central Plain: Jiahu

Sixteen signs incised on fourteen objects ranging from turtle shells (nine signs on eight turtle shells including one carapace and seven plastrons), to bone (two signs on two long bones manufactured into flutes), stone (two signs), and ceramic (three on potsherds), were excavated from burials, ash pits. and house floors at Jiahu (Wuyang, Henan), an Early to Middle Neolithic settlement in north-central China. Three signs came from a rich male burial, that held among other things eight turtle shells filled with pebbles and placed over the head of the deceased (Figure 2.3b). Two signs—a deeply carved shape that resembles *jiaguwen* and has been interpreted as 目 *mu* ('eye') and two shallow parallel lines—were incised on a turtle plastron. The third was superficially incised on a bone tool. Another burial yielded a bone fragment with a carved sign identical to the modern character 日 *ri* ('day/sun') (Figure 2.3a). The remaining signs are rather simple, ranging from single or double lines to rounded elements (Henan Province Institute of Archaeology 1999: 344–461).

Jiahu signs have attracted considerable attention; questions have been raised, however, about the interpretation of this evidence. Some scholars consider them

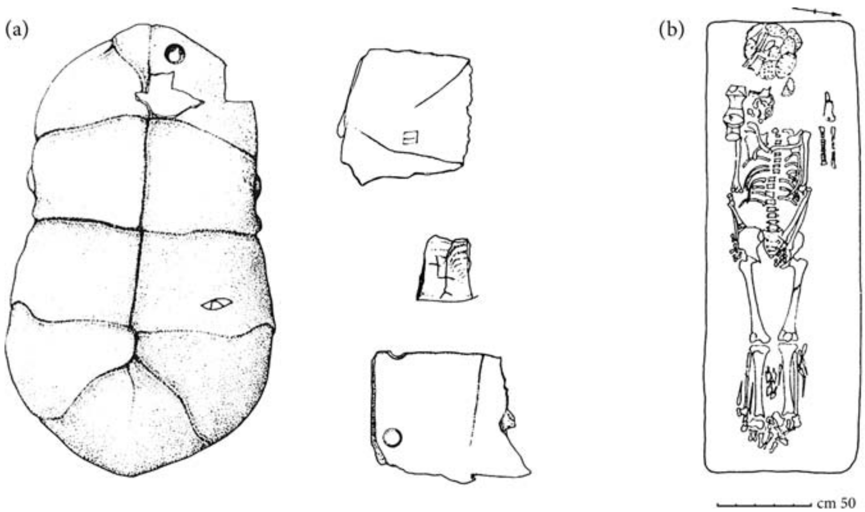


Figure 2.3 Jiahu, Wuyang, Henan: (a) inscribed and bored bone pieces; (b) layout of tomb M 344
Source: Henan Province Institute of Archaeology (1999: 5, 13, figs 8, 29).

to be proof of incipient writing activities in the Early Neolithic (Li Xueqin et al. 2003). Others are sceptical about the nature of the signs and the early date proposed for the origins of Chinese writing, noting that the signs are either too simple or unconvincing as an incipient writing form (Liu Zhiyi 2003). There is a distinct possibility that Jiahu signs have different origins. Some shallow signs that are not clearly defined may be the result of depositional events. Others may be workshop marks indicating places where holes should be drilled (for instance, in the making of the flutes) or knife marks produced by defleshing. Yet others, like those that feature deep, sharp, and clean V-shaped cuts, are intentionally made but may have been recently cleaned.

The Lower Huai and Yangzi River Valleys: Hemudu and Shuangdun

Early signs have been discovered at sites in the Yangzi and Huai River valleys. Pictorial symbols incised on ceramic vessels, potsherds, and bone objects have been unearthed at Hemudu, a pile-dwelling village in the Ningpo and Zhaoxing plain area of coastal Zhejiang that was occupied from the fifth to the fourth millennium BCE (Sun Guoping 2013: 557). In addition, some decorative patterns on Hemudu bone and ceramic artefacts prefigure signs of the Late Neolithic Liangzhu and Dawenkou cultures that may have been forms of proto-writing (Figure 2.4a).

Even more intriguing are the more than six hundred pictorial and abstract signs incised on pottery from Shuangdun (Bengbu, Anhui), an Early Middle

Figure 2.4 (a) Decorative emblems carved on bone, ivory, and pottery from the site of Hemudu, Zhejiang; (b) signs carved on pottery from the site of Shuangdun
Sources: Zhejiang Province Cultural Heritage et al. (1978: 60, fig. 14:4, 70, fig. 22); Hemudu Site Archaeological Team (1980: 7, figs 7:1, 7:5); Wang Yunzhi (1994); Kan Xuhang and Zhou Qun (2007).

Neolithic mound site in the Huai River valley (Figure 2.4b). Shuangdun signs are for the most part incised pre-firing at the bottom of ring-footed *wan* bowls and occasionally on pedestalled *dou* cups. They range in size between 3 and 5 cm and come in over fifty different forms, from naturalistic renderings of animals (fish, pig, deer, silkworm, cocoon with silk), to plants (leaves, flowers), objects (houses, nets) and abstract or geometric patterns (crosses, hooks, lozenges, triangles, rectangles, lines). The most common are fish pictographs (Kan Xuhang and Zhou Qun 2007: 112–20, figs 16–20 and colour pls VII–XII).

The Middle and Upper Yellow and Wei River Valleys and West China: Yangshao

Middle Neolithic signs are present in significant numbers among the agricultural settlements of the middle to upper Yellow River basin, an area characterized by a flourishing painted pottery tradition known as Yangshao. Signs carved or painted on pottery containers have been unearthed at several sites (5000–3000 BCE) in the Wei River (a tributary to the Yellow River) valley of Shaanxi. The largest concentrations are at Banpo and Jiangzhai, two sizeable villages, and in smaller numbers at Beishouling. Most date to the early occupations of these sites, which is placed at *c.*5000–4000 BCE (Institute of Archaeology, CASS 1963; Wang Zhijun 1980; Xi'an Banpo Museum et al. 1988).

Yangshao signs share several traits. They were mostly incised after firing with a sharp stone, bone, wood, or bamboo knife (a few may have been carved even after the vessels had been in use for some time). They were almost always carved in prominent spots (such as on the black band running around the outer rim of select types of red pottery vessels such as *bo* bowls and *pen* basins), and only rarely in less visible positions like the bottom of vessels. They are generally non-figurative, simple in structure, and not arranged into compounds or sequences. The most common and those that appear at the largest number of sites are single or double vertical strokes, crosses, inverted V shapes, comb patterns, and hooks (Figure 2.5). Most of these signs have been interpreted as numerals, but a few more complex types could be pictographs. Two from Jiangzhai deserve attention. One, , could be a combination of two stacked elements: above what could be animals in profile, below possibly a numeral. Another, , may be a pictograph representing a horned animal (Cheung Kwang-yue 1983:, 365) (Figure 2.6). Notwithstanding their simplicity, Yangshao marks have been repeatedly at the centre of debates about the origins of Chinese writing, at times overinterpreted as early Chinese characters (Ho Ping-ti 1975: 223–67; Li Xueqin 1985) and at others dismissed as meaningless scribbles (Keightley 1989: 188, 192–3).

Yangshao signs embodied meaning, but it is not clear what they recorded. They are unlikely to be part of a writing system, because they are structurally too simple. On the other hand, they are also unlikely to be potters' marks, because they appear only on painted *bo* bowls and *pen* basins, they are visibly carved post-firing on their black painted bands, and the same signs are used in different villages. Archaeological evidence indicates that they are consistently associated with valuable painted ceramic *pen* basins and *bo* bowls used for the burial of infants and toddlers. Yangshao signs may, therefore, have been part of a socially significant inter-village signing system: a form of non-linguistic recording akin to tallies, tokens, or knotted ropes that noted aspects associated with the performance of rituals, particularly those of burial, and clan appurtenance. Given their lack of formal complexity and low variability, they could only have had a limited

Sequential number	Sign type	Banpo	Jiangzhai	Lingkou	Huantou	Wulou	Xinye	Lijiagou	Total
1		65	72	1	1			15	154
2		4	7						11
3			1						1
4		1	1						2
5		3	1					1	5
6		2	2					1	5
7		2	2					2	6
8		2	1						3
9		1	2					1	4
10		4	4						8
11		1							1
12		3	3					1	7
13		1							1
14		2							2
15			1						1
16		1							1
17		1							1
18		1	1						2
19		1							1
20		2							2
21		1							1
22		1							1
23		1	2	1					4
24		1	1						2
25			3				1		4
26		4	2					1	7
27			1						1
28		6	2						8
29		1							1
30		1							1
31			2						2
32			1						1
33			1						1
34			1						1
35			1						1
36			1						1
37			1						1
38			1						1
39			1						1
40			1						1
41			1						1
42			1						1
43			1						1
44			1						1
45			1						1
46			1						1
47			1						1
48			1						1
49			1						1
50								1	1
51						1			1
52			1						1
		113	129	2	1	1	1	23	270

Figure 2.5 Table of Yangshao signs

use in graphic recording and communication. Still, their use in these circumstances signals that sign-making may have risen with the expanding ritual needs of village life. If so, they could be considered not ancestors, but logical antecedents of writing.

Signs similar to those of the Yangshao tradition have been recovered also west of Shaanxi, in Gansu and Qinghai, which have a comparable painted pottery tradition. These similarities suggest that these signs may have been part of a regional system that extended from the middle to the upper Yellow River valley. Several marks incised on pottery have been found at Dadiwan (Qin'an, Gansu), a

Figure 2.6 Drawings and rubbings of Jiangzhai signs on pottery dating to period I
Source: Xi'an Banpo Museum et al. (1988: 142–3, figs. 108–9).

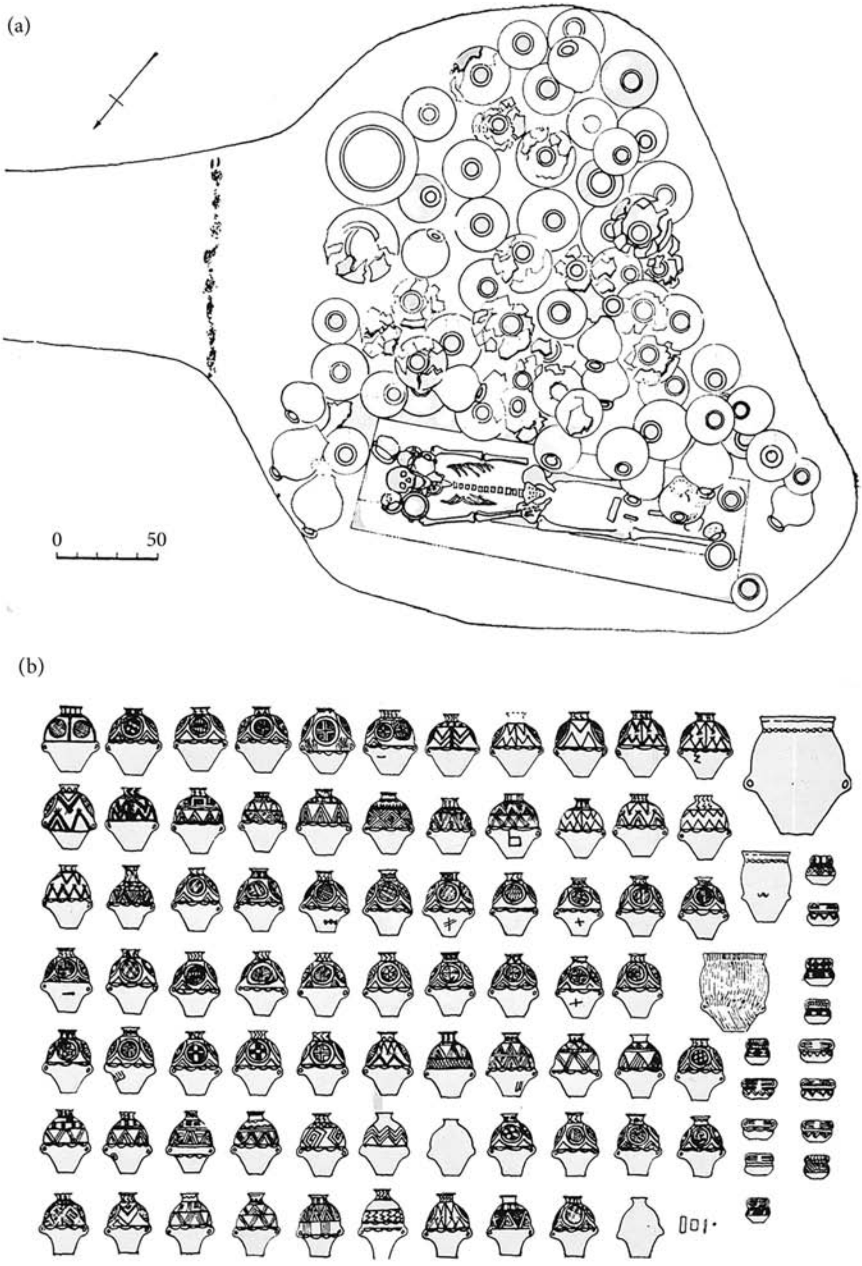


Figure 2.7 Tomb M564 at Liuwan, Ledu Qinghai: (a) layout of burial; (b) painted pottery vessels from the same burial

Source: Qinghai Province Cultural Relics Bureau and Institute of Archaeology CASS (1976: 369–70, figs. 6–7).

large settlement near the Qingshui River, and at Liuwan (Ledu, Qinghai), a cemetery with over five hundred tombs (Figure 2.7) (Qinghai Province Cultural Relics Bureau and Institute of Archaeology CASS 1976: 365–77, esp. 376, fig. 7; Gao Ming 1990: 5; Xie Duanju 2002).

Beyond incised non-figurative signs, fine ceramic vessels from various sites in Shaanxi (Banpo, Jiangzhai, Beishouling) and beyond (Yancun, Miaodigou, Dadiwan) frequently carry painted designs. These motives tend to be large and not organized as decorations. Some resemble Chinese pictographs, and it is possible that they could have been used as emblems to identify clans or individuals. Among them is a large red pottery *gang* urn serving as an adult secondary burial that was excavated at Yancun (Linru, Henan). The urn carries the images of a cormorant with a fish hanging from its beak and a stone axe at its side (Figure 2.8). These three signs—bird, fish, and axe—are oversized and organized in a way that suggests that they had some semantic content. The drawing is conceptually close to Bronze Age compounds that combine birds, fish, and axe pictographs to create clan emblems. Since the vessel was a funerary urn, the sign could have served to

Figure 2.8 The stork, fish, and axe design on a Yangshao period burial urn from Yancun, Linru, Henan
Source: Yan Wenming (1989: 304, fig. 1).

identify the deceased as an individual or as belonging to a specific clan (Linru County Cultural Center 1981: 3–6, pl. I).

Late Neolithic (3000–2300 BCE) and Longshan Transition (2300–1900 BCE)

By the Late Neolithic more complex forms of graphic recording came into use among some societies of the middle and lower Yangzi and Yellow River valleys. In these contexts (Dawenkou, Liangzhu, Shijiahe, Shandong Longshan, Taosi) graphs were carved or painted on pottery vessels or jade artefacts that were employed in ritual activities. Though limited in number and scope, many of these signs are not simple pot-marks, but pictographs that are structurally similar to Chinese characters and probably ancestral to them. Archaeologically, the appearance of these signs goes hand in hand with a trend towards urban development and its corollary of social stratification, political centralization, technological specialization, and ritual organization that characterizes some prehistoric communities from the beginning of the third millennium BCE (Demattè 2010).

The Lower Yellow River Valley and Coastal Areas: Dawenkou Graphs

Since the late 1950s, pictorial graphs on pottery have been found in a territory that stretches from Shandong to the coastal and inland areas of Jiangsu and Anhui. In the Middle to Late Neolithic, these lands were characterized by clusters of sites collectively known as Dawenkou, a tradition that emerged in the lower Yellow River valley and entertained ties with the middle Yellow River (Late Yangshao), the Liao River (Hongshan), and the middle and lower Yangzi River (Shijiahe and Liangzhu) valleys. Dawenkou sites feature traits that appear ancestral to those of the subsequent dynastic period. Among them are: pit and timber structures for elite burials; sets of monochrome pottery cooking and drinking vessels for ritual use; bone divination; as well as the practice of incising or painting large pottery containers with signs that structurally appear similar to archaic Chinese graphs (Gao Guangren and Luan Fengshi 2004: 78–80).

Most signs were carefully incised, probably with a dedicated bone or bamboo stylus prior to firing on thick wide-mouthed pottery vats recovered from burials or ritual contexts. The signs appear either singly at the top or belly of the vessel or in pairs in separate parts of the body. If a vessel carries two graphs, they always differ from each other. In some cases, graphs are smeared with red pigment, a practice also used during the Bronze Age to enhance the visibility or signal the importance of bone and bronze inscriptions (Wang Shuming 1992; Wang Haicheng 2015: 139, fig. 7.4, 144). Only one graph was painted and appeared on a different type of vessel, a *hu* bottle (Figure 2. 9).

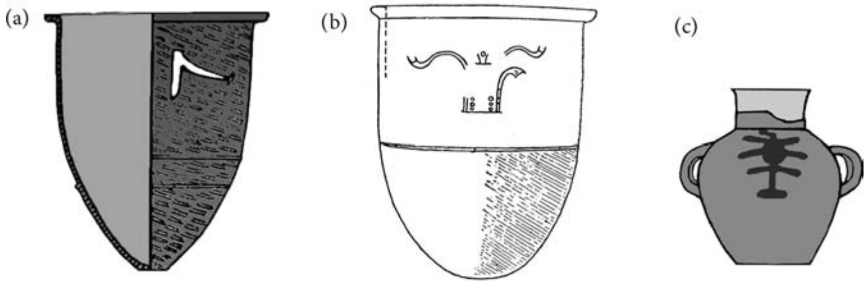


Figure 2.9 Inscribed Dawenkou pottery vessels: (a–b) *zun* jars from Lingyanghe and Beiyinyangying; (c) flat back *hu* with painted graph from Dawenkou tomb M75
Source: Shandong Province Cultural Relics Bureau and Jinan Museum (1974: 118, fig. 94); Nanjing Museum (1993: 87–8, fig. 49:1).

Many graphs originate from sizable sites in central and south-eastern Shandong, the so-called Dawenkou core. Among them are Dawenkou, Qianzhai, Dazhucun, Hangtou, Lingyanghe, Gangshang, Yaowangcheng, and Dantu. However, similar graphs have been found also at Yuchisi (Anhui) and Beiyinyangying (Jiangsu), which are at a considerable distance from the Dawenkou core but share material traits with it. Most sites are large and, in some cases, include both cemeteries and habitations. Regardless of the location or size of the site, all inscribed evidence is datable to the late Dawenkou phase (2800–2300 BCE) possibly spilling into the subsequent Longshan phase (2300–1900 BCE) (Wang Sili and Jiang Yingju 1963: 351–61; Shandong Province Cultural Relics Bureau and Jinan Museum 1974: 72–3, 117, fig. 59; Nanjing Museum 1993; Institute of Archaeology CASS 2001, 2007; Luan Fengshi 2004).

Based on published archaeological reports, approximately thirty-three graphs of eight different types have been excavated in Dawenkou contexts, but probably more have been found (Figure 2.10). Some are single pictographs (types 4, 5, 7, 8), others are composites made of two or three basic signs (types 1, 2, 3, 6). Given their resemblance to Shang bone and bronze characters, Dawenkou graphs have been considered ancestral to Chinese writing and have been interpreted accordingly. This has led to the practice of providing straightforward correspondences between Neolithic signs and modern characters, sometimes (but not always) mediated by Shang graphs. This interpretative *modus operandi* can be problematic, because meaning, function, and use of Neolithic signs may have been substantially different. Nonetheless, paleographic comparisons of Dawenkou graphs or of their pictorial elements with Shang graphs are worthy of attention. For instance, type 1 (also known as 'fire–sun') is analysed as being composed of elements comparable to the *jiaguwen* graphs (火 *huo* 'fire') and (日 *ri* 'sun'), or alternatively (月 *yue* 'moon') and (日 *ri* 'sun'). Type 2 (also known as 'mountain–fire–sun'), which may be a complex form of type 1, is thought to be a combination of three pictographs comparable to *jiaguwen*: (山 *shan* 'mountain'), (火 *huo* 'fire') and (日 *ri* 'sun'). Type 3 may be a variant or hybrid of

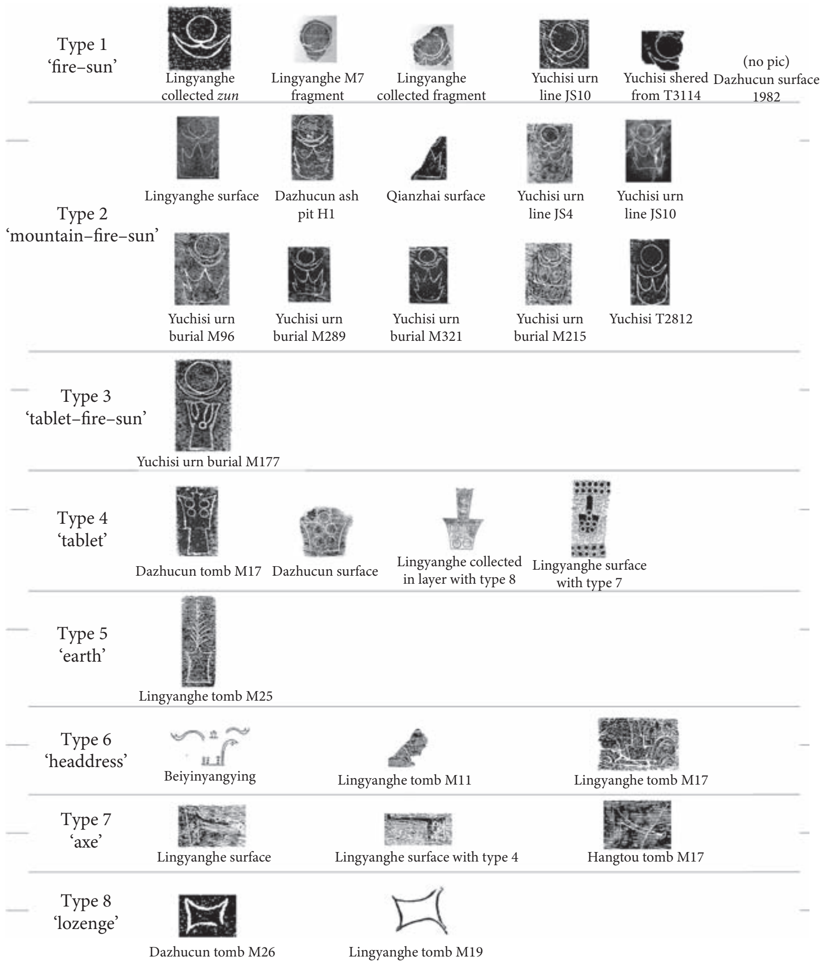


Figure 2.10 Table of Dawenkou graphs

type 2, where the  component is replaced by a three-pronged elongated element with a circle in the middle. This element resembles similarly shaped signs of uncertain significance classified as type 4 ('tablet'), which may represent a jade ceremonial tablet/sceptre or a sacrificial altar. Alternatively, it has been hypothesized that they indicate early forms of the *jiaguwen* graph  (享/亯 *xiang* 'worship'), which may have represented an altar or temple but that in shell and bone inscriptions was used as a name. Type 5, which features a pedestal with a plant-like growth, has been likened to *jiaguwen*  (土 *tu* 'earth/soil'),  (南 *nan* 'south'), or  (封 *feng* 'fief'), the latter being a character that in Bronze Age inscriptions resembles a plant germinating from the soil. Type 6 may show a headdress with flowing ribbons at its centre as type 4. Type 7 resembles Shang pictographs of hand-held cutting tools, such as *jiaguwen* (斤 *jin* 'sickle' or 锛 *ben* 'adze'), (钺 *yue* 'axe'), or (斧 *fu* 'axe'). Type 8, a square or lozenge with concave sides, has been compared to *jiaguwen* (凡 *fan* 'every') (Yu Xingwu 1973; Shao Wangping 1978: 75; Tang Lan 1981a; 1981b; 1981c: 125; Wang Shuming 1986: 272; 1987: 75, fig. 10; 1992; Li Xueqin 1987: 78–9; Gao Guangren and Luan Fengshi 2004).

Although a comparative analysis of Dawenkou graphs with Shang characters can be useful to establish a connection between the two traditions, the meaning and function of Neolithic signs cannot be gained only by paleographic means. The analysis of spatial distributions and material associations gained from the archaeological context may be more illuminating. The type of vessel inscribed is one of the most important elements. The majority of incised graphs appear on the same vessel type, a black or gray pottery vat known as *zun* or *gang*. This tall, wide-mouthed, hand-made container of thick and coarse pottery was widespread in Late Neolithic sites of the lower Yellow River valley and eastern coast (Dawenkou and Shandong Longshan) but was also in use further south in the Huai Basin and the Yangzi delta area (Hemudu and Liangzhu). Variants of this vat are found in Central Plain (Miaodigou) and Jiang-Han contexts (Shijiahe). In Dawenkou contexts, the *zun* was placed only in rich tombs, often in association with other large ritual vessels, such as the *ding* tripods and the *guan* jars. *Zun* vats continued to be in use and maintained a steady importance during the Longshan transition and in the Bronze Age, when they were again inscribed (Wang Shuming 1989: 373–4).

Clues on the significance of these graphs can be made to emerge also by analysing the frequency of individual signs, their geographic distribution, their position and visibility on the vessel, and additional features such as colour. The most common graph is type 2 ('sun–fire–mountain'), followed by type 4 ('tablet') and type 1 ('sun–fire'). Types 2 and 4 are also the ones that appear at most sites. Type 2 has at least ten occurrences at four sites (Lingyanghe, Dazhucun, Yuchisi, Qianzhai), followed by type 2 and type 4 with six occurrences at three sites (Lingyanghe, Dazhucun, Yuchisi) (Wang Shuming 1986; Gao Guangren and Luan Fengshi 2004: 132–6). Not only are types 2 and 4 graphs more common; they are also the only ones smeared with a red substance (two type 4 at Lingyanghe, one type 4 at Dazhucun, and one type 2 at Qianzhai), probably cinnabar (mercury sulphide), with the intent to make them stand out both visually and symbolically (Wang Shuming 1986: 272).

The position of graphs on vessels signified different levels of importance. To give them maximum visibility, most graphs were incised just below the rim of the vessel. However, if a vessel carried two signs, one appeared at the bottom of the vessel. This suggests that the signs did not all belong to the same semantic category and that some were more important than others. Difference in status between graphs is evident on two *zun* from Lingyanghe, which each bear two graphs: one at the top and one at the bottom. In both *zun*, the graph at the top is a type 4 and it is smeared with red pigment. The graphs at the bottom are in one *zun* a type 8 ('lozenge') and in the other a type 7 ('axe'). In addition to emphasizing some signs, red pigment might have highlighted semantic differences between graphs. A type 4 graph, which occurs with a certain frequency and has been compared to the Shang 亞 *ya* cartouche that enveloped names inscribed on bronze vessels and tools, may have indicated a title, a position, or a ritual, whereas other graphs associated with it on the same vessel (types 8 and 7) may have had further specifications relating to the primary sign (Wang Shuming 1986: 249–308).

This evidence suggests that Dawenkou signs may have been a signing system used predominantly in elite ritual contexts to note information relating to ceremonies, such as names of rituals or names of extended clans involved in such activities.

Inscribed Jades and Pottery from the Lower Yangzi River Valley and Delta Area: Liangzhu

A variety of marks and graphs on jade and pottery have been linked with different degrees of certainty to the Late Neolithic sites of the Yangzi River delta and Taihu lake area of Jiangsu and Zhejiang, which are collectively known as Liangzhu (3200–2200 BCE), a culture known for the size of its urban and ritual centres, mounds, lavish upper-class burials, and a wealth of jade (Qin Ling 2013). Jades inscribed with faintly visible graphs with bird or solar symbolism appear stylistically consistent with archaeological material from the Liangzhu area, but they are overwhelmingly part of unprovenanced holdings of museums, research institutes, and private collections in China, Taiwan, Great Britain, France, and the United States. One bracelet and four *bi* discs are at the Freer Gallery of Art, Washington DC.[3] One *bi* disc and two *cong* tubes are at the Palace Museum, Beijing. A *bi* and a *cong* are at the National Palace Museum, Taipei, alongside two other discs decorated with incised patterns around the rim. A seventeen-tiered dark green jade *cong* is at the National Museum of China (formerly Museum of Chinese History) in Beijing. Other inscribed jade *cong* tubes are at the Shanghai Museum, the Beijing Capital Museum, the Zhejiang Jiashan County Museum, the Musée Guimet in Paris, and the Victoria and Albert Museum (Teng Shu-p'ing 1992–3, 2004). Although they have no archaeological provenance, these jades resemble ritual objects that are routinely excavated from elite Liangzhu burials. Evidence suggests that they were all found in the 1930s in the area of Yuhang county (Zhejiang) and then sold to antique dealers, who distributed them around the world (Figure 2.11) (Wilson n.d.).

[3] The inscribed discs are listed with accession numbers: F1917.346, F1917.348, F1917.79, F1919.58, the bracelet with accession number F1917.385. Another inscribed piece, a jade *cong* (F2016.2), was recently acquired from the collection of Eugene and Agnes Meyer, but does not seem to be published (Wilson n.d.: n. 37).

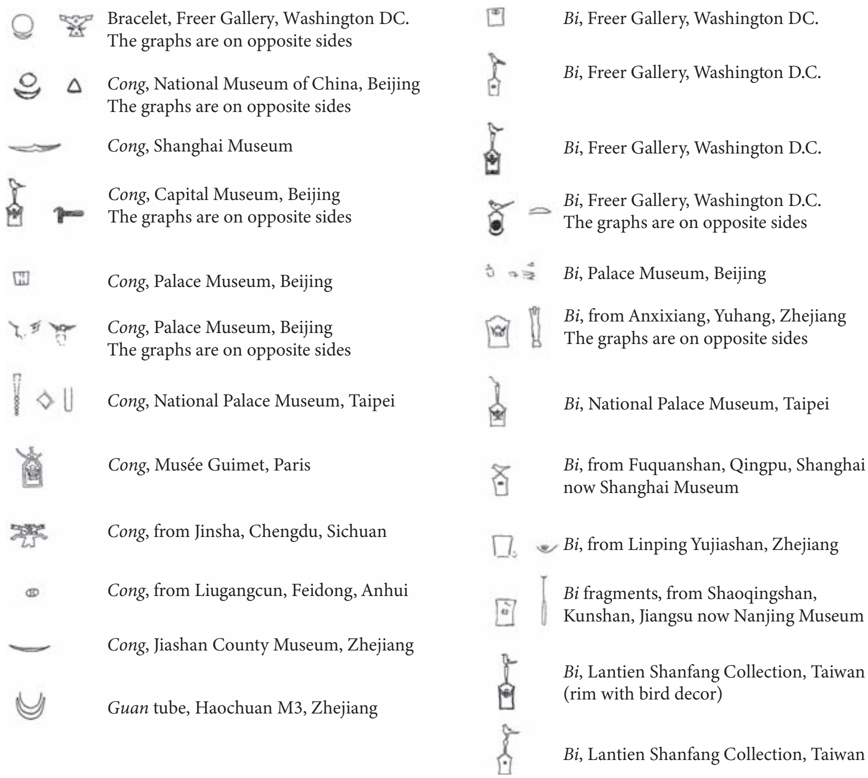


Figure 2.11 Table of Liangzhu graphs

In contrast to these museum pieces, very few *bi* and *cong* retrieved recently from known Liangzhu contexts are inscribed, and few of these were obtained through controlled excavation. Among them are *bi* disks from Baimushan (Anxi), Linping Yujiashan (Yuhang, Zhejiang), and Fuquanshan (Qingpu, Shanghai) (Figure 2.12) and some *bi* fragments from Shaoqingshan (Kunshan, Jiangsu). As for Liangzhu style *cong* tubes, one (now at the Anhui Provincial Museum) was found by farmers in 1996 at Liugangcun (Feidong, Zhangjixiang, Anhui); another inscribed with a version of the wing-shaped graph was excavated at the Bronze Age site of Jinsha (Chengdu, Sichuan) in a context that is neither Liangzhu nor Neolithic (Figure 2.13) (Chengdu Municipal Institute of Archaeology and Beijing University Archaeology Museum 2002:82–3). Finally, a small *guan* tube inscribed with part of a graph comparable to the Dawenkou 'fire–sun' came from a burial at Haochuan, a post-Liangzhu site in southern Zhejiang.

Graphs inscribed on Liangzhu style jades can be grouped into several types: platforms with or without birds; fire or moon crescent; sun pictographs; sun plus

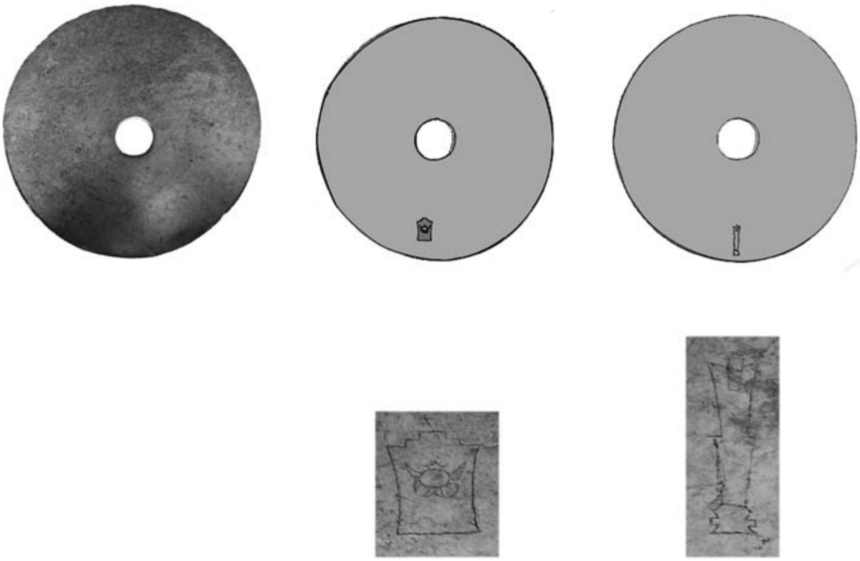


Figure 2.12 Jade *bi* with two graphs from Anxiang, Yuhang, Zhejiang
Source: Gems of China's Cultural Relics (1993: 235, pl. 44).

fire/crescent; winged symbols; tablets, sceptres or elongated shapes; geometric patterns (triangle, lozenge, zigzags); clouds; and tools or weapons (axes, adzes). Some of these signs (particularly sun pictographs and sun–moon crescent combinations) are comparable to Dawenkou graphs and suggest the existence of close ties between these two adjacent Neolithic traditions.

Platforms are the most common type. Eight are surmounted by a bird in profile standing either on a beaded perch atop a stepped platform or directly on the platform. In one case, the platform with the bird rests on a crescent. In seven others, the platform appears alone without the bird, possibly because the piece was recut in historic times. The platform may or may not have had a semantic function. It may have worked as an honorific container for the actual semantic sign, or it may have indicated a title or position held by the clan or person identified by the signs on the inside (Gao Ming 1980: 581–98, especially 592yu). These functions are similar to those hypothesized for the 亞 *ya* cartouches of Shang bronze inscriptions. In fact, two nearly identical emblems on Shang bronze vessels, the *Fuyi zun* and the *Fuyi gui*, which consist of a *ya*-cartouche enveloping a bird on a pedestal, are reminiscent of the Liangzhu platform-bird (Figure 2.14).

Bird images appear alongside an intertwined double-face design on some jades from controlled excavations. These elaborate images, which could be decorations, emblems, or complex graphs, are finely incised on a jade *yue* axe excavated from

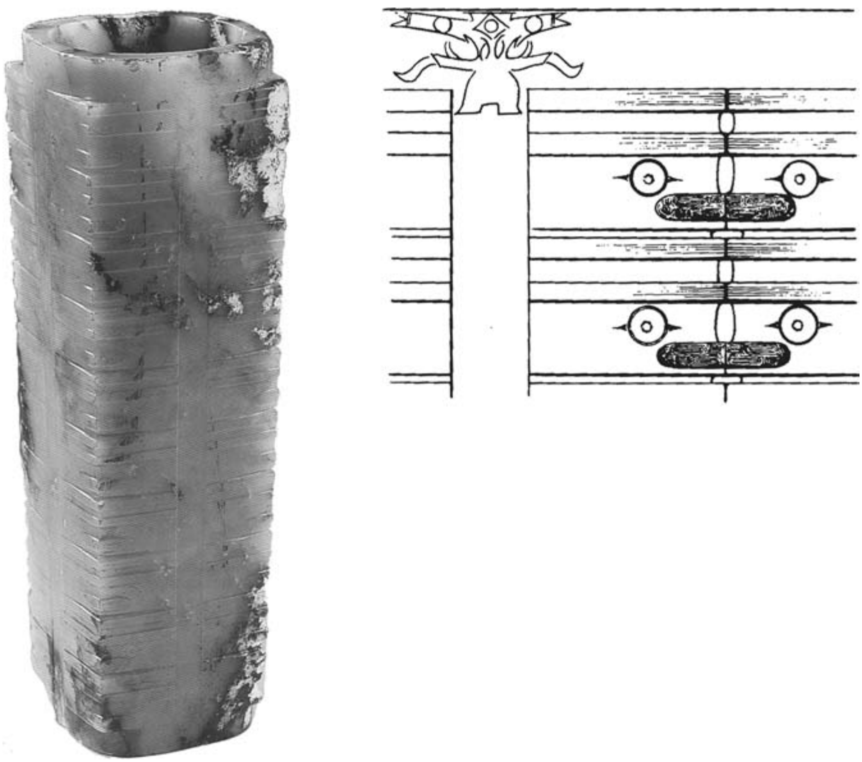


Figure 2.13 Jinsha *cong* and sign
Source: Chengdu Institute of Archaeology (2005: 56); Chengdu Municipal Institute of Archaeology and Beijing University Archaeology Museum (2002: 82–3).

tomb M12 at Fanshan, a wealthy burial that probably belonged to a ruler. The axe blade is inscribed on the upper corner with a double face and on the lower corner with the bird in profile. A small two-tiered *cong* from the same tomb has the same two elements in multiple positions: two double-face emblems on each of its four sides and a larger but simplified version of the double face flanked by birds at the four corners (Fanshan Archaeology Team 1988: 15–16, fig. 26–7, colour pl. I:2) (Figure 2.15).

Sun and bird symbolism has been linked to east-coast ethnic groups such as the Dong Yi (eastern Yi), which were said to have been active in the Shandong–Jiangsu–Zhejiang area during the late predynastic period (Wu Hung 1985).

The use, function, and meaning of these signs is difficult to determine, but, from the nature of the objects on which they appear (ritual jades) and from the circumstances of their discovery when known, it is clear that these graphs had some association with ceremonial activities. A few inscribed pieces have emerged either from tombs or, as at Shaoqingshan, from pits filled with ritual

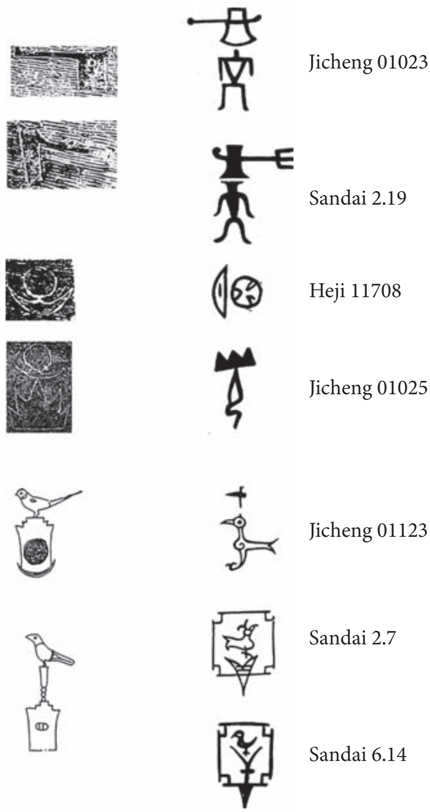


Figure 2.14 Comparison of Dawenkou and Liangzhu signs with Shang emblems

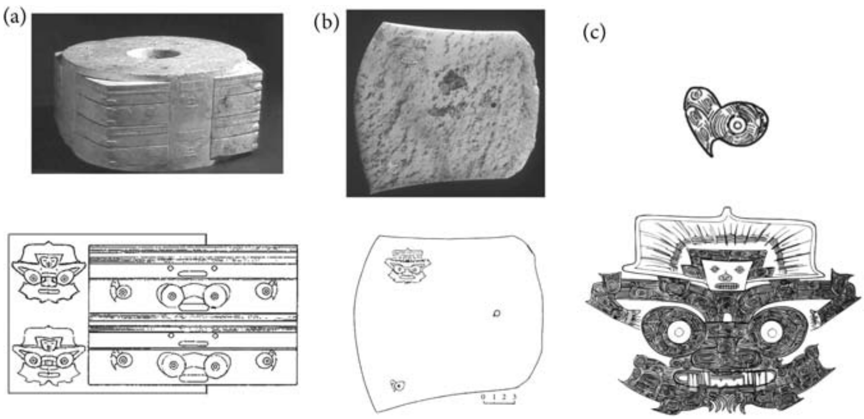


Figure 2.15 Jades from M12 burial at Fanshan, Yuhang, Zhejiang: (a) *cong* tube with face and bird emblems; (b) *fu* axe with face and bird emblems; (c) details of emblems
Source: Demattè (2022: 184, fig. 5.13–14).

Figure 2.16 Comparison of Liangzhu and Dawenkou signs and symbols

offerings. These uses indicate close ties with ritual practice and elite individuals or religious specialists. Graphs on jade may have worked in ways similar to those from Dawenkou pottery graphs, with which they share some basic elements as the 'platform/mountain', the 'crescent', and the 'sun' (Figure 2.16). Dominant symbols such as the platform and the bird may have marked belonging to a certain class, official post, or rank, whereas the other signs inside or outside the platform could have been further specifications, such as names.

Beyond jades, a significant number of marks and signs incised on pottery that are sometimes similar to Shang characters have been archaeologically excavated at a number of Liangzhu sites. They range from simple pot-marks comparable to those of Early and Middle Neolithic contexts to complex pictographs. Sometimes these signs appear singly, but in a number of cases they form intriguingly long sequences, which, though undecipherable, hint at the presence of sign-making activities that may be related to writing (Figure 2.17).

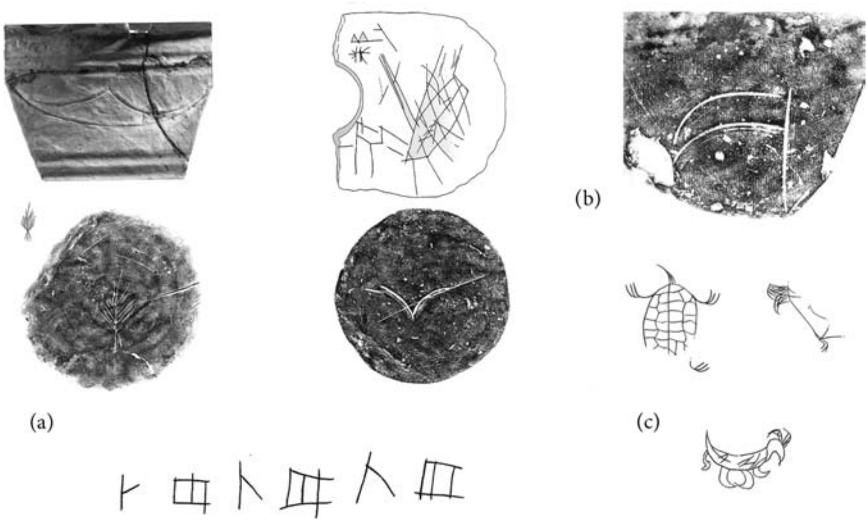


Figure 2.17 Liangzhu pottery signs from: (a) Zhuangjiaofen; (b) Bianjiashan; (c) Majiafen
Source: Zhang Binghuo (2015).

The Jiang-Han Area: Shijiahe

Graphs on pottery have been discovered in significant quantities in the Jiang-Han area, a region of the middle Yangzi River valley that during the late third millennium BCE was characterized by the presence of clusters of urbanized settlements often surrounded by walls. A large number was found at Shijiahe (Tianmen, Hubei), a group of roughly contemporaneous loci centred at a large proto-urban site with a sizable earthen enclosure (Figure 2.18).

The graphs, dated to the end of the third millennium BCE (2200–2000 BCE), are concentrated at the loci of Xiaojiawuji and Dengjiawan, which appear to have been the ritual and burial areas of the Shijiahe urban enclaves. Fourteen graphs were found at Dengjiawan. Thirteen were engraved on complete or fragmentary *gang* vats found on the living surface of the site, in the ritual alignments, or in ash pits. The remaining three inscribed *gang* were not directly associated with any feature but were in the vicinity of either an alignment or an ash pit. In addition, a difficult-to-classify single sign was on a *guan* jar recovered from one of the largest and richest tombs (M32) of the area. Most inscribed vessels had one sign each. The signs were classified by the excavators into five types (A–F). Type A, the most common at Dengjiawan, resembles a horn. Type B, the second most common sign, represents a tool, possibly a sickle or an axe. Types C (circle with a much smaller circle at its centre), D (a tablet-like form), E (a platform shape), and F

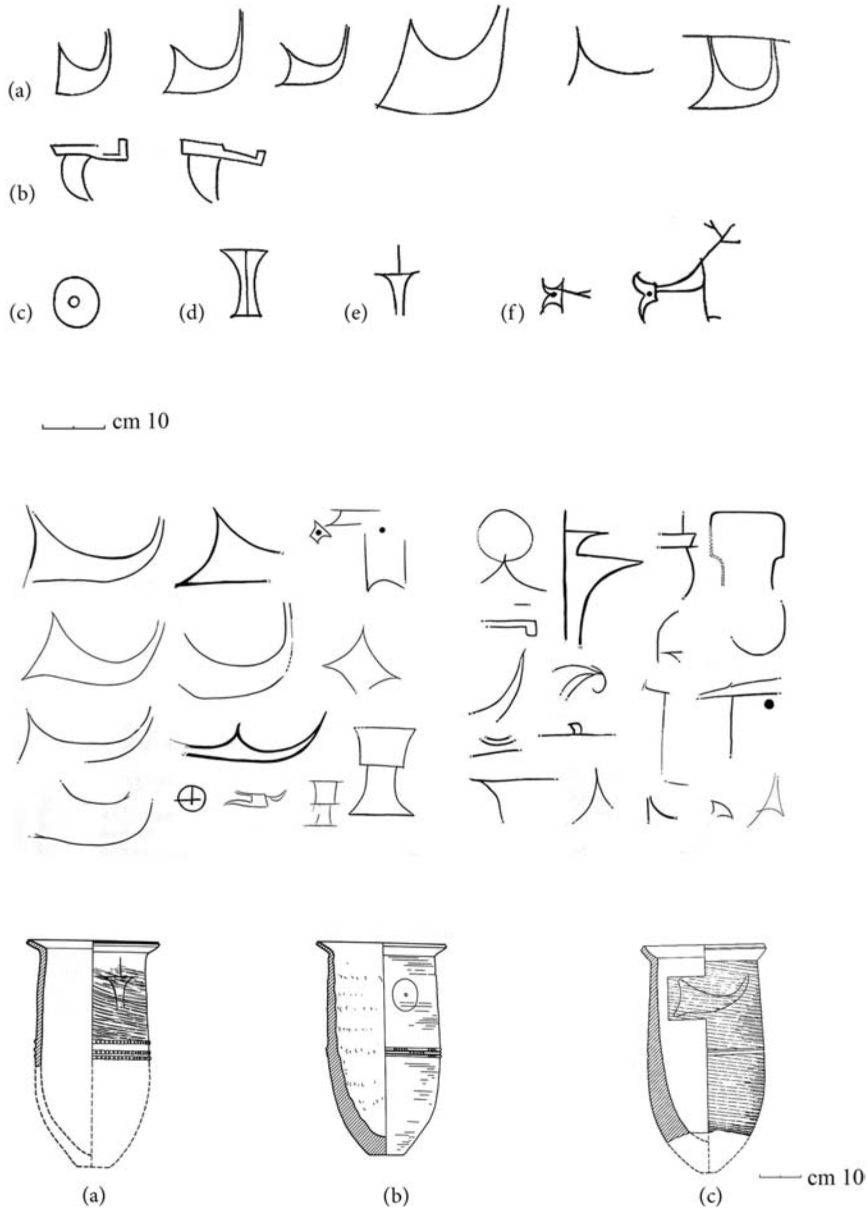


Figure 2.18 Shijiahe graphs and inscribed containers: graphs from Dengjiawan (top); graphs from Xiaojiawuji (middle); inscribed ceramic vats from Dengjiawan (a–b bottom) and Xiaojiawuji (c) (bottom)

Sources: Hubei Jingzhou Museum et al. (1999: fig. 169, 134–5); Yan Wenming and Quanxi Yang (2003: fig. 185).

(a human-like creature) occur only once at Dengjiawan (Yan Wenming and Quanxi Yang 2003: 1–6, 139–40, 233–6). Similar signs were found in comparable contexts at Xiaojiawuji, an elevated platform with remains of ceremonial activities located just outside the southern section of the walls. The Xiaojiawuji signs, forty-one graphs on sherds and on eight complete vessels, are on complete or fragmented pottery vessels from ritual contexts, such as ash pits (thirteen graphs), buried alignments of *zun* urns (seven graphs), and the living surface of the site in the vicinity of disturbed pits (twenty-one graphs). The correspondence with Dengjiawan is clear also in terms of vessel and sign types. Thirty-five graphs were inscribed on *zun* vats (called *jiu* in the excavation report), three on *gang* (vats with a flat bottom), one on a long neck *guan*, and two on unidentified shards. Generally, the shards were carved before firing on the upper body of the vessel with a sharp bamboo or bone tool (Hubei Jingzhou Museum et al. 1999: 218–23).

Overall, it is clear that the Shijiahe signing system shares forms, objects, and ritual practices with those in use in Dawenkou contexts. This is not surprising, since the Late Neolithic societies of the Middle Yangzi area were in contact with those of the lower Yellow and Huai River valleys and the coastal area.

The Middle and Lower Yellow River Valleys: Shandong Longshan and Chengziyai

The Shandong Longshan tradition followed Dawenkou in the lower Yellow River valley during the final stages of the Neolithic (also known as the Longshan transition). Between the two there is considerable continuity in material and immaterial culture, such as ritual practices and burial patterns. However, in sites attributed to Shandong Longshan or Longshan in general, there are no graphs similar to those found in Dawenkou contexts. There are instead pottery marks and graphs that range from simple and abstract to complex and pictorial. Most were found at Chengziyai (the Shandong Longshan type-site), a proto-urban settlement that was first investigated in 1930–1. Though considerably smaller than walled sites of the Early Bronze Age, Chengziyai shares with them many elements, such as its pounded earth enclosure and the practice of pyro-scapulimancy. Among the remains are numerous types of pottery vessels both ritual and utilitarian, some metal artefacts, uninscribed bones prepared for divination, and over eighty graphs on pottery shards (Li Chi 1934).

The graphs were classified into eighteen different types. Many are simple and, in some cases, resemble Middle Neolithic pot-marks, such as those from Jiangzhai and Banpo. These have been interpreted as early Chinese characters representing numerals (Figure 2.19). The most common is a straight line that occurs twenty-five times (n. 1–3), followed by two types of cross (n. 5 with five occurrences and n. 7–8–9 with thirteen). A few more complex signs that resemble *jinwen* and/or *jiaguwen* forms have been given tentative interpretations that

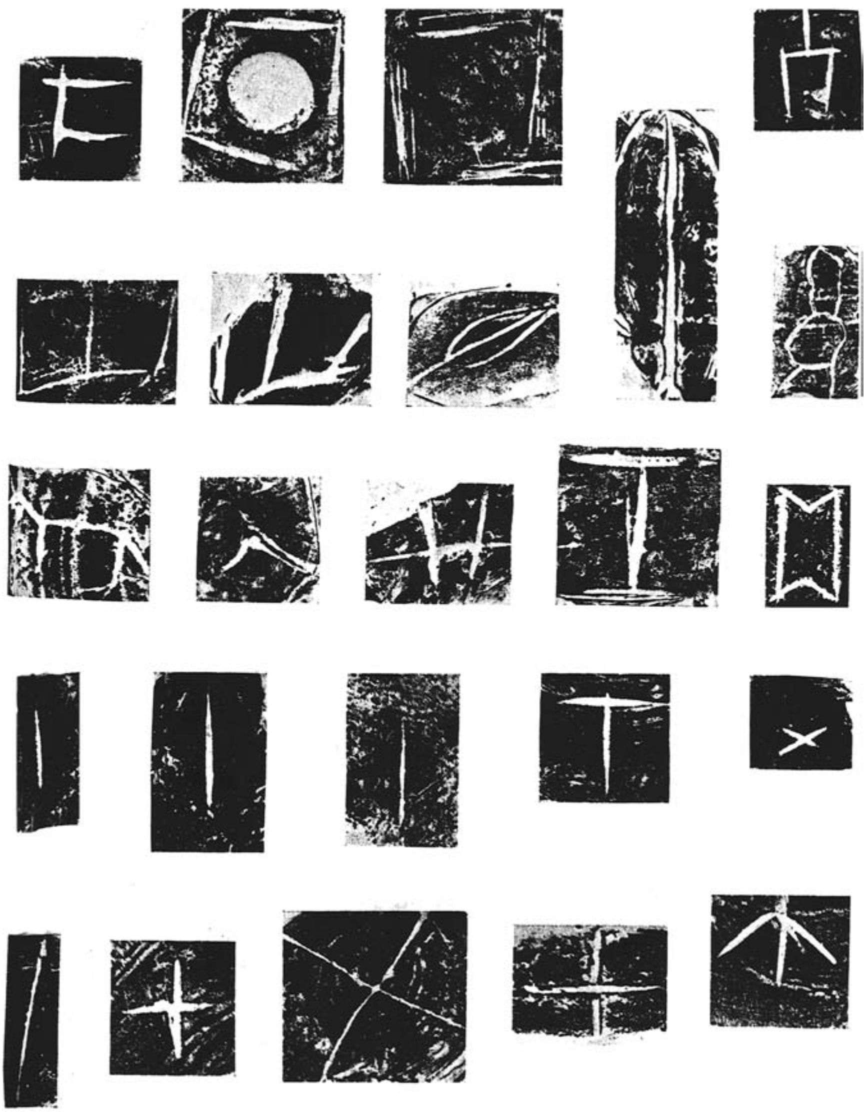


Figure 2.19 Pottery graphs from Chengziyai, Shandong
Source: Li Chi (1934: 53 and pl. 16).

link them to the modern characters 子 *zi* ('son'), 犬 (*quan* ('dog'), and 羽 *yu* ('wing') or possibly 葉 *ye* ('leaf') (some in Figure 2.20). Based on the reconstruction of the vessels, graphs were carved in highly visible places, such as the bellies of vessels or the inside of dishes. Most of them were incised after firing (seventy-nine versus eight pre-firing signs), an indication that they may have been scored by the vessels' owners rather than by the potters. Since similar signs on pottery containers have been discovered in Shang dynasty contexts at Anyang, when

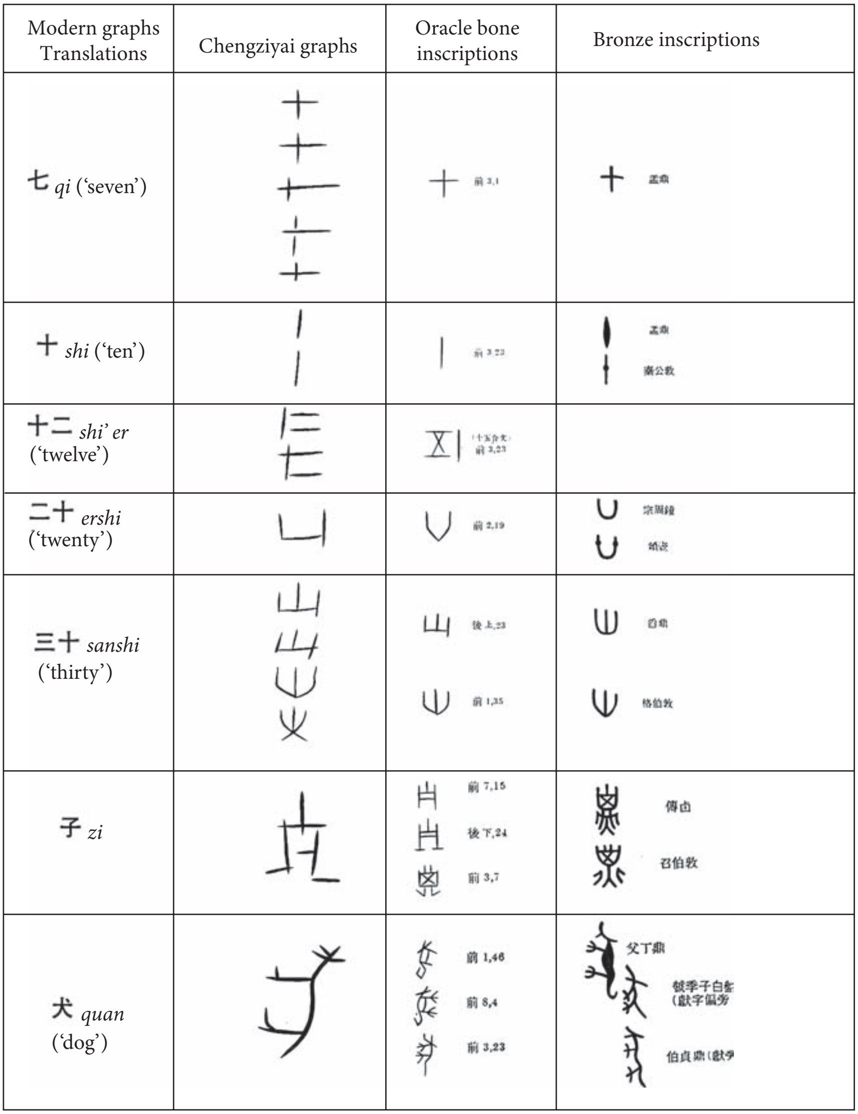


Figure 2.20 Numerical interpretation of some graphs from Chengziyai
Source: Li Chi (1934): 71, fig. 13).

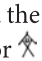
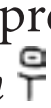
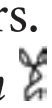
writing was already well established, Chengziyai graphs probably served a similar ritual purpose.

Some Controversial 'Longshan' Material

One of the most widely publicized, yet controversial, finds is the so-called Dinggong potsherd, which was brought to light in 1992 at Dinggong (Zouping, Shandong) (Shandong University 1993). The ‘inscription’ of eleven or twelve signs arranged in five vertical rows is incised on what would have been the inside wall of the urn. The potsherd certainly dates to the Longshan phase, but the date and nature of the inscription are in question. Some consider it a genuine example of Longshan-era Chinese writing; others think it is neither Chinese, nor writing, nor ancient (Wang Sitian in Multiple Authors 1993: 344; Li Xueqin in Multiple Authors 1993: 347; Cao Dingyun 1993, 1996). Two other potsherds with similar ‘inscriptions’ have been found in Longshan contexts at Longqiuzhuang (Gaoyou, Jiangsu) and Jingyanggang (Shandong), and, like the Dinggong shard, they remain undeciphered and controversial (Postgate et al. 1995; Wang Shougong 1998; Longqiuzhuang Archaeological Team 1999: 204–6).

Transition to the West: Taosi

Beyond Shandong, signs have been recovered at Longshan era sites in Henan, Hebei, Inner Mongolia, and Shanxi. Among them are Wangchenggang (Dengfeng, Henan), Wangyoufang (Yongcheng, Henan), Baiying (Tangyin, Henan), Taikoucun (Yongnian, Hebei), Laohushan (Wulanchabu League, Liangcheng, Inner Mongolia), and especially Taosi (Xiangfen). The latter is a large walled citadel in the lower Fen River valley of south-western Shanxi that was occupied during three phases between 2300 and 1900 BCE (He 2013: 256–7; Institute of Archaeology CASS, Linfen Municipal Cultural Relics Bureau 2015). The site was probably a polity, possibly a city state, with considerable socio-political complexity (Li Jianmin 2001). A variety of pottery and jade artefacts were found there, but there was also evidence of metalsmithing in two late phase burials: specifically, a small bronze *ling* bell and a bronze bracelet.

The signs and symbols painted on ceramic vessels appear structurally like characters and are likely to be one of the earliest examples of Chinese writing so far excavated. Most intriguing are two graphs painted with a red pigment on a fragment of a flat-back *hu* bottle. The piece was excavated in 1984 from an ash pit (H4303) in area III and is datable to the late occupation stratum (*c*.2000–1900 BCE), the time of the decline and destruction of Taosi (Figure 2.21). Since the pot is incomplete, the signs are difficult to interpret, and it is hard to read the inscription as a text. However, one sign resembles graphs like *jiaguwen*  or  (文 *wen* ‘writing’) and it is so interpreted by most investigators. The second sign has been read as either *jiaguwen*  (昜 *iyang* ‘sun’), *jiaguwen*  (堯 (*yao*, the name of the legendary emperor Yao), or *jiaguwen*  (邑 *yi* ‘city’) (Feng Shi 2008).

Two elements point to the continuity and contiguity of these signs with the material tradition of Chinese writing: the first is their formal similarity with Shang *jinwen* and *jiaguwen* characters; the second is the fact that they were created by brush with red pigment that is comparable to the cinnabar paint used in Shang times to pen some inscriptions or to highlight them.

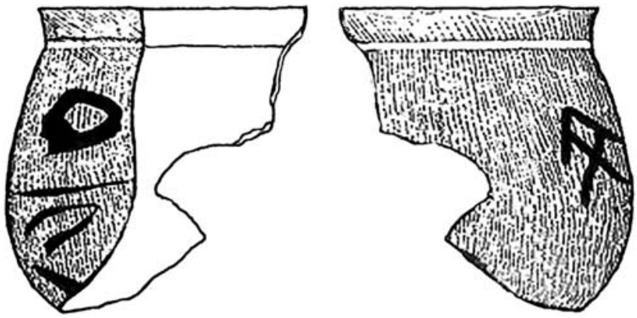


Figure 2.21 Painted graphs on a pottery vessel discovered in an ash pit at Taosi
Source: Demattè (2022: 215, fig. 5.32c).

Conclusions

During the Early to Middle Neolithic (fifth and fourth millennium BCE), sites in several parts of China developed marking and symbolic visual or graphic systems that in different ways were related to the recording practices of emerging elites. Their association with ritual objects (ceramic vessels but also jade implements) indicates that they were employed for comparable ceremonial activities at different sites. These were not writing systems but signaries with pictorial and numerical notations. Pot-marks may have recorded quantities, types, or positions, whereas pictorial signs may have had a more ritualistic function such as indicating a target for a sacrifice, a totem, or a clan (possibly something similar to a name). Nonetheless, the simplicity of the signs, their early dates, and the lack of sequential developments towards more complex recording systems suggest that these may have been localized traditions with uncertain connections with Chinese writing.

With the increased interaction of the Late Neolithic (third millennium BCE) and the emergence of a more connected material culture, several centres in the middle and lower Yellow and Yangzi River valleys developed complex signing systems that shared structural characteristics with each other and with early Chinese characters. This community of signs is probably related to the growing trade activities and population movements of the times. It is, however, during the Longshan transition of the late third millennium BCE, with the progressive shift of political power from the eastern lowlands to the western highlands, that the connections between Neolithic pictographic systems and Bronze Age writing become apparent. The most significant are the graphs from Chengziyai and Taosi, which are clearly early forms of Chinese writing.

Though hundreds of years separate the Chengziyai and Taosi signs from the Late Shang writing on bone, bronze, and jade, characters inscriptions from the early second millennium BCE at Erlitou and from the middle of the second millennium BCE at Wucheng, Zhengzhou Xiaoshuangqiao, Zhengzhou Shangcheng, and Taixi complete the evidence of this transition. At Erlitou, a large-scale site near Luoyang in western Henan province that is thought to have been the capital of the first and still legendary dynasty (Xia), there are hundreds of potsherds with carved graphs comparable to those found at Chengziyai. Some look like numerals, others may be pictographs similar to Shang characters indicating 'plant', 'arrow', 'walk', 'road' (Cao Dingyun 2004). Another sign very close to the Shang pictograph 'fish' was found on a bone fragment. At Zhengzhou Xiaoshuangqiao, a Middle Shang walled settlement with evidence of ritual activities and bronze-smelting, clearly recognizable Chinese characters (such as 天 *tian* 'heaven' and 東 *dong* 'east') were painted with red pigment (probably cinnabar) on ceramic containers (Song Guoding 2003). At nearby Zhengzhou Shangcheng, probably a Middle Shang capital, inscribed oracle bones and pottery sherds give further evidence of the progression of the script (An Zhimin 1954; Li Weiming 2013: 305–14) (Figure 2.22). Further south at Wucheng (Jiangxi), several graphs on pottery comparable to Shang characters suggest that by the middle of the second millennium BCE writing was also present in the Yangzi River basin.

What is clearly missing from the Late Neolithic and even Early Bronze Age record is unmistakable evidence of the phoneticization of signs and therefore of the transition from pictography to glottography. We know that, by Shang times, writing had fully adopted this, because in bronze and bone inscriptions a significant number of characters are used solely as phonetic loans to represent verbs or grammatical particles and never for their original pictographic value. The issue is therefore how to link Late Neolithic and Early Bronze Age signs with no evidence of phoneticization with the fully developed writing system of the Shang.

At present, this appears to be difficult to resolve owing to at least two factors. The first is our inability to identify glottography in prehistoric signs owing to the peculiar nature of the Chinese language's relationship with its script. Though the Chinese language is not necessarily monosyllabic (and probably was not in antiquity), it works effectively with a script that emphasizes monosyllabism and is not very exact in sound recording. Since most words can be monosyllabic and characters represent monosyllabic words, this means that without a grammatical context it is nearly impossible to establish whether a single pictograph stands for itself or for its associated sound. In ancient languages such as Egyptian or Mayan, whose words could not routinely be rendered as monosyllables, the necessity to spell names with multiple signs signals the emergence of phoneticization. This means that some of the Chinese Late Neolithic and Early Bronze Age signs could have had a phonetic value, but, since we do not have texts, we are not in a position to demonstrate it.

This brings us to the second problem: the lack of texts that could put these signs in a grammatical context. The absence of this material until the appearance of shell and bone and bronze inscriptions is probably due to the fact that the

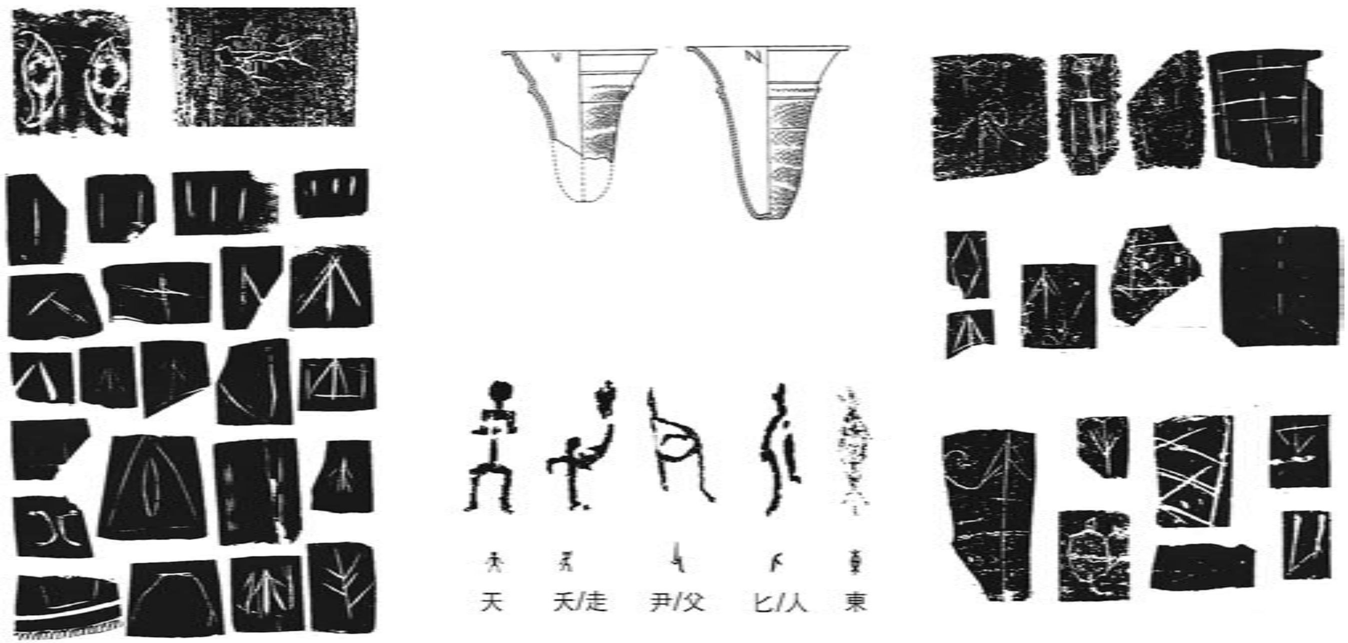


Figure 2.22 Graphs and signs from Erlitou (left); inscribed zun vats from Zhengzhou Shangcheng (top centre); painted graphs from Zhengzhou Xiaoshuangqiao with comparisons with known Shang and modern characters (bottom centre); pottery graphs from Zhengzhou Shangcheng (right)

Source: Demattè (2022: 233, fig. 6.2a; 235, fig. 6.3; 248, fig. 6.8;; 249, fig. 6.9).

ancient Chinese wrote preferably on perishable materials such as bamboo and wooden strips (Demattè 2022: 357–68). Tied into bundles, these strips were the standard administrative records of the Bronze Age.

Although those dating to the Shang period have so far not been discovered, bamboo and wooden documents are known to have existed, because they are mentioned in historic sources and in Shang inscriptions and have been excavated in tombs of the Late Bronze Age.

To describe the documents used by the Shang to keep historical records the Book of History or *Shangshu* uses the characters 冊 *ce* and 典 *dian*, which are attested also in shell and bone inscriptions. *Jiaguwen* (冊 (*ce* 'volume/book'), is a pictograph that shows what looks like a series of vertical strips tied together with strings. Similarly, *jiaguwen* (典 *dian* 'classic/large volume/precious text') displays a bundle of tablets held (or offered) by a pair of hands (Tsien 1962: 114; Gao M. 1980: 486; Sagart 1999: 209–15). Though is it not always possible to establish the original meaning of a character from its pictorial aspect, the development and meaning of the graph (冊 (*ce* 'volume/book') is well documented. It was used to indicate bundles of documents presented during ceremonial activities. A common formula, which occurs in the contexts of sacrifices, is (爯/稱 冊 *cheng ce* 'to raise/offer the documents').[4]

Until future excavations bring new information on these matters, the connections between historic glottographic writing and prehistoric pictographs such as those from Dawenkou, Shijiahe, and Longshan contexts can be argued only on the base of the structural similarities of signs.

[4] The formula 爯 (稱) 冊 *cheng ce* ('to raise/offer the documents') appears on several bones, among them *Heji* 03582-1; 06401-1; 06401-2; 06403. Kern (2007: 153–7) has argued that the graph 冊 *ce* may have originally represented bundles of documents, but that its actual meaning in the context of Shang inscriptions varies and may include verbs such as 'to announce', 'to stab', or 'to enclose' that describe ritual procedures.

3
The Failure and Success of the Early Alphabet

Aaron Koller

Introduction: Was the Alphabet Revolutionary?

The great scholar of Near Eastern texts and languages Frank Moore Cross (1979: 111) wrote: 'With the creation of the alphabet came the first opportunity for the democratization of culture. […] With the invention of alphabetic writing, literacy spread like wildfire and a new epoch of cultural history may be said to begin with the emergence of the Linear alphabet.'[1]

This is, of course, empirically false. Following the invention of the alphabet in approximately 2000 BCE or shortly thereafter,[2] we know of only small numbers of alphabetic inscriptions for the following half millennium at a minimum—and those we do have are never more than a few lines, often just a few words. As Sanders (2004: 33;) wrote, 'For the first half millennium or so of its history, the

This chapter has its direct origins in a talk presented virtually to the SCRIBO seminar in the winter of 2021; I thank Professor Silvia Ferrara for that opportunity. I am indebted to Professors F. W. Dobbs-Allsopp, Richard Steiner, and Seth L. Sanders for reading earlier versions of this chapter and for suggesting numerous improvements, and to the editors for their tireless work to improve the presentation.

[1] Cf. also his comments in Cross (1989: 78): 'The weight of the impact of the alphabet on the evolution of human civilization is difficult to exaggerate. Literacy spread rapidly and broadly (in centuries rather than millennia), and with it came the democratization of culture.'

[2] The date of the invention of the alphabet has never been a settled question. The dates of specific texts, and the date of the invention of the alphabet as a system are still disputed. Sir William Flinders Petrie, the discoverer of the alphabetic texts at Serabiṭ el-Khadim, noted that nearby was pottery from the time of Thutmose III (reigned 1479–1425 BCE), that one of the inscriptions was on a sphinx made of red sandstone—a material used, too, by Thutmoses III's craftsmen, and that another inscription was found near the entrance to a shrine built by Hatshepsut (1507–1458 BCE), Thutmose's aunt and co-regent. So, Petrie concluded, 'we are bound to accept this writing as being of about 1500 BC.' (1906: 131). Sir Alan Gardiner, who first cracked the code of the early alphabet a decade after, suggested that those inscriptions may have dated to the Middle Bronze Age. He disputed the date of the shrine (Gardiner 1916: 13). Subsequent discoveries have not resolved the date of the texts from Serabiṭ el-Khadim (although see Wilson-Wright 2021, who dates the inscriptions to the nineteenth century), but they have made it clear that the alphabet itself must be from closer to the beginning of the second millennium. Benjamin Sass (1988: 135–44) noted short texts from elsewhere, such as Lachish, Gezer, and Shechem, that date from the seventeenth and sixteenth centuries. In the late 1990s, the discovery of the Wadi el-Hol inscriptions (Darnell et al. 2006), dated to roughly the early nineteenth century, substantiated the hypothesis of a Middle Bronze Age invention. See also Goldwasser (2006b) and Puech (2015), as well as Rico (2015).

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main attested use of the alphabet was for marginal people—foreign soldiers and laborers—to write graffiti in desolate, out-of-the-way places' (see also Sanders 2009: 40, and 36–78 *passim*; also Lemaire 2008: 46–7; 2017, 106; Goldwasser 2016: 156).[3]

Cross's claim is highly attractive, however, and it is hard to avoid the sense that it *ought* to be true. This chapter will try to address the question of *why* it is false. Benjamin Sass (1988: 1) observed, 'it was the invention of the alphabet that brought literacy potentially within the reach of every man, even if this potential was not realized until much later'. But this gap between potential and actual is precisely the question. If the alphabet *could have* spread through society, why didn't it? Since the alphabet is in fact so much simpler than other writing systems then prevalent in the world, such as Egyptian hieroglyphs and hieratic and Mesopotamian cuneiform, why did alphabetic literacy *not* 'spread like wildfire'?[4]

A technology such as the alphabet cannot simply be said to be 'good' or 'bad'. The most sophisticated car is the wrong tool if the terrain has no roads or if the goal is explore underwater, and the printing press could not work wonders for a script like cuneiform, with 600 signs needed for any text.[5] There are two points that should be detangled and made explicit here. The first is that technologies do not exist in vacuums: the movable type printing press could revolutionize the world only when it was coupled with an alphabetic script. The second is that a technology will spread only to the extent that there is demand for it. Premodern societies did not live (as we do) in the expectation that next year would be technologically different from this year.[6] The development of metal sickles, for example, did not lead farmers to abandon flint (Rosen 1984: 504–5; 1997). There had to be a demonstrable advantage, and, until that advantage made a difference to people's economic lives, the status quo was likely to remain.

[3] Sass and Finkelstein have even argued that the linear alphabet spread no further north or east than Philistia until the Iron IIA period, in the early first millennium BCE (despite the evidence to the contrary from farther-flung sites to the north and east); see Finkelstein and Sass (2013); Sass and Finkelstein (2016: esp. 26–37). This is exaggerated, and is contradicted by data from Mesopotamia and the Levant; in fact the alphabet can be seen to have spread quite distantly: it is attested in a handful of epigraphs on cuneiform tablets from roughly 1500 (Dalley 2009: 15, 16 and pl. CLXXV; D'Istria 2012; Hamidović 2014) and appears on a solitary hieratic ostracon from Thebes at around the same time (Haring 2015; Fischer-Elfert and Krebernik 2016; Schneider 2018); see for now Koller (2018).

[4] Sass himself was later (2004–5) led to the view that the most parsimonious explanation is simply to reject the view that the alphabet is from the Middle Bronze Age or even the early Late Bronze Age, preferring instead to date it to the late fourteenth century. His argument in essence is that, since the alphabet *should have* spread if it existed, but did not spread, it must not really have existed: if P then Q; not Q; therefore not P. This chapter will argue that 'if P then Q' is not true in this case, and the syllogism therefore does not hold.

[5] For this reason, movable type had little effect when it was invented in China in the thirteenth century, but changed Europe when it was introduced there two centuries later. See Briggs and Burke (2009: 13).

[6] This is true, whether or not ancient and medieval thinkers had an idea of 'progress', something denied by Bury (1921) but defended by Nisbet (1994). 'However,' notes Margaret Meek Lange (2019), 'it is clear that the figures of antiquity who exerted the most influence on later thinkers did not believe in progress in the robust sense used in this article'.

The combination of these two points is more subtle than is sometimes thought. It is not enough to show that a bronze blade can cut faster than a flint sickle: this has to be contextualized within the way farmers *in that place, at that time,* harvested their crops, in order to test whether there is an advantage to bronze sickles over flint. In other words, technologies have to be matched to the historical circumstances in order to be evaluated; 'better' and 'worse' are more or less meaningless on their own.[7] The key point is that when it comes to the history of technology, building a better mousetrap will lead the world to beat a path to your door only if they have a mouse problem.

When we think about the early alphabet, therefore, the question cannot be the abstract, 'Is an alphabet better than other writing systems?' This is a meaningless question. It makes little sense to talk about whether an alphabet is a 'good' or 'bad' writing system without specifying (a) what we are trying to write and (b) for what purpose. It is, first, likely that, for a tonal language like Mandarin or a click language like !Xóõ, an alphabet will be less effective as a writing system than for a language whose phonology consists mostly of consonants and vowels.[8]

Second, one of the latent assumptions in the perspective that the alphabet must revolutionize society is that, when widespread literacy became possible, the advantages would become clear to everyone, and literacy would indeed 'spread like wildfire'. But, in fact, it is not obvious that a premodern society benefits from widespread literacy. Since most people did not write letters, poems, or short stories, there was no need that was not being met under the old system of elite literacy. This leads to the crucial question in understanding the early history of the alphabet: what was it good for?

[7] Space constraints preclude a full consideration of other examples but note that Roman numerals were the dominant way of writing numbers in Europe for roughly two thousand years, from 500 BCE to 1500 CE, despite the introduction of the Hindu–Arabic numerals (0123456789) to Europe by the early Middle Ages. It is exceedingly difficult to do arithmetic with Roman numerals, but *Roman numerals were not used for calculations*, only for recording. See discussion in Chrisomalis (2020: 66; the question of the abandonment of Roman numerals is the topic of chs 3 and 4, pp. 55–122). Another example is the wheel, which—although invented thousands of years ago—was entirely absent in the Middle East and North Africa for the past two millennia or more. Richard Bulliet (1975: 107–10) showed that there is actually nothing *inherently* better about wheels or straight roads, and that in fact camels proved to be a more efficient means of transport throughout the region, able to carry more weight at lower cost than wheeled vehicles. For more on the wheel, see Bulliet (2016). Once there are no wheeled vehicles, there is no need for artificial straight roads, and city planning can more closely model the natural topography of a region and other practical considerations, as shown by Bulliet (1975: 224–6).

[8] Berry (1958: 753) commented: 'It is generally accepted that on all grounds an alphabetical system is best.' Berry worked on West African languages, and his claim prompted a response from Don Graham Stuart (1958: 767–8), who worked on Chinese and Japanese languages and writing systems: in fact, for languages with a small syllabic inventory, a syllabary may be preferable to an alphabet. Graham Stuart also pointed out that the assertion of the alphabet's superiority was at least in part a cultural and ideological prejudice, rather than a scientific judgement. Gelb (1963: 190–205) argued that there are better and worse writing systems, that alphabets are better, and that writing naturally evolves towards an alphabet; see also Coulmas (1989: 44, 47–9).

A further piece of data that is relevant here—although its precise relevance will become clearer as this discussion proceeds—is the fact that the earliest alphabetic inscriptions are still subject to a large degree of interpretative uncertainty. Since Gardiner's 1916 reading of the phrase *m'hb'lt* 'beloved of the Lady' in Sinai 345, the early alphabetic script has been considered 'deciphered'. But most of the corpus is still not intelligible![9] But if we know how the script works and we know that it is a Northwest Semitic language, why can we not read these texts? This chapter takes this lack of decipherment as important data, and, in attempting to answer *why* the texts are not yet interpreted, also suggests *how* we can make further progress.

The essential argument of the chapter is that the early alphabet was structurally a very difficult script to read—not only for modern scholars but for the people who used it as well. This was not perceived as a problem, however, because it was not meant to be read. The brilliance of the alphabet was that it was very simple to write, and it was used for texts that, once written, had already fulfilled their functions. The following will proceed to articulate three features of the early alphabet that make it exceedingly difficult to read, drawing on the science of reading as a way of assessing this question, and then turn to the question of the function of the texts if they were not meant to be read.

Three Problems with Early Alphabet

Characters Are Not Linear

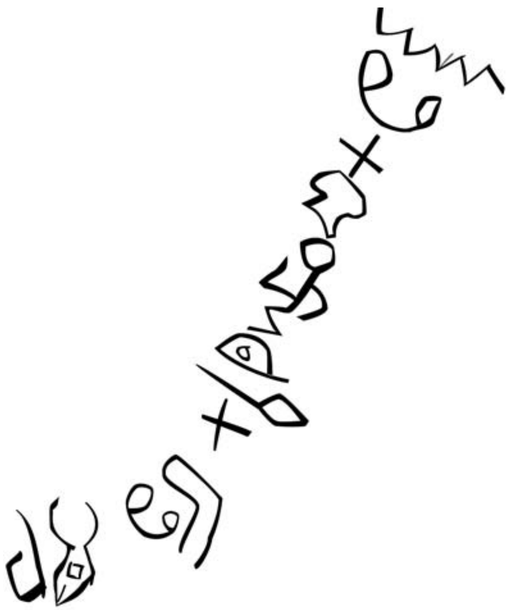
The shapes of the early alphabetic characters are highly iconic. The two Wadi el-Hol inscriptions are shown in Figures 3.1 and 3.2. In stark contrast to these complicated, disorganized, asymmetrical signs, researchers have found that, throughout the dizzying variety of the world's writing systems, most characters share a few features in common. A number of features in particular are relevant to thinking about these early alphabetic signs. First, writing systems around the world tend to start with signs that are notably complex in their shapes, but then become simplified over the course of their histories (Kelly et al. 2021).[10] Second, the resulting signs tend to be organized around lines in the two cardinal directions, up–down and right–left (Morin 2018: 665). And, third, written symbols tend to be symmetrical on the vertical axis, so that 'letters like A and T are twice as frequent as E- or B-like letters' (Morin 2018: 666).

[9] For recent suggestions, see Wilson-Wright (2013, 2017), and especially the ambitious attempt by Morenz (2019).

[10] This general trend towards 'compression' of the signs is explained as being due to the pressures of writing, as scribes who begin to write more need to write faster. But, as is argued here, an equally significant factor (and perhaps, in a conceptual sense, a more significant factor), reading should be taken into account, as well: regular, simple shapes allow the eye and the brain quickly to identity the signs and then the word, making for much quicker, more efficient reading.

1.16 1.15 1.14 1.13 1.12 1.11 1.10 1.9 1.8 1.7 1.6 1.5 1.4 1.3 1.2 1.1

Figure 3.1 Drawing of Wadi el-Hol Inscription 1
Source: Drawing by Marilyn J. Lundberg, West Semitic Research.



2.1
2.2
2.3
2.4
2.5
2.6
2.7
2.8

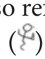
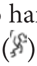
2.12 2.11 2.10 2.9

Figure 3.2 Drawing of Wadi el-Hol Inscription 2
Source: Drawing by Bruce Zuckerman, West Semitic Research.

The result of all this is that the shapes of letters tend to cluster around a small number of basic shapes: a T, a star, a circle, a J, a Y. These are often made of three strokes, and include some redundancy, so a shape can be recognized even when half its strokes are removed (Changizi and Shimojo 2005). These shapes are found often in the natural world, and in particularly important environments (Changizi et al. 2006), and can be instantly recognized by the brains not only of humans but also of macaque monkeys. Stanislas Dehaene (2009: 139) explains the psychological rationale for this: 'We did not invent most of our letter shapes: they lay dormant in our brains for millions of years, and were merely rediscovered when our species invented writing and the alphabet.' The key point is that the shapes of characters develop into what our brain is built to process quickly. Researchers have even been able to replicate the development of signs from highly iconic to simply linear in experimental conditions; it takes only a few 'generations' of group communication to reduce a complex picture to a bare-bones shape that does the job well enough, but that no longer looks like the object it was originally meant to portray (Fay et al. 2010, 2018; Ferrara 2022: 204–16).

There are, of course, exceptions to these general trends, and hieroglyphs are a prime example. Islamic calligraphy and Maya texts also resisted these trends towards compression and simplification. But, as researchers have observed (Kelly et al. 2021: 682), these have something in common: 'These kinds of texts are not designed primarily to be read so much as displayed for the admiration literate and non-literate alike,' whereas 'mundane or secular genres of writing often take a more simplified form, as witnessed in the bureaucratic handwriting of the hieratic and demotic scripts.' Egyptian writing is the example that proves the rule: the intricate, complicated hieroglyphs were retained for display purposes, in tombs and on temple walls, but, for everyday reading and writing, the cursive hieratic script was developed.[11]

To return to the early alphabetic sign, we note that, while there is an X (the *taw*), the signs otherwise consist of a series of pictures, variably lovely to look at but cognitively challenging for our brains to process. They lack cardinal orientation or symmetry and are far too complex for the quick visual identification that makes other writing systems so efficient.

From the modern perspective, this is also reflected in basic problems of identification. Is the man with two hands raised () an allograph of the man with one hand raised and one down () appearing in the same inscription, or is this a different sign? Such subtle differences make for inefficient visual processing.

No Vowels

The second significant flaw in the early alphabetic script when it comes to reading is that it, like all early Northwest Semitic scripts until much later, did not express any vowels. In the literature on writing systems and the science of reading, one often encounters the idea that Semitic languages, in contrast to Greek

[11] For a possible reason why Maya script resisted the natural tendency towards linearization, see Ferrara (2022: 150–2).

and other Indo-European languages, do not need vowels, because the root system reduces the ambiguity to a level that can be easily handled by readers (e.g., Perfetti and Harris 2013: 309). This is at best an exaggeration: even for a language such as Hebrew or Arabic, scripts without vowels make the reading process difficult and laborious. Perhaps this claim needs no justification for anyone who has learned Hebrew or Arabic, but it may not be superfluous to add empirical evidence to the claim as well. Such evidence comes from two directions: first, from the history of the writing systems themselves, which repeatedly introduced vowels; second, from experiments on the efficiency of reading different writing systems.

First, the fact that the Northwest Semitic writing systems did not, in fact, leave things in place as they were in the Iron Age indicates that there was an internal sense that improvement was needed. The growing inclusion of vowel letters was not random drift, as it moves in one direction only: towards greater inclusion of signs for the vowels. Aramaic scribes were apparently the innovators of this trend. The oldest continuous Aramaic text known to us, the Tell Faẖariya inscription, begins דמותא זי הדיסעי זי שם קדם הדדסכן לגוגל שמין וארק; both דמותא and גוגל contain medial *matres lectionis* (Gzella 2014: 78; Woodard 2019). Although Phoenician scribes resisted any vowel letters throughout the Iron Age, *matres lectionis* became increasingly common in epigraphic Hebrew throughout that time, and these developments continued in the literary traditions through the Persian Period and into later stages of Classical Hebrew (broad survey in Weinberg 1975; for the Iron Age in particular, see Zevit 1980: 1–10). Commonly cited examples of this development within the history of spellings preserved within the Hebrew Bible are שלש > שלוש, דוד > דויד, and לכתֹב > לכתוב (see detailed analysis in Hornkohl 2014; see also Ariel 2013 and the references cited there).

The same dynamic occurred in Modern Hebrew. David Yellin proposed a spelling system for Modern Hebrew that he said was based on Biblical Hebrew—but not on how Biblical Hebrew is, but rather on how it *should* have been written had the language been allowed to develop normally (Weinberg 1976: 248–55, discussing Yellin's proposal (1904); see also Yellin 1921). The specific proposal was for a system parallel to that of literary Arabic: long vowels are marked by *matres lectionis*, but short vowels are left unexpressed. This proposal, and others of the sort, were abandoned by the Language Commission (*Va'ad ha-Lashon*), however, in the spelling rules published in 1948. Those rules called for spelling most /i/ vowels with a *yod*, except when in a closed unstressed syllable, and most /o/ vowels with a *waw*. The rules were only inconsistently followed, however: printers added many *more* vowel letters—e.g., *yod* for /i/ or for /e/—than were prescribed by the Language Commission, producing forms such as פיסקה for פסקה and פירות for פרות (Cohen-Gross and Ilani 2014). Since then, the commission has updated the rules to add more vowel letters; it has added *waw* for all /o/ vowels (even those spelled with a *qameṣ* in Biblical Hebrew), *yod* for all /i/ vowels (even those deriving from a vowel other than /i/), and *yod* for /e/ in words such as פירות and שׂיער (Academy of the Hebrew Language 2017).

The point is that Northwest Semitic spelling has repeatedly drifted in the direction of fuller spelling of vowels. The reason for this is simple: even in a root-based language like Hebrew, the absence of graphemes for vowels makes reading a more arduous process. In many cases, actual ambiguities result. Is פרות meant to represent פֵּרוֹת 'fruits' or פָּרוֹת 'cows'? The spelling מספר could be any of five real words (setting aside nonsensical readings): *məsaper* 'tells', *misper* 'numbered', *mispar* 'number', *mi-sefer* 'from a book', and *mi-sapar* 'from a barber' (Share and Bar-On 2017). To read fluently requires a lot of input from an analysis of the syntactic context, and research has shown that this is more demanding on the reader than the work required for reading French or English (Bar-On and Ravid 2011). (And even when ambiguities did not result from defective spellings, the orthography omits information that would otherwise be helpful in accurate reading.[12])

Over the centuries, Arabic has resisted the type of changes recently introduced into Hebrew, and studies showed that now that Hebrew–Arabic bilinguals who spoke *Arabic* as their first language read *Hebrew* more quickly; the absence of vowels in literary Arabic compared to the relatively plene spelling of Modern Hebrew is hypothesized as the explanation (Ibrahim et al. 2002).[13] In sum, all this evidence points to the fundamental conclusion that the lack of signs for vowels makes reading early alphabetic texts significantly more difficult, and can be said to be a weakness in the alphabet as a writing system to be read by others.

Failure to Mark Word Boundaries

A final weakness of the early alphabet was the non-marking of word boundaries throughout the early texts. The most famous phrase at Serabit el-Khadim, מאהב בעלת, appears sometimes as an eight-, but also as a seven-letter string, in which the *b* that is both the last letter of the first word and the first letter of the second word is written once at that juncture: מאהבעלת. Why did these writers not mark the division between words? Naveh argued that the relevant factor was not conceptual

[12] Using recordings from the 1960s, Yael Reshef and Einat Gonen found that words whose pronunciation was underdetermined by their spellings had varying pronunciations in the speech of Israelis in the early part of the century: these speakers had learned the words from texts, rather than from speech, and so did not know whether כמובן was pronounced *kəmuvan* or *kamuvan*, or whether הכרח was pronounced *hexreax* or *heḥrax*, and so on (Reshef and Gonen 2016).

[13] Geva and Siegel (2000) showed that Hebrew–English bilinguals read pointed Hebrew with more accuracy than English. The challenge of reading unvocalized Hebrew could be empirically tested by using students who know Biblical Hebrew well and asking them to read pointed and unpointed texts and compare the two. The experiment reported in Miller-Naudé et al. (2017) is not all that helpful, because it compared students reading in their native languages (mostly Afrikaans, also English or Sesotho) to first-, second-, or third-year students reading Biblical Hebrew. It is, therefore, not surprising that the Biblical Hebrew reading was slower and more laborious.

or historical, but sociolinguistic, or better, socio-orthographic. According to Naveh, word dividers co-evolved with writing itself, but were left out in the texts from Sinai, however, because they are 'actually graffiti', and the word divider 'was often neglected in short texts and non-formal scripts' (Naveh 1973). However, as was pointed out by Steiner (2016: 326), some of the texts from Serabiṭ el-Khadim are not graffiti at all, but are dedicatory texts in the temple to Ḥatḥor. Steiner himself (2016) made the crucial observation that the absence of word dividers is not an isolated phenomenon but is one symptom of the shallow orthography in use in these inscriptions. The writing reflects the sounds of the language in an almost one-to-one, phoneme-to-grapheme, system.

Intriguingly, this feature (or lack of feature) of the early alphabet appears to be exactly what we would expect from a newly invented script, as the division of writing into words does not appear to emerge instinctively with the invention of writing.[14] There are no word divisions within the Cherokee syllabary developed in the 1820s by Sequoyah, or in the Vai script of Liberia developed in the following decade by Mɔmɔlu Duwalu Bukɛlɛ (Massaquoi 1911; for the likelihood that the structural similarities between Vai and Cherokee are not just coincidental, see Tuchscherer and Hair 2002), nor do any exist in Silas John's Apache script of the twentieth century (Basso and Anderson 1973).[15]

Although this is regular, then, it creates a grave disadvantage for readers: word divisions are invaluable for effective reading. Eye-tracking experiments show that, when reading, our eyes do not travel smoothly across the lines, but instead jump from word to word, on average about eight letters at a time. The brain has already picked out, from peripheral vision, approximately how long the next word is, and aims the saccade for the centre of it. People who read from left to right see, out of focus, approximately fifteen letters further on to the right than where they are actually reading; people who read from right to left do the same in the leftward direction (synthesis in Rayner 1998; good accounts in Wolf 2007: 148; Dehaene 2009: 13–19; Seidenberg 2017: 62–8).[16] The shape of the words, the shape of the sentence (for example, spaces between words, capital letters), and the specific letters all contribute to the speed with which we can process text (Pelli and Tillman 2007: e680).

This process relies, of course, on the existence of orthographic words, marked in most of today's scripts by a space on each side. The presence of these spaces cues the brain as to how long the word is, and therefore where, approximately, it will be beneficial to focus the eyes (Seidenberg 2017: 20; for the

[14] Contrast the view of Naveh (1973); contrast, too, Greene (2017: 39, n. 1): 'Word division was common practice in Northwest Semitic inscriptions from its earliest instantiations.'

[15] This case may be somewhat different, because each symbol stands for a whole word or phrase; there is, however, no visual distinction made between words and phrases.

[16] Schotter and Rayner (2015: 46, 51) note that different orthographies affect the length of these saccades.

usefulness of spaces even in Chinese, see Bai et al. 2008). Although most of the research conducted has utilized English or other languages, in which there are blank spaces between words, some researchers have noted that it does not have to be a space in particular and that distinctive graphemes at word boundaries can accomplish the same task (Kessler and Treiman 2015: 14). This is important for considering other types of word dividers (for example, dots, wedges, and so on). One set of experiments showed that, when spaces were removed but words**were**alternating**bold**and**not**bold, reading speeds were comparable (Perea and Acha 2009).

This last point is particularly relevant to a consideration of ancient non-alphabetic scripts, and particularly to ancient Egyptian writing. Egyptian scribes certainly had a concept of the 'word', since they wrote word lists (Gardiner 1947), but more relevant for the present discussion is that the marking of words was more systematically built in to the writing system: most words obligatorily ended with one or more classifier signs.[17] For reading purposes, these classifiers may have been helpful in cueing the peripheral vision system as to the length of the coming word, assisting greatly with saccades and fluent reading.

In fact, many Egyptologists believe that word segmentation was one of the purposes of these classifiers (Allon 2010: 4; Stauder 2010: 146).[18] Could they have been helpful for reading? Evidence from modern Japanese reading may be illuminating here. In Japanese, the transition from a 'simple, curvy hiragana character' to a 'more complex, angular kanji character' (for example, from を to 食) marks the end of each word, and this has been found to be a sufficient visual clue to the presence of a word boundary (Kessler and Treiman 2015: 14). In fact, experiments have shown that even adding spaces to Japanese texts did not improve reading speeds, since the information provided by those spaces was redundant (Sainio et al. 2007). The use of the classifiers in Egyptian writing, then, is similar to the way that Japanese marks word divisions.[19] Modern Japanese writing has no spaces between words but does typically end each word with a hiragana character and begin each word with a visually different kanji character.

[17] These 'determinatives' have been profitably analysed as classifiers in the linguistic sense; see Goldwasser (2006a); Goldwasser and Grinevald (2012).

[18] Stauder also suggests that 'the rise of determinatives may also have been an indirect consequence of increased phoneticism': as writing became more phonetic and less logographic, the possibilities for ambiguity increased, as did the utility of a means of graphically disambiguating. This function seems to increase in some Late Egyptian and Demotic texts, in which the determinatives have lost their semantic content and function primarily or even exclusively as word dividers; see Allon 2010. In P. Amherst 63, an Aramaic text written in Demotic script form around 300 BCE, the man-with-hand-to-mouth sign (A2) is used as a word divider; see already Nims and Steiner 1983: 262.

[19] Eyre and Baines (1989: 97–9) write that reading Egyptian must have begun by identifying the word units, a process enabled by the classifiers.

In Mesopotamia, on the other hand, words are not graphically divided in continuous texts.[20] In certain marginal zones, however, there were simple wedges used to divide words; this is found in the Old Assyrian texts from ancient Kanesh (modern Kültepe) in the Cappadocian region of central Anatolia, and in scattered other texts (Gelb 1942; Driver 1948: 42). This pattern—a practice that is non-canonical but exists on the margins of scribal culture—suggests a phenomenon that is useful but proscribed from official use by convention and training.[21]

Indeed, reading cuneiform with no word dividers is a laborious practice. While there are certain signs, such as determinatives, that often appear at the end of a word, and other clues that can help along the way (a preliminary comparison between Mesopotamian and Egyptian systems is in Rude 1986; it is more developed in Selz et al. 2017), deciphering an unfamiliar text written in a mixture of syllabic and logographic signs is not linear and cannot be rapid. On the other hand, scribes probably specialized in certain textual genres and script traditions, so general, all-encompassing 'literacy' may not have been expected even of scribes (for a discussion of the various types of cuneiform literacy, see Veldhuis 2011: 68–89).

Thus, there must have been internal pressure within the use of the early alphabet to mark word boundaries in order to facilitate smoother and faster reading. It is not surprising, then, that, within centuries of the invention of the alphabet, word dividers began to be used. The earliest known example may be the Tell Nagila sherd, dating perhaps to the sixteenth century (Hamilton 2006: 392), which reads in part, … *hwy* ❘*y*, with a clear, bold, short vertical sign between the two *yod*s. A similar sign is seen on the Lachish bowl from the thirteenth century, following the word *bšlšt*, and, on the contemporary ewer from Lachish, at least two words are divided by three dots: *mtn* ⋮ *šy* [*lrb*]*ty* *ʔlt* (Naveh 1973: 206; Cross 1984: 71; see, in particular, Hestrin 1987; Steiner 2016). In the same century, or perhaps a bit earlier, Ugaritic scribes used a vertical wedge—probably the offspring of that vertical stroke—to divide words in their novel cuneiform-inflected alphabet. Thus, most Late Bronze and Iron Age texts show some marker of word division: three dots, one dot, a wedge, or a line. An influential survey of these practices was written by Alan Millard (1970), who concluded that word dividers were ubiquitous in Northwest Semitic writing by the turn of the millennia (see also

[20] Mesopotamian scribes were certainly aware of words as words, however, because there are monolingual word lists from the fourth millennium BCE. These listed members of a class of words: metals, plants, or wooden objects (including trees). For historical details and analysis, see Veldhuis (2014: 13–14, 27–142). In the following millennium, beginning in the Old Babylonian period, cuneiform scribes developed bilingual, and later trilingual, lists. For a probably example from the southern Levant, see Huehnergard and van Soldt (1999).

[21] These same Cappadocian scribes simplified the cuneiform writing system to a syllabary of 69 signs—vastly reduced from the official script in use in contemporary Babylon, where 600 signs, including dozens of logograms, were needed for functional literacy; see Charpin (2004: 501).

Levitt 2002; Ashton 2008: 126–39).[22] More recently, Crellin (2022) has offered a thorough and sophisticated discussion of how 'word dividers' function in Northwest Semitic and early Greek.

Spacing itself developed, as many innovations do, in another marginal scribal zone. Off in the east, the Aššur ostracon from around 650 BCE clearly shows *spaces* between words (Fales 2010).[23] It is not surprising to find dramatic developments taking place on the margins of a scribal region. Whereas marginal innovations often stay marginal, in this case the Aramaic scribal practices current in mid-first-millennium Mesopotamia became the basis of the imperial system developed and promulgated by the Persians. Scribes throughout the empire were trained in uniform methods, as can be seen by comparing the well-known documents from Elephantine (Porten and Yardeni 1986–99) with the more recently published documents from ancient Bactria, at the modern intersection of Afghanistan, Uzbekistan, Kyrgyzstan, and Tajikistan (Naveh and Shaked 2012). Among other commonalities, all the imperial Aramaic texts utilize spacing to separate words.

The Alphabet Is Good at What It Was Meant to Do

To recall, the genius of the early alphabet was that there were no rules of spelling or writing, no 'orthography' at all. The weakness of the early alphabet was precisely the same: that there were no rules of spelling or writing, no orthography at all (Steiner 2016). Writers simply had to listen to themselves speak and write down what they heard, consonant by consonant.

The irony is that what is good for readers is often bad for writers, and vice versa. As Geoffrey Sampson (1985: 212; see also Berry 1977: 10; Baroni 2011) put it:

> [a]ny literate adult, even a professional author, reads far more than he writes; so if [...] the ideal script for a reader is a somewhat unphonemic script [...] the balance of advantage has been tending to move towards the reader and away from the writer: extra trouble in writing a single text can now be massively repaid by increased efficiency of very many acts of reading that text. [...] it is worth spending more time nowadays to learn an orthography, if the extra time is the cost of acquiring a system that is relatively efficient once mastered, because

[22] Millard drew the conclusion that biblical scholars should not rely quickly on the idea of continuous writing in assessing textual critical questions. On the other hand, the inconsistencies seen here suggest that such considerations should not be off the table—and well-known examples, such as 1 Chronicles 17:10, where the Hebrew reads two words (וָאַגִּד לָךְ) but the Greek translates it as if the Hebrew were one word (*αὐξήσω σε* 'I will make you greater', reading וַאֲגַדֶּלְךָ?), show that this did on occasion create ambiguities.

[23] There are nouns there such as *mtkdy*, derived from *māt Akkadē* but synchronically clearly a single word.

> the period during which the average individual will enjoy mastery of an orthography is now longer than it used to be.

The very considerations that made the early alphabetic inscriptions easy to write made them exceedingly hard to read. Given all this, then, how were early alphabetic inscriptions read? One possibility is that oral reading—reading out loud—would obviate some of these difficulties. Paul Saenger showed that, in the classical and medieval worlds, the lack of spaces between words was connected to reading out loud. The key insight is that when one reads aloud, the aural experience allows the reader to make sense of the text even though the graphic representation of the text is difficult to decode (Millard 1970: 13; Saenger 1982, 1997).

In the Middle Ages—beginning in the eighth century on the Irish margins of Europe, and reaching France and Spain in the twelfth and thirteenth centuries—reading became silent, and writing concomitantly gained spacing. This type of approach to the question of word divisions relates the practice of writing, especially the peritextual elements in the written text, to the practices of reading.[24] This approach could be modified and incorporated into the story of Northwest Semitic writing (Boyarin 1993; Dobbs-Allsopp 2012: 36–49).[25] Perhaps reading out loud can overcome the deficiencies discussed above. The aural input, coupled with the slower process of reading aloud, may enable smooth, if slow, reading.

A different possibility seems more likely for the early texts, however, and that is that the texts were never meant to be read at all—at least not by mortals. Although they are not all graffiti, the more formal texts are dedicatory inscriptions found in and around the temple of Hathor. The intended audience of these texts is a goddess, who presumably can read even poor writing systems.

This then yields a very important conclusion, which is that the alphabet is badly designed for efficient reading of long texts, because it is not at all designed for that purpose. It was, however, well designed for something else, which was the simple writing of short texts by people on the margins of society who otherwise could not write. This is a major reason why now, more than a hundred years after these texts were discovered by Flinders Petrie, few of them are fully undeciphered. They were simply not made to be read.

[24] Saenger (1997: 9–10), seems overly deterministic about this approach, arguing that 'throughout the antique Mediterranean world, the adoption of vowels and of *scriptura continua* went hand in hand. The ancient writings of Mesopotamia, Phoenicia, and Israel did not employ vowels, so separation between words was retained.'

[25] We have no literary texts from ancient Israel, and therefore it would be difficult to apply Saenger's methodology to that question directly, but we have other information on reading practices, and these could be triangulated with the data we do have from inscriptional evidence to produce a richer account.

In general, it is true that our writing systems are quite efficient.[26] This is not because we learned to use them well, but because we have moulded them to draw on skills that our brains are quite good at. As Dehaene (2009: 149–50) put it: 'Our writing systems changed under the constraint that even a primate brain had to find them easy to acquire' (see also Tsur 2017: 42–4). This takes time, though, and the first alphabet, not being designed for rapid and efficient reading, was not good for that purpose; furthermore, it had had, by definition, no time to evolve. It was in beta testing mode, and, when scribes got their hands on it, the reviews were harsh.

The major conclusion here is that the alphabet, when first invented, was the easiest system ever designed for *writing phonetically*—but that it was, therefore, not practical to read. The ease of writing came at the expense of all of the features of most writing systems that enable quick, efficient reading. It is no surprise, then, that the next few centuries were not dominated by alphabetic scripts. In fact, as we see the alphabet trickle out of the Levantine–Egyptian sphere over the next few centuries, it is always in the hands of scribes, but always serving sub-official functions characterized by extreme brevity: a name, a phrase, a label.

Over the following centuries, the alphabet was modified in important ways: crucially, word dividers were added, letter shapes were linearized,[27] and to some extent vowels came to be marked. Then the alphabet was ready for a more central role in reading and writing. Thus, the alphabet—originally a simplistic system developed for writing short inscriptions and graffiti, and nothing more—was adapted in ways that enabled it to spread throughout Europe and later much of the world, in which books and journal articles can be written in hundreds of languages. This is a familiar pattern, today called a 'disruptive innovation'.[28] For example, people domesticated animals 10,000 years ago, but realized the economic potential inherent in domesticated flocks only four millennia later.[29] This secondary revolution makes the original revolution look more dramatic than it really was (Rosen 2001: 12). In the case of the alphabet, the realization of the potential took centuries rather than millennia, but the pattern is the same. After word dividers had been introduced, letter forms had been linearized, and vowels had been marked, the alphabet was ready for prime time: it could be used to write genealogies, creation myths, treaties, and poetry. In retrospect, those first tentative steps taken around 2000 BCE look like a dramatic turn of events.

[26] Seidenberg (2011) argues that that there is no objectively 'good' or 'bad' writing system, but that 'languages get the writing system they deserve'. For arguments in the opposite direction, see Katz and Frost (1992) and Perfetti and Harris (2013).

[27] For a sophisticated historical consideration of the linearization, see Hamilton (2014). A related issue is the consolidation of alphabetic writing being written right to left, rather than in varying directions. See Dobbs-Allsopp (2023).

[28] For a conceptually similar consideration of the alphabet as a 'disruptive innovation', see Goldwasser (2018).

[29] Sherratt (1981) termed this realization the 'Secondary Products Revolution', and the revolution included the development of utilizing animals to pull ploughs, as well as for the consumption of milk, the production of wool, and pack transport.

4

Closing the Gap

Writing in the Aegean from the Late Bronze Age to the Iron Age

Willemijn Waal

Introduction

The conventional view of the history of writing in the Aegean may roughly be summarized as follows: in the Bronze Age, several logo-syllabic writing systems were in use (of which only one, Linear B, has been deciphered). The usage of this script, which recorded the Mycenaean language, was strictly confined to palatial economic administration. It fell out of use with the collapse of the Mycenaean palaces around 1200 BCE, marking the start of a long illiterate 'Dark Age' of some four centuries, which ended with the introduction of the alphabet around 800 BCE. We then witness an explosion of writing; the alphabet suddenly turns up everywhere and is used for all kinds of private purposes, from explicit graffiti to poetry. In this scenario, literacy in the Aegean is viewed as an isolated and unique phenomenon without taking its wider context into consideration. This 'tunnel vision' has everything to do with the unfortunate dichotomy according to which Greece belongs to the 'West', and all regions on the other side of the Bosporus to the 'East'. This division has deeply penetrated the organization of academia; the study of the Aegean and that of the ancient Near East are two distinct disciplines. In reality, of course, no such divide existed; the Aegean formed an integral part of a much larger Mediterranean world and should be studied and appreciated as such. One is faced not only with geographic but also with chronological fragmentation; the Late Bronze Age is usually studied separately from the Early Iron Age and ensuing historical periods in the Aegean. Especially in the light of the growing evidence for continuity between the second and first millennium BCE, however, there is much to be gained by a diachronic approach.

The present chapter aims to situate the use of writing in the Aegean in a broader geographical and historical framework and offer an alternative scenario to the one presented above.[1] It will first adduce evidence that the surviving Linear B clay

[1] Considering the wide scope of this chapter, it is impossible to discuss all aspects in detail. For a more exhaustive treatment of the topics addressed here I refer to some of my earlier publications (Waal 2018, 2019, 2021, 2023).

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tablets represent only a small portion of the texts that circulated in the Late Bronze Age, as this script was primarily written on perishable materials.[2] In a similar vein, the alphabet was also mainly recorded on perishable materials, and introduced much earlier than 800 BCE. This implies that there was no long Dark Age of some four centuries without writing, but that developments with respect to writing in the Aegean were to a large extent comparable to those in the wider ancient Near East.

Writing in the Ancient Near East: An Ultrashort Overview

In the ancient Near East, various writing systems were in use. The most widely spread script was the cuneiform script, which is attested from around 3400 BCE to the first century CE. It was used for various languages and all kinds of purposes in Mesopotamia, Syria, the Levant, and Anatolia. One of the most distinctive features of this writing system is its primary writing material: clay (Figure 4.1).

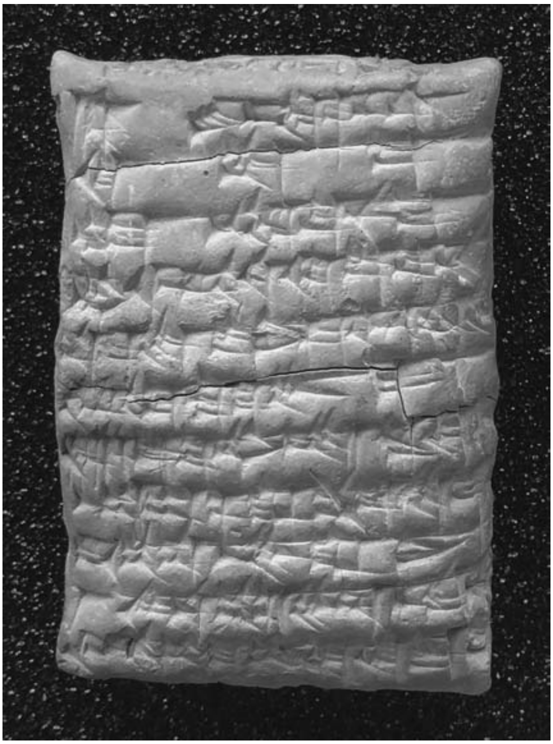

Figure 4.1 Private letter in Old Babylonian cuneiform (LB 2061), Iraq, *c.* nineteenth–seventeenth centuries BCE

Source: Courtesy of Nederlands Instituut voor het Nabije Oosten (NINO), Leiden University. *Photograph:* W. Waal.

[2] Note that 'perishable' is a relative concept; most of these writing materials could easily survive for centuries, but not for several millennia.

Unlike most writing materials, such as parchment, papyrus, wood, leaves, or bark, clay is extremely durable and fire resistant, which is why thousands of cuneiform tablets have survived to this day. Around the same time that the first cuneiform sources appear, we also see the first evidence for hieroglyphic writing in Egypt. The Egyptian Hieroglyphs, which are attested until the fourth century CE, were mainly used for monumental inscriptions on the walls of temples and tombs. For more mundane and practical purposes, the Hieratic (and later Demotic) script was used. The primary writing material was papyrus, and in addition use was made of other materials such as wood and leather. Because of the exceptional climatological circumstances in Egypt, these materials have sometimes survived for millennia, though of course much has been lost. Other writing materials included ostraca of broken pottery and (lime)stone.

Another important writing system was the alphabet, which was already in use from at least the beginning of the second, or even the end of the third millennium BCE (Schwartz 2021). In Wadi el-Hol in Egypt, alphabetic inscriptions dating to between 1900 and 1800 BCE were found (Darnell et al. 2005). Before their discovery in 1999, the earliest attestations of consonantal alphabetic or abjad writing were inscriptions attested in the Sinai region and Palestine. The date of these inscriptions is contested, and proposals range from the nineteenth to the fifteenth (or even the thirteenth) century BCE (see on this recently Haring 2019; Rollston 2020: 70; Höflmayer et al. 2021). Though these early West Semitic inscriptions, whose number is steadily growing,[3] are not yet completely understood, it is evident that they can be considered the forerunners of the later consonantal alphabets such as Phoenician, Hebrew, and Aramaic. In Syria and Mesopotamia, alphabetic scripts coexisted with the cuneiform script from the second millennium onwards, becoming more prominent in the first millennium BCE.[4] However, since this script was primarily used on perishable writing materials such as parchment and leather, it is attested much more poorly in the archaeological record than the cuneiform script on clay. An important exception is the consonantal cuneiform alphabet attested at the city state of Ugarit (Ras Shamra) from the fourteenth or thirteenth century onwards, which was written on clay (Figure 4.2). For Egypt, recent evidence suggests a wide presence of alphabetic writing in the mid-second millennium BCE (Haring 2015, 2019; Fischer-Elfert and Krebernik 2016). Early use of the alphabet is further attested in South Arabia (Yemen) on ribs or stalks of date-palm leaves, dating to the late second or early first millennium BCE (Stein et al. 2016) (Figure 4.3).

[3] See, e.g., the recent discovery (November 2022) of an inscribed lice comb from Lachish dated to *c.*1700 BCE.

[4] For an evaluation of the earliest alphabetic writing in Mesopotamia, see recently Rollston (2020: 69).

Figure 4.2 Clay tablet with an Ugaritic abecedary (RS 12.063), Ugarit (Ras Shamra), thirteenth century BCE; the letter order shows that the standard *aleph-bet-gimel* order was already in use at that time
Source: Courtesy of Project PhoTEO Mission de Ras Shamra.

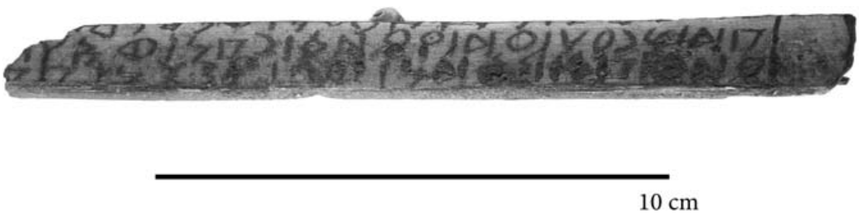

Figure 4.3 Palm midrib with incised alphabetic inscription from Yemen (L024), *c.* eleventh–tenth centuries BCE
Source: Courtesy of Stichting Oosters Instituut, Leiden University Libraries.
Photograph: Wim Vreeburg.

There is obviously much more that can be said about writing in the ancient Near East. Various writing systems, such as the Anatolian Hieroglyphs or undeciphered scripts, such as the Cypro-Minoan syllabary and the Byblos script, have not even been mentioned here. The very succinct overview presented here merely serves to show that the literary landscape of the ancient Near East was very rich and diverse; writing was used for many purposes, and various writing systems coexisted. Some scripts are, however, much better attested than others, which is mostly due to the choice of writing material and/or climatological conditions.

Writing in the Aegean: The Second Millennium BCE

The first evidence for writing in the Aegean is found at Crete at the end of the third millennium BCE, when Cretan Hieroglyphic signs appear on seals and seal impressions. From *c.*1800 to 1500 BCE, the Cretan Hieroglyphs are attested on clay tablets; altogether they comprise some 200 (short) documents (Tomas 2010:

341–2). In the eighteenth century, the first documents written in Linear A emerge. This script was used on the Greek mainland and several of the Aegean islands till c.1500 BCE. The Linear A corpus includes some 1,500 inscriptions, mainly on sealed nodules and unsealed clay tablets, as well as some inscriptions on other objects (Tomas 2010: 347–50) Both the Linear A script and the Cretan Hieroglyphs are undeciphered, which makes it hard to establish the precise content of the documents. They are overall quite short and appear to be predominantly economic–administrative records. Other, lesser-known writing systems at Crete include the Archanes script attested from around 2000 BCE (Decorte 2018) and the script of the much-discussed Phaistos disc.

The best-attested script is Linear B, the only deciphered writing system. It was used for the Mycenaean language, a forerunner of ancient Greek, and is documented in mainland Greece and the Aegean islands from *c.*1450 BCE till the end of the Mycenaean period (*c.*1200 BCE). The entire corpus consists of about six thousand clay records, which were virtually all found in palatial contexts. They are mostly small 'palm-leaf shaped' tablets (Figure 4.4), recording economic and administrative activities, but also included larger, summarizing, page-shaped tablets. In addition, Linear B has been attested on clay nodules and labels. At all find spots, the tablets, which are not dated, appear to cover administrative periods of a year at most (Bennet 2001: 29; Palaima 2003: 153, 172). To the Linear B records incised in clay, we may add the (very short) painted inscriptions on transport stirrup jars and incidental inscriptions on other pottery and stone.

Judging from the available evidence, the literary productivity in the Aegean appears much more limited than that in the contemporary Near East. The number of Aegean clay tablets is dwarfed compared to those found in the archives in Syria, Mesopotamia, and Anatolia. In addition, the purposes for which writing was employed in the Aegean seem much less varied; the Linear B texts are all of an administrative–economic nature; other text types, which are found at many sites in the ancient Near East, such as literary, historical, or religious documents, letters, lexical lists, school texts, or officially sealed deeds, such as sale contracts, wills, loans, and so on, are absent. An often-drawn conclusion is, therefore, that

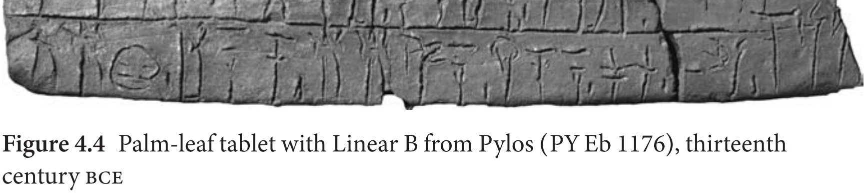

Figure 4.4 Palm-leaf tablet with Linear B from Pylos (PY Eb 1176), thirteenth century BCE

Source: Courtesy of The Pylos Tablets Digital Project and the Palace of Nestor Excavations, Department of Classics, University of Cincinnati.

the use of writing was more restricted in the Aegean, but this is not the only, and in fact not the most likely, explanation. The first question that needs to be asked is whether the surviving text corpus is representative, or if in fact a large part of the documentation is missing, because it was written on perishable materials.

With respect to Linear A, it is generally agreed that its usage was not restricted to clay, but that documents of a less durable nature also existed. The main reasons for this assumption are the discovery of so-called flat-based nodules with traces of leather or parchment (see, e.g., Weingarten 1983; Hallager 2000: 135–45; Krzsykowszka 2005: 155–7; Perna 2017: 72–6), and the fact that Linear A has been attested on other materials, such as metal and stone, in non-administrative contexts. When it comes to Linear B, however, there is less consensus. According to some scholars, writing on perishable material must have existed (e.g. Driessen 2000: 186–7; Palaima 2003: 171–2; 2011; Waal 2021), but others maintain that this script was restricted to writing on clay (e.g. Bennet 2001: 27–8; Perna 2011: 18–19; Steele 2017: 154 with n. 5). The reason why writing on perishable materials is less accepted for Linear B is the fact that, in contrast to Linear A, there are no certain and unambiguous examples of flat-based nodules that were attached to leather documents. Further, compared to Linear A, there is less evidence of the use of Linear B outside strictly palatial administrative contexts. Such evidence is, however, not completely absent, as, for example, the inscribed stirrup jars mentioned above and the discovery of a Linear B tablet at Iklaina in a non-palatial setting demonstrate.[5] Moreover, as will be shown below, there are important other indications that Linear B was indeed written on perishable materials (see also Waal 2021 for a more elaborate discussion).

Arguments for the Use of Perishable Writing Materials for Linear B

Evidence from the tablets. As has long been pointed out (see already Evans 1921: 638; more recently Palaima 2003: 171), the round and complex Linear B characters are much more suited to be written with pen and brush, or to be incised in a soft material, rather than in the coarse material clay. Tellingly, the sign forms hardly underwent any processes of simplification or abstraction that would have facilitated writing on clay, which we do see in the cuneiform script that was written almost exclusively on this material (see Figure 4.1).[6] In addition, the substantial number of scribal hands that have been identified (see on this Palaima 2011: 96–100) would suggest that literacy was not confined to a small elite, and that writing was used for more than short administrative records alone. As observed

[5] Though the inscribed stirrup jars were probably related to the palatial administration, they have also been found outside administrative centres (for a discussion of their function, see Judson 2013). For other examples of Linear B outside of palatial context, see Kelder (2024).

[6] Cf. the Linear A script, of which it is generally agreed that it was written on other materials than clay, which also maintains a degree of pictorial representation.

by Driessen (2000: 186), the external and internal features of the script betray elements that make it more than just a bookkeeping script. The striking overall uniformity and standardization of the script and the scribal habits are also of interest. They imply a rigid training, and it is doubtful whether such an elaborate educational system would have been set up and maintained so consistently only for the detailed recording of a very limited part of the administration.[7] It is evident that the surviving tablets do not represent the complete economic administration, as some aspects are conspicuously missing. Moreover, they cover only a time span of a year or less, which means that records of previous periods were (deliberately or accidentally) destroyed. The tablets at our disposal thus represent only a very selected group of documents, which happened to survive the destruction (by fire) of the palatial centres, because they were written on the resistant material clay.

The shape of the surviving Linear B clay tablets is also of interest. The most ubiquitous type has been dubbed 'palm-leaf tablet', as its shape resembles a palm leaf (see Figure 4.4). The most obvious reason why the clay was kneaded in this form is that it was imitating an already existing type of document—namely, one made of palm leaves (see, e.g., Evans 1921, 638; Diringer 1953: 42; Ahl 1967: 188; and now Waal 2021, 2023).[8] The choice for palm leaves as a primary writing material, would not be surprising; it is easy to use, widely available (especially at Crete), and quite resistant, which is why the palm tree has been, and still is, a popular and common source for writing material in many regions of the world (see, e.g., Diringer 1953: 37–44; Padmakumar et al. 2003).

Archaeological evidence. When investigating the possible existence of perishable writing materials, archeological evidence is bound to be absent or extremely limited. So far, the remains of two wooden diptychs (one almost complete) from the Uluburun shipwreck are the only surviving wooden documents from the Late Bronze Age. Their original provenance is unknown, but they may have belonged to the Mycenaean officials who were on board the ship (Pulak 2005; Bachhuber 2006: 352–6). As has recently been proposed by Martien Dillo (2021), the best-preserved exemplar possibly contains traces of Mycenaean numerals. Further archaeological evidence for the use of such wooden diptychs in the Mycenaean world are the bronze hinges found at the Archive Complex at Pylos and in the arsenal at Knossos, which may be hinges of wooden tablets, similar to the ones found in Uluburun (Shear 1998). In addition, at Knossos a number of flat-based nodules were found which could have been attached to (leather) documents, though other purposes cannot be excluded (Krzyszkowska 2005: 217–18).

[7] Note that the lack of school tablets is another indication that the preserved text corpus is not complete (cf. Waal 2021: 209–10).

[8] In most literature, the term 'palm leaves' is used, but it may be more accurate to speak of palm ribs. The alphabetic inscriptions from Yemen show that the central spine ('rib') or stalk of palm leaves could be inscribed (see Stein et al. 2016). It cannot, however, be excluded that leaflets were also used for this purpose. With respect to the shape, there is no fundamental difference, as both have a comparable long and narrow format (Waal 2023).

Evidence from contemporary sources from Anatolia. Additional evidence for a wider use of writing in the Aegean is the correspondence between the Hittite king and the king of Aḫḫiyawa, a region that can be safely identified with Mycenaean Greece (see, e.g., Beckman et al. 2011: 3–6). During the Late Bronze Age, the rulers (Great Kings) of the various empires maintained intensive diplomatic contacts, and the tablet collections of the Hittite capital Ḫattuša (some 200 km east of Ankara) have yielded letters exchanged between the Hittite kings and the kings of Babylonia, Assyria, Egypt, and Aḫḫiyawa. Most of them were written in cuneiform in Akkadian, the Late Bronze Age *lingua franca* of the ancient Near East, but some, including the Aḫḫiyawa correspondence, are written in Hittite. The Aḫḫiyawa correspondence includes at least two letters sent by the Hittite king to his Aḫḫiyawan colleague. The fact that these were found at Ḫattuša does not mean they were not sent; they probably represent either drafts or archival copies. There is also an incoming letter that was sent from Aḫḫiyawa to the Hittite king. This tablet is written in Hittite, by a Hittite scribe, which prompts the much-discussed question what the original message dispatched from the Aegean would have looked like (see, e.g., Bryce 2003: 199–200; Sürenhagen 2008: 260–5; Hoffner 2009: 299; Beckman et al. 2011: 138–9; Melchert 2020; Waal 2021: 213–14). Theoretically, it could have been transmitted strictly orally, but this would be highly exceptional in the light of the wider Near Eastern context, where letters were an essential tool for the maintenance of diplomatic relations, be it often in combination with oral reports from messengers. Not only the Great Kings, but also vassal kings of smaller states, made use of writing. Apart from Anatolia, the Mycenaeans maintained contacts with Egypt (e.g. Cline 1994; De Fidio 2008: 96–7), so we can safely assume that they were familiar with existing diplomatic conventions. In particular, since the Mycenaeans were no strangers to the concept of writing, there is no reason to think that they would not have participated in the regular practice of exchanging letters. Possibly, they made use of the cuneiform script for this type of international correspondence (though no examples hereof have so far turned up in the Aegean), but it should not be excluded that they (also) made drafts or copies in Linear B. Regardless of the kind of script they used, the contacts abroad suggest that in the Aegean writing was used for more than purely local economic administrative purposes.

Evidence from later sources. Last but not least, it is significant that in later classical traditions it was generally believed that the first writing materials were perishable materials such as palm leaves and wood (see already, e.g., Evans 1909: 105–6; Ventris and Chadwick 1973: 109; and now Waal 2021, 2023).[9] Clay, on the other hand, is never mentioned in later sources, which can be seen as a further

[9] In addition, as I have recently argued elsewhere, the expression *phoinikeia grammata*, which Herodotus famously links to the Phoenician alphabet ('Phoenician letters'), is probably to be understood differently. The hybrid word *φοῖνιξ* has multiple meanings and can also refer to palm trees. A closer inspection of the available attestations reveals that the expression *phoinikeia grammata* originally referred not to alphabetic writing, but rather to 'palm leaf writing'—i.e. Linear B (Waal 2023).

confirmation that this was not a common writing material, but that its usage was rather exceptional.

Concluding Remarks

All in all, there is substantial evidence—from very diverse sources—that suggests that the surviving corpus of Linear B texts does not reflect an accurate representation of literary productivity in the Aegean during the Late Bronze Age. Many more documents on perishable materials, which are now lost, must have circulated, including letters and undoubtedly all kinds of other text genres. The excavated tablets are only a fraction of a much larger written repertoire, and they survived only because they were exceptionally written down on clay, rather than on palm leaves or other comparably perishable materials. This observation begs the question why these particular texts were written on the material clay, and not on palm leaves, a question that is hard to answer based on the presently available evidence. Possibly, there were some very practical, mundane reasons behind this choice, which can no longer be traced (see already Ventris and Chadwick 1973: 109; and now Waal 2021: 219–20). Another question that must remain open is to what extent the use of palm leaves was an innovation, or whether they had already been used for Linear A and Cretan Hieroglyphs. The available evidence indicates that the shift from Linear A to Linear B writing also entailed certain changes in administrative and sealing practices (Tomas 2010; 2017: 65–7; Waal 2021: 206), but it cannot be determined whether the introduction of palm leaves was one of them. In any case, palm leaves were not the only ephemeral writing material available; as mentioned above, there is evidence that Linear A was written on leather and parchment, and the use of other writing materials such as papyri and wood should not be excluded. The coexistence of several writing systems (Linear A, Cretan Hieroglyphs and the elusive Archanes and Phaistos scripts) attests to a diverse and rich literary productivity from the beginning of the second millennium onwards. The awareness that writing in the Bronze Age Aegean was, in all likelihood, much more prolific and varied than has generally been assumed has significant repercussions for our understanding of the following 'Dark Age'.

Writing in the Aegean: The 'Dark Ages'

The last documents written in Linear B date to around 1200 BCE. It then takes about four centuries before written evidence appears again in the form of inscriptions in alphabetic Greek on stone and pottery. Though the Semitic origins of the Greek alphabet are undisputed, there is no consensus about the moment when the Greeks took over this script. The question to what extent the first attestations reflect the beginnings of alphabetic writing in Greece, or whether this script had already been introduced much earlier but written on perishable materials, is much debated. Ever since Rhys Carpenter in his influential 1933 article did away with 'the old illusion of the great antiquity of the Greek alphabet', it is generally accepted among classicists that the alphabet was introduced only shortly before its first attestations, though there have always been voices pleading for a much earlier introduction (e.g. Ruijgh 1995, 1997), especially within the field of Semitic studies (e.g. Ullman 1934; Naveh 1973). New discoveries and developments over the recent decades have made it clear that the dominant scenario in classical studies is untenable, especially if one also takes into consideration the evidence from the Near East. To a large extent, the discussion about the introduction date of the Greek alphabet is similar to the debate about the usage of Linear B; both hinge around the likelihood of the existence of perishable writing materials. And, just as in the case of Linear B, there are several important indications for an earlier (and wider) use of alphabetic writing in the Aegean, of which I will discuss the most important ones below.[10]

Arguments for an Earlier Introduction of the Alphabet

Archaic scribal habits of the early Greek alphabet. As mentioned above (p. 73), the history of the alphabet can now be traced back to at least the beginnings of the second millennium BCE, and there is growing evidence that West Semitic alphabets were used on a regular base in the broader Levant from the mid-second millennium onwards. In the course of the eleventh century, some important standardizations took place. In the case of the Phoenician alphabet, the alleged forefather of the Greek alphabet, the writing direction became stabilized (from right to left) and the letter forms were fixed (Naveh 1982: 42; Millard 2012: 17–18). The writing direction of the early Greek inscriptions, however, is not yet stable; they are written from right to left, left to right, or boustrophedon (horizontally and vertically) until around 500 BCE, from when onwards dextroverse writing became the norm. As pointed out by Joseph Naveh (1973), they resemble the early West Semitic inscriptions, which could also be written in any direction: right to left, left to right, vertical, and boustrophedon (vertically and horizontally). In this respect, the early Greek inscriptions are thus more archaic than the Phoenician script, where the direction of writing had been established from right to left since the eleventh century. A similarly archaic feature is the Greek use of word dividers. In some, though by no means all, of the early Greek inscriptions, words are divided by means of multiple dots and/or short vertical strokes. Similar kinds of word division are

[10] For a more detailed discussion, see Waal (2018). For recent treatments of the early (Greek) alphabets, see now Boyes and Steele (2019) and Parker and Steele (2021).

attested in the early West Semitic inscriptions, but hardly in later Phoenician inscriptions, which are as a rule written in *scriptio continua*.

If one assumes a late introduction date, one is forced to accept that the Greeks ignored the scribal conventions of the standardized ninth–eighth century Phoenician alphabet, but instead coincidentally mimicked writing practices that existed much earlier, and, moreover, ended up writing in completely the opposite direction (left to right) as their supposed Phoenician ancestor (cf. Naveh 1973, 1982). The counterargument that a loose writing direction is typical for early writing in general is not valid, as this applies to only *newly invented* writing systems. When, however, an existing writing system is adopted, elementary scribal conventions, such as the writing direction, tend to be taken over along with the script. A good demonstration hereof is provided by the cuneiform script, which was adopted multiple times by various cultures, together with the most important scribal habits.

A more straightforward solution is that the Greeks did not adopt the alphabet from the Phoenicians in the eighth century, but that they had already done so in or before the eleventh century BCE, taking over the then existing scribal conventions of the West Semitic alphabets.[11]

Diversity and wide geographic spread of the archaic Greek alphabets. From the eighth century onwards, Greek alphabetic inscriptions turn up all over the Greek mainland, the Aegean islands, Italy, and Sicily. These early inscriptions show regional variety; no less than thirty three (!) different versions of the alphabet can be distinguished. These local or epichoric scripts are generally divided into the following main groups, after Kirchhoff (1887); the blue (further split into light blue and dark blue), red, and green alphabets. Despite their obvious differences, however, these alphabets all share certain innovations. The most important one is the presence of vowel signs. The Phoenician (and the other Semitic alphabets) were consonantal or abjad alphabets, which did not have signs for vowels. The Greek alphabets all do have vowel signs, which are generally thought to be a Greek innovation (for a different scenario, see Waal 2019). The fact that these vowels are present in all the Greek alphabets means that they must ultimately go back to the same source (e.g. Wachter 1989; Jeffery and Johnston 1990: 6). In order to explain the fact that the Greek alphabets, on the one hand, share the same ancestor, but, on the other hand, show differences from the very start, one is forced to assume an incredibly rapid adoption, development, and spread of alphabetic writing throughout the Mediterranean. This is hardly conceivable, as has already been pointed out by Ullman (1934), particularly after a long illiterate

[11] Such a scenario would incidentally also offer a more satisfying explanation from a linguistic perspective for some of the modifications the Greeks made to the Phoenician consonantal script, such as the choice for the letter *heta* for /h/ (Ruijgh1995, 1997) and the origins of the letter *phi* (Brixhe 1991). By contrast, there do not appear to be any linguistic arguments that call for a later date.

'Dark Age' of some four hundred years. Carpenter's response (1938: 69) that this unparalleled development speed was possible because the Greeks were 'intensively active people' not only implies an undemonstrated cultural superiority and painfully lays bare a very Eurocentric outlook on history, but also is unsatisfying from an academic perspective.

Another fact that is difficult to explain in the current model is the great variety of Greek letter shapes. Naveh (1973, 1982) explains this diversity by assuming that the alphabets stem from a prototype that had unstable letter forms. This implies that the alphabet was introduced in or before the eleventh century, when the West Semitic alphabetic script did not yet have fixed letter forms. Alternatively, one could see the regional diversity as the result of local developments, which must have taken place over a longer period of time. As these signs are present from the start, this would also imply an earlier date for the introduction of the alphabet.[12]

Related alphabetic traditions. Another argument for an earlier introduction is the contemporary, independent tradition of the Phrygian alphabet. The Phrygian and Greek alphabets are unmistakably closely related, and it was long believed that the Phrygian alphabet was derived from the Greek. There is, however, no clear single Greek alphabet that can be identified as the source (see, e.g., Young 1969: 254; Diakonoff and Neroznak 1985: 4), and the Phrygian alphabet clearly underwent some independent developments (Brixhe 2004: 277). What is more, redatings at Gordion have pushed back the date of the first Phrygian inscriptions by some hundred years (Brixhe 2007: 278). They can now be placed at around 800 BCE, making them contemporary with or even earlier than the oldest Greek inscriptions, which is difficult to reconcile with the current paradigm. Similarly complicated are the relations between the Greek and Etruscan alphabets, and some of the Anatolian alphabets, notably the Carian alphabet. The relations between the Greek, Etruscan, Phrygian, and Anatolian alphabets would be easier to explain in a scenario in which the origins of the Greek alphabet are older than its first attestations.[13]

Poetry and porn. The earliest Greek inscriptions are of a private nature, including (proprietary) inscriptions on pottery and tombstones and rock graffiti. These early personal expressions indicate an extremely broad and fast propagation of writing among various layers of the population.[14] Even more astounding is that some of the oldest known inscriptions—namely, the Nestor cup of Pithekoussai (Figure 4.5), the Dipylon inscription from Athens, and the Hakesander cup from

[12] Naveh (1973) further claimed that some Greek letter shapes resemble the archaic West Semitic more than the Phoenician forms, but this is arbitrary; Carpenter (1938) has claimed the exact opposite, arguing that they are more similar to the Phoenician letters.

[13] For a recent overview of the complex relations between the Greek alphabets and the alphabets supposedly derived from them, see Waal (2019).

[14] Cf., e.g., Teodorsson (2006: 173), and, recently, Bourogiannis (2019: 151–2).

Figure 4.5 The Nestor cup with an alphabetic inscription in Greek hexameters, Ischia (Italy), eighth-century BCE, Museo archeologico di Pithecusae, Ischia.
Source: https://commons.wikimedia.org/wiki/File:Nestorbecher_auf_Ischia.jpg.
Photograph: Marcus Cyron.

Methone (see now Janko 2015)—present elaborate poetic verses. Some have taken these early literary attestations as proof that the alphabet was invented by the Greeks for the sole purpose of recording Homer (Powell 1991). Generally speaking, however, poetic and fictitious texts are unlikely candidates for the first use of writing.[15] The same applies to salacious and playful rock graffiti, which are also among the oldest Greek inscriptions.[16] A perhaps less romantic, but more pragmatic, explanation is that writing was already in use for other, more prosaic purposes, such as (economic) administration and trade, on perishable materials before the first surviving inscriptions on more durable materials (see, e.g., also Ruijgh 1995: 37).

Concluding Remarks

In the present model, according to which the Greeks took over the Phoenician alphabet in the late ninth or early eighth century BCE, one is faced with a number of awkward facts. One is forced to assume that the Greeks ignored certain

[15] For a critique of Powell's claim, see, e.g., Woodard (1997: 253–6).

[16] The corpus of archaic inscriptions has grown in recent years: for an overview of discoveries up to 2021, see Matthaiou (2021). Especially significant are the over twelve hundred rupestral graffiti dating to the sixth century BCE that have been found since 1994 in southern Attica; see Langdon (2015); Van de Moortel and Langdon (2017).

Phoenician scribal habits, such as a fixed direction of writing and standardized letter forms, but instead turned their alphabet into a more primitive script without these features, accidentally imitating the early West Semitic inscriptions. The Greek alphabet subsequently would have spread, developed, and diverged with enormous speed over a large geographical area. It instantaneously circulated among the population and was used for all kinds of playful private purposes—facts that are all the more remarkable after a long 'Dark Age' of some four hundred years in which writing was presumably completely unknown.

If, on the other hand, one allows for an earlier introduction date—that is, in or before the eleventh century (as advocated by Naveh 1973)—a much more credible scenario unfolds: the Greeks took over the script in its then existing form, including the contemporary writing conventions. The Greek alphabet then spread and developed over a longer period of time, which accounts for the regional divergences, as well as the dissimilarities between Greek and Phoenician writing. In all likelihood, writing was in the first instance primarily used for administrative and economic records, as in many ancient societies. These earliest records have not survived, as they were written on perishable materials. Unlike the cuneiform script, which was closely connected to the durable writing material clay, alphabetic writing was (and for the most part still is) largely tied to more ephemeral materials such as papyrus and parchment (and nowadays paper). It was only in a later phase, when the use of writing extended to other (private) domains, that inscriptions were also made on more durable materials—such as pottery and stone, which as a consequence survived. This would mean that the first inscriptions of the eighth century reflect not the *beginning* of writing, but rather an *expansion* of writing, on other materials, and for different purposes.[17]

The latter scenario gains even more plausibility if one takes the wider context into consideration. Recent archaeological studies have shown that the Greek 'Dark Age' was not as dark as was long assumed, but that, apart from decline, there was also a substantial amount of continuity and prosperity, in places such as Knossos and Lefkandi, and exchange with the Near East did not come to an end (e.g. Dickinson 2006: 196–218). The close and constant contact with a region, where alphabetic writing circulated from the second millennium onwards, makes it highly improbable that the Greeks started to use this script only around 800 BCE, especially since writing had been practised in the Aegean for some seven hundred years (1900–1200 BCE), and was already used to record the Greek language from at least *c*.1450 onwards.

[17] The question why writing on pottery starts to appear from the eighth century onwards is, of course, of great interest. It was undoubtedly related to social–cultural changes in this period, but these fall beyond the scope of the present chapter. In any case, the fact that we do not have examples of inscribed pottery before that time does not mean that there was a complete absence of writing in the preceding centuries. By comparison, during the long three millennia that the cuneiform script was in use, it was rarely inscribed on pottery.

The Argument from Silence and Chronological Considerations

The key argument against an earlier use of the alphabet as well as a broader use of Linear B on perishable materials is the *argumentum ex silentio*: there are no certain Greek alphabetic inscriptions attested before the eighth century BCE, and no Linear B documents other than elementary economic records on clay have been found. An argument from silence is, however, never more than that: it remains inconclusive, however 'loud' the silence may be. Since the dominant writing mediums for most scripts, including the alphabet, were perishable materials such as leather, wood, or papyrus, which can survive for millennia only in exceptional circumstances, the absence of evidence is hardly surprising, nor unique. Contemporary Cyprus offers a welcome parallel; there are no written records from *c.*950 to the eighth century, yet the continuity of the syllabary tradition from Cypro-Minoan to the Cyprian syllabary shows writing did not cease. Likewise, there are chronological gaps in the attestation of the Anatolian Hieroglyphic script. Chance discoveries from other regions and time periods, such as the Novgorod birch bark documents or the Runic inscriptions from Bryggen, which have profoundly changed earlier views about literacy, demonstrate the risk of relying solely on the surviving evidence. In the Aegean, no such 'game changers' have yet turned up,[18] though new discoveries have already pushed back the date of the first Greek alphabetic inscriptions by about a century, and possibly they need to be dated even earlier. The absolute date of the so-called Late Geometric Period, the period in which the first Greek alphabetic inscriptions appear, is much contested and considered to be too low by some scholars (e.g. Nijboer et al. 1999–2000: 173–4; Janko 2015: 13–16). Recent ^{14}C data from Sindos (Gimatzidis and Weninger 2020) confirm that the conventional chronology and periodization of the Early Iron Age Aegean are in dire need of revision. The Sindos material implies that the Geometric period was much longer and started roughly a century earlier. As the authors observe, this would have serious repercussions for the date of the introduction of the alphabet (Gimatzidis and Weninger 2020: 25) and would significantly reduce the gap in our sources.[19]

Another factor to consider is the so-called Signor–Lipps effect, named after Philip Signor and Jere Lipps. This paleontological principle holds that, since the fossil record of organisms is never complete, it is highly unlikely that the last organism in a certain taxon will be preserved as a fossil. The youngest-known fossil therefore does not represent the last appearance of a taxon. Conversely, the oldest-known fossils

[18] A serious candidate, however, is the recent discovery of a Late Bronze Age alphabetic inscription found at Mycenae, which was presented by Robert Martin (University of Toronto) at an online CREWS seminar, 30 September 2022.

[19] Note that James et al. (1991) have proposed shortening the length of the Dark Age considerably, which would make the 'illiterate gap' virtually non-existent, but their thesis has not found general support. For critical discussions about the problems surrounding the chronology of the Bronze Age, see, e.g., Bietak (2015, 2021); Wiener (2015).

cannot be equated with the first appearance of a taxon—this is sometimes referred to as the Spill–Rongis effect (Signor–Lipps spelled backwards). *Mutatis mutandis*, it would be an exceptional stroke of luck if the oldest samples of writing found in the Aegean are indeed the first (or almost the first) inscriptions that were ever made.[20]

Final Considerations

The story of writing in the Aegean as it is conventionally told is one of extremes. In the Late Bronze Age, writing was very restricted and confined to palatial administration; it then disappeared completely for some four centuries, from *c.*1200 BCE until 800 BCE. Then, finally, the alphabet was introduced, causing an immediate explosion of writing (the so-called alphabetic big-bang). These disruptive and drastic developments are very different from what we observe in many regions of the adjacent Near East, where writing was used for all kinds of purposes in the Late Bronze Age. The alphabetic script coexisted with other writing systems from at least the second half in the second millennium, gaining more and more ground in the Iron Age. One should obviously be wary to extrapolate from parallels in neighbouring societies too readily; the fact that regions were in contact and formed part of the same cultural continuum does not, of course, necessarily mean that their use of writing was similar; the presence of various local writing systems is already a nice illustration that regional differences indeed existed. At the same time, however, one needs very cogent and persuasive arguments to single out one region and reconstruct parts of its society in a completely deviant manner, disengaged from its surroundings. In this case, there are no such compelling arguments, but the current paradigm is rather the product of an outdated Hellenocentric world view, which has managed to persist because of the unfortunate academic fragmentation already referred to in the Introduction to this chapter.

The new model presented here is largely based on indirect evidence, and some questions inevitably remain open. We do, for instance, not know exactly when the alphabet was introduced, nor if it coexisted for some time with the Linear B script, and we can only speculate about the exact appearance and usage of the missing documents. These uncertainties may be reason for some to dismiss this scenario as speculative, and to cling on to the security of the old familiar narrative, which appears to offer more solid ground. This is, however, a dangerous fallacy; the prevalent paradigm has become a dogma based on factoids rather than facts and buttressed by convention rather than curiosity. Instead of falling into the certainty trap, we should be prepared, in the words of Bertrand Russell (1950), 'to endure uncertainty, which is difficult, but so are most of the other virtues'.

[20] By the same token, it should not be excluded that Linear B was in use longer than its last attestations, and for a while coexisted with the alphabet, possibly already before the end of the Mycenaean period around 1200 BCE.

5

The Caroline Islands Script

How One Script Informs Five Debates

Alex de Voogt

Introduction to the Caroline Islands Script

The Caroline Islands are located in the Federated States of Micronesia. The Caroline Islands refer to the islands of Woleai, Ulithi, Fais, Sorol, Eauripik, Faraulep, Ifaluk, Elato, Lamotrek, and Satawal, better known as the Outer Islands of the Western Carolines (see Figure 5.1). 'Outer' specifies their distance from Yap, the centre of the traditional hegemony as well as the present-day administration.

Woleaian is spoken with dialectal differences on Woleai, Eauripik, Faraulep, Elato, Lamotrek, Puluwat, Satawal, and Ifaluk. The Caroline Islands script was found only on this group of islands that share the Woleai language and is, therefore, also referred to as the Woleai script. According to Sohn, whose grammar (Sohn 1975) and co-authored dictionary (Sohn and Tawerilmang 1976) are still the main sources for the language of Woleai, there were approximately 1,500 speakers of Woleai on the various islands in 1975. Like Trukese, Ulithian, and other nearby languages, the language can be classified as a member of the Trukic subgroup of the Micronesian group of the Oceanic branch of Austronesian.

The First Descriptions and an Obsolete Debate

In 1909, the Hamburg Südsee Expedition visited the island of Woleai. Two ethnographers, Damm and Sarfert (1935), described examples of the local script, but, unfortunately, this part of their work was not published until the 1930s. The delay was such that Sarfert had already passed away, and other researchers had already noted the existence of this script in other publications.

Shortly after this Hamburg expedition, the islands were briefly visited by Brown (1914), who collected a series of characters that also appeared in later publications. For instance, Diringer (1948), in his publication on the writing systems of the world, refers to Brown in his description of the Caroline Island script.

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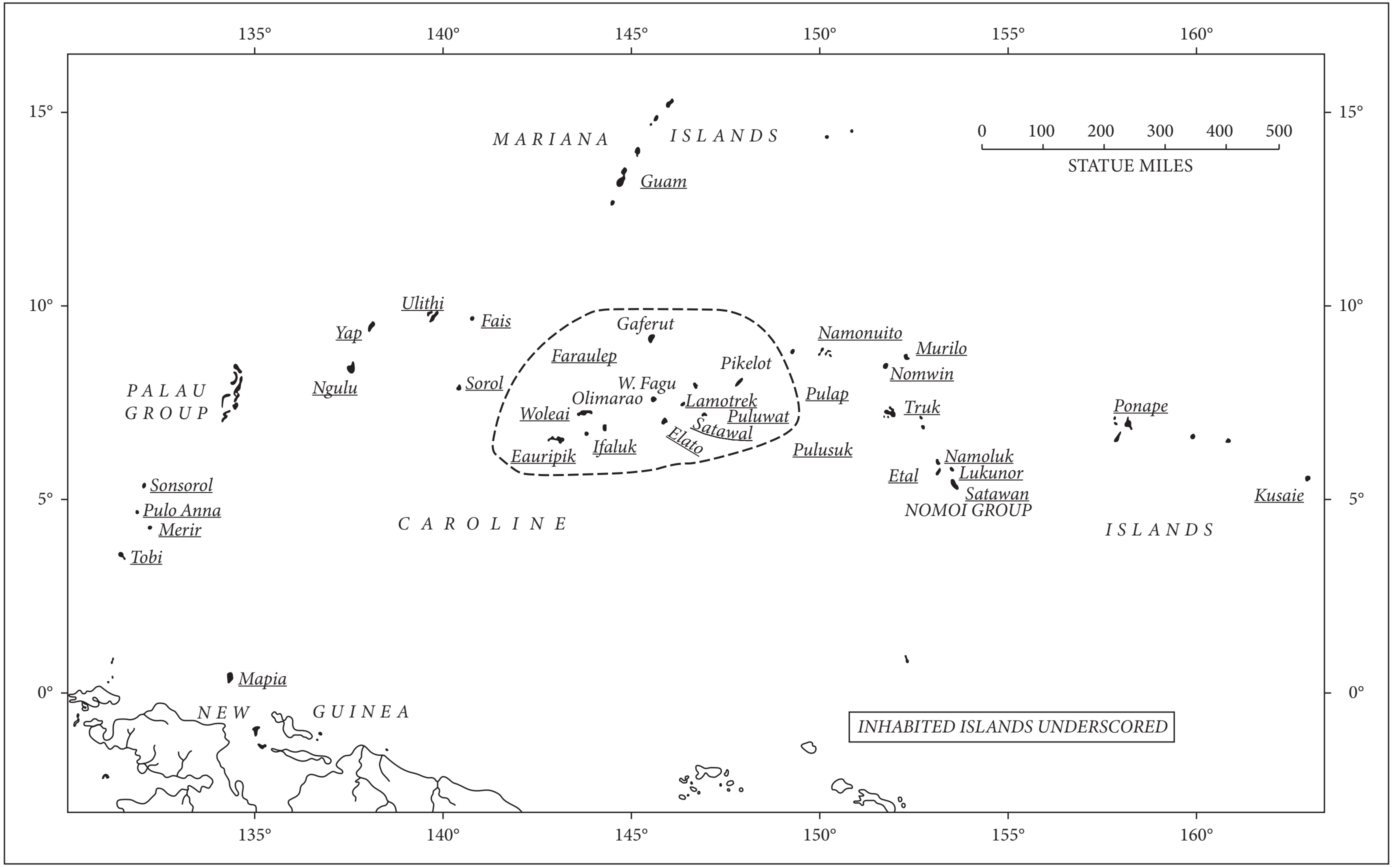

Figure 5.1 Map of the Caroline Islands

Source: Riesenberg and Kaneshiro (1960: 281, map 1).

Two decades after Brown, the Japanese scholar Someki (1936) visited the islands and described thirty-eight characters collected from different islands. Someki (1936: 178) presented the Caroline Islands sign inventory next to a sample of the undeciphered Rongorongo script from Easter Island. It is one of the first, though largely unproductive, debates in which the Caroline Islands script played a specific role. Imbelloni (1951: 164) and Barthel (1971) also commented on the possible link between the Easter Island and the Caroline Islands script, but this idea has now been abandoned and dismissed.

The most significant description of the Caroline Islands script was collected by two anthropologists, Shigeru Kaneshiro and Saul Riesenberg in the 1950s. Kaneshiro did not publish much on the Micronesian region before he worked on the Caroline Islands script, but his co-author was deeply involved in Micronesian matters long before their collaboration. Riesenberg worked as an assistant and later as an associate professor at the University of Hawaii, and, between 1953 and 1954, he was also the staff anthropologist of the United States Trust Territory of the Pacific Islands. After leaving his position at the University of Hawaii, he became curator of ethnology at the Smithsonian Institution and was chair of the National Museum's department of anthropology until 1970. From 1954 to 1957, Riesenberg and Kaneshiro conducted fieldwork on the Caroline Islands script and published their findings in the Anthropology papers of the above-mentioned Smithsonian Institution, a government publication and thereby publicly available.

Riesenberg and Kaneshiro (1960: 273) compared the inventories collected by Damm and Sarfert, Brown as well as Someki, and proposed that the origin of the script was one of 'stimulus diffusion'. The history of the script that they collected and expanded provides a detailed account about the inception of the script. Such histories are especially rare, even for twentieth-century scripts, but contribute to an ongoing debate about the possible scenarios of script development that may have taken place in antiquity as well as in more recent settings.

Stimulus Diffusion

Riesenberg and Kaneshiro (1960: 282) state that the Caroline Islands writing system was developed some time before 1909. They noted a difference between two types of script, a distinction that was also pointed out by people on the islands. They translated this distinction into a type 1 and a type 2 script and found seventy-eight characters of type 1 and nineteen of type 2.

Riesenberg and Kaneshiro reconstructed the history of type 2 symbols (Figure 5.2) and found that most type 2 symbols ended in an /i/ sound. They attributed this /i/ sound to the name of the letters of an alphabet. The names of the symbols were taken as their syllabic sound value. The alphabet was identified as the one created by the Reverend Robert William Logan (1843–87), who in 1878

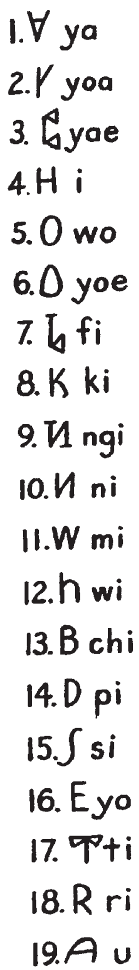

Figure 5.2 Type 2 list of signs and sign values
Source: Adapted from Riesenberg and Kaneshiro (1960: fig. 26).

was assigned by the American Board of Commissioners for Foreign Missions to write religious texts in the Trukese language.

Damm and Sarfert (1935) suggested that a missionary from Truk, who was familiar with Logan's alphabet, had been shipwrecked on Eauripik. This missionary was instrumental in transferring the Trukese alphabet to Woleaian, which then became the source of the type 2 script. Islanders had learned the alphabet using the names for the letter symbols. These names subsequently became the values of the symbols: a consonant and a vowel -i, or just a vowel. Logan's alphabet appeared to be close enough to type 2 to reach the reasonable conclusion that the Truk area must have been the source.

Various stories were collected that spoke about a missionary shipwrecked with his companions. The companions were said to have taught the Trukese alphabet to the people of Eauripik and later Woleai. Riesenberg and Kaneshiro (1960:

288–9) identified this shipwrecked missionary as Alfred Snelling from Truk. He had been lost at sea in 1905 and reached Eauripik, after which a Woleaian chief brought him to Woleai. One of Snelling's surviving companions, Airas, later confirmed this story to Frank Mahoney, the district anthropologist in Truk in the 1950s. Airas pronounced the consonant letters with /i/ endings. according to interviews with Mahoney.

Type 1 writing (Figure 5.3) was developed after the syllables with endings in /i/ appeared to be insufficient to write the Woleai language. This development occurred when islanders started teaching type 2. The type 1 symbols have values with vowels other than /i/. Riesenberg and Kaneshiro's consultants agreed that type 1 was invented in Faraulep. They even called type 1 script the 'writing of Faraulep'. Their statements suggest that the script was learned through correspondence between islands, and even the people who did not master the script recognized it as the script from Faraulep. Riesenberg and Kaneshiro dated the development of type 1 script from after the big typhoon of 1907 to before 1909, when the Hamburg expedition found the writing on various islands.

Riesenberg and Kaneshiro suggest a series of inventions, because they found variations within the type 1 script. The characters of type 1 appear to have had a particular order, but after the first fifty characters more variation was found within this order than at the beginning, suggesting a later invention of characters after the first fifty.

Stimulus Diffusion and the Syllabary Debate

When Kroeber (1940) set out to explain his concept of 'stimulus diffusion', or 'idea diffusion', writing systems provided an important part of his examples. One may even argue that the discussions about stimulus diffusion have found significant inspiration in the history of scripts. Kroeber offered eighteen scenarios in which this 'process of diffusion or spread of cultural material' could have taken place. He specifically notes that this process pertains to situations 'where a system or pattern […] encounters no resistance to its spread, but there are difficulties in regard to the transmission of the concrete content of the system' (Kroeber 1940: 2). Writing systems offered him useful examples, as only the idea of writing may have been transmitted, with the 'contents' developing at a later stage.

Kroeber's first example relates to the invention of porcelain in Europe, but then he continues with examples from the history of writing. His extensive description of the invention of the syllabary of the Cherokee language by Sequoya is followed by a short history of stimulus diffusion of the Vai script. He continues with the possible transmission of the idea of script between ancient Egypt and Mesopotamia as well as between the ancient Egyptians and the Phoenicians for consonantal signs. The sixth and following examples continue with stimulus

Figure 5.3 Type 1 list of signs and sign values
Source: Adapted from Riesenberg and Kaneshiro (1960: fig. 25).

diffusion of dramatic art, pottery, algebra, and poetic forms. In all these cases it is not the visible part but the underlying pattern or system that is being transmitted.

Kroeber (1940: 3) was puzzled by Sequoya's choice of a syllabary instead of an alphabet and suggested a 'psychological fact, namely that non-literate peoples have again and again been found able to syllabify their words on request' but are generally unable to parse words into phonemes. Although Kroeber (1940: 4) notes that Sequoya had knowledge of English letters and used the shapes of particular letters but not their sounds, he stated that Sequoya had not 'grasped the alphabetic principle'. A brief discussion of the Vai script is presented by Kroeber as a parallel example.

Riesenberg and Kaneshiro (1960: 273) were convinced that the Caroline Islands script also came about through stimulus diffusion in the manner Kroeber described. Ignace Gelb, a pioneer of systematic writing systems research, does not mention Riesenberg and Kaneshiro's work but depends on Diringer's early edition of his history of writing, where the Caroline Islands script is described using only the work by Brown. Gelb's theories about borrowed and invented scripts suggest that syllabaries like the Caroline Islands script have histories and developmental patterns in common with other syllabaries, similar to what had already been suggested by Kroeber. This idea was repeated and expanded upon by Daniels (1996: 579) several decades later. Gelb (1963: 210) comments further that writing systems of 'primitive societies' are a fertile ground for investigation.

Daniels (1996: 579) presents the Cherokee and Vai script as central to his theory about 'unsophisticated grammatogenies' and also includes the Caroline Islands script, using Riesenberg and Kaneshiro's work, the Bamum scripts, and several other examples. With 'unsophisticated' Daniels refers to the inventor(s) of the script, who were not literate in any writing system and did not have a linguistic or phonemic awareness of their own language. The non-literate background of the inventors had already been noted by Kroeber, and both Kroeber and Daniels suggest that there may be a general preference for syllabaries when it concerns illiterate inventors.

Tuchscherer (2007) provided the necessary historical details of West African scripts that partially question the suggestions by Kroeber and Daniels when it comes to syllabaries. For example, the introduction of a syllabary for the Bassa by local missionaries was surprisingly unsuccessful (Tuchscherer and Hair 2002: 459). The Vai appear to have been instrumental in the spread of writing to other parts of Liberia as well as to Sierra Leone and even to Cameroon, linking the few syllabic scripts developed in this region and making the concept of the syllabary part of the trait that was transmitted for scripts such as Bamum and Bagam (Tuchscherer 2007). Tuchscherer and Hair (2002) also suggests that the Cherokee may have inspired the Vai. In an overview of the history of syllabic scripts in Africa, I have suggested that, in most cases, the system of writing had spread together with the idea of writing (de Voogt 2014: 139).

The misinterpretation of an alphabet as a syllabary, as for the Caroline Islands script, may still offer a useful scenario that could explain why exposure to an alphabetic system does not necessarily result in an alphabet. One such scenario could be found with the Meroitic writing system, which was used sometime between 270 BCE and 330 CE and located in today's northern Sudan. It developed after a period of Egyptian writing in the same region, including demotic writing and Greek. The alphabetic signs present in Egyptian writing may have been reinterpreted as syllabic rather than alphabetic (Rilly 2022, pers. comm.), subsequently requiring additional signs for syllables using other vowels. This scenario of a reinterpretation of an alphabet, in the case of Meroitic resulting in an alpha–syllabic system, is a specific contribution to our understanding of the history of scripts but not one that should be applied generally.

The conviction of Riesenberg and Kaneshiro (1960: 273) that the Caroline Islands script was spread through stimulus diffusion in the manner Kroeber described also needs revisiting. It appears that it was not just the 'idea' of writing that reached the islands but also the shape and value of alphabetic signs. While the system of writing was reinterpreted, their type 2 writing is part of a complex cultural trait. The spread of a cultural process such as writing is more easily traced in the historical record, which is exactly what Riesenberg and Kaneshiro were able to do. The subsequent development of type 1 script in Faraulep came after this practice had been taught by Snelling and his assistants. While Cherokee features signs that resemble alphabetic signs from English but without the associated sign value, although mostly found for printed Cherokee texts (see below), the Caroline Islands type 2 script has both signs and values that were transmitted. It does not make the script less remarkable, but it is not an example that fits Kroeber's definition of stimulus diffusion.

Several syllabaries have been recorded for nineteenth- and twentieth-century scripts, all of which were probably in contact with alphabets to various extents and in some cases also to an existing syllabary. The Caroline Island script's history offers a possible scenario for changing one system into another. This possibility does not necessarily support Daniels's and Kroeber's suggestion that this was due to a preference of people otherwise unaware of script. Indeed, there is little evidence that non-literate societies in general prefer to reinterpret an alphabet as a syllabary.

Script Transmission

In the study of the history of writing systems, the transmission of script is a central theme. It is generally agreed that script was invented in probably three or four geographically unconnected areas in antiquity, with ancient Egypt and Mesopotamia identified as the first regions where writing occurred. According to

Kroeber, Egypt and Mesopotamia may have transmitted the idea of writing to each other through stimulus diffusion, but the regions of Mesoamerica and China are considered to be out of reach. All subsequent writing systems are thought to have come about through stimulus diffusion or through a more comprehensive cultural transmission process.

The practice of writing can be considered a complex cultural trait (Lyman and O'Brien 2003: 245) that includes the context in which writing took place, the shape of the signs, the sound value(s) associated with a sign, as well as the system of writing (de Voogt 2012). Script traditions vary significantly in this transmission process, particularly what parts of an existing script they adopt and adapt in the development of their own writing system. The Caroline Islands script is unusual not only in the variety of influences but also in the different processes that lie at the basis of its script.

The Specificity of Cultural Transmission Processes

The distinction between type 2 and type 1 also distinguishes between different sources of influence. The two types are part of the same Caroline Islands script, but one is mostly the result of a particular form of cultural transmission while the other is mostly an independent innovation. Both scripts were also transmitted to several islands within the region, introducing yet another cultural transmission process. The combination of these processes in the history of one script informs our understanding of cultural transmission theory.

Writing systems may be transmitted horizontally—that is, from one peer group to another—even if it was designed for a different language and culture group (for examples, see, e.g., Krispijn 2012; Osterkamp 2012). The many examples of this process have made this process well known in the recent literature of writing systems studies. In the case of the Caroline Islands, it involves a teacher—that is, Alfred Snelling and his assistants—transmitting to a group of Woleaians. According to Guglielmino et al. (1995: 7585), this is the 'most rapid' form of cultural change and a 'prevalent route of innovation', even more so than the horizontal transmission process that is defined as person-to-person—that is, between unrelated peer groups, as opposed to a leader or teacher to a peer group. While this latter transmission process is probably a common mode of transmission once a script has been developed, the Caroline Islands offer an example where this is the route of the actual script inception.

Type 2 has the shape and the associated sound values of the Trukese alphabet, but with the alphabetic writing system adapted towards a syllabic one. As Kroeber (1940) and other researchers have noted, signs that resemble Roman and Cyrillic alphabetic shapes can be found in Cherokee. Cherokee was also printed, and the signs took on a greater resemblance to alphabetic signs when the shapes developed further for the printing press. The Caroline Islands script was never printed or redesigned that way, which makes it easier to understand which signs are unique to the script, a process that became more complicated for Cherokee (see, e.g., Walker and Sarbaugh 1993; Cushman 2010). In addition, Sequoya, the inventor of the Cherokee script, was not being taught; if anything he became a teacher of his script, further amplifying the differences in the respective ontologies of the Caroline Islands scripts and the Cherokee script.

Once the type 2 script was around, it was rapidly transmitted throughout the Caroline Islands with the help of Snelling's assistants and, considering the extensive spread of the script in the archipelago, also with the help of Woleians, who now became part of a horizontal transmission process of the type 2 script. This was repeated with the type 1 script, but not before a process of independent innovation had created the type 1 signs.

The process of generating additional signs in a writing system is difficult to unravel in most scripts. It is possible to study a script over time and document the changes that occurred in sign shapes and values. For instance, the introduction and increased use of diacritics in Arabic script has been documented in detail, but it is understood that the script's first set of signs was mainly based on the Nabataean script (Gruendler 2012). A syllabary such as the Caroline Islands script required a much broader set of inspirations, since the Trukese alphabetic signs were not sufficient in number. The gradual change of sign shapes and values over time is largely absent, owing to the relatively short time span of about fifty years in which the script was in use. A more detailed discussion of this innovation process follows below.

Guglielmino et al. (1995) identified certain cultural traits that follow particular patterns of cultural transmission. For instance, games were proposed as following a vertical transmission pattern—that is, from one generation to the next. In the case of board games, it has been shown that this process of transmission differs per game and that this cultural trait cannot be systematically linked to a particular transmission process (de Voogt et al. 2013). The Caroline Islands script suggests that this may also be the case for the transmission of writing systems. Many processes are at play for this one script, and they are different from what has been recorded for a script such as Cherokee. But Cherokee has often been grouped together with the Caroline Islands script as having a similar 'grammatogeny', while its history is significantly different in terms of transmission processes.

Iconicity

Riesenberg and Kaneshiro (1960: 297) were instrumental in documenting much of the detail in the development of the Caroline Islands script. Their interviews also revealed the inspiration for the signs developed on Faraulep or, as they called them, the type 1 characters of the script. In this part of the script's history, the Caroline Islands script stands out for its highly diverse strategy of generating new signs.

The Limitations of Iconicity to Explain the Origin of New Signs

Iconicity in writing systems may be defined as a relationship of resemblance or similarity between the two aspects of a sign: its form (sign shape) and its meaning (sign value). (See https://www.oxfordbibliographies.com for a general definition of iconicity, on which this one is based.) An iconic sign is one whose form resembles its meaning in some way. Iconicity can be considered functional for its users in its role of generating new signs and for memorizing or systematizing a writing system with a large sign inventory. The Caroline Islands script shows both the limitations of iconicity as an inherent part of new signs in a writing system. Even if the definition of iconic is expanded to include signs from other writing systems, iconicity is not a dominant part of their type 1 script.

Iconicity in writing systems refers specifically to a shape that visually resembles a real-life referent. This shape may be identical or partially associated with the sound value of the sign. It is possible to expand this view on iconicity to shapes that resemble or are identical to signs of other writing systems. In such a case, the process of using an existing visual shape is similar. Instead of drawing a fish or a bowl, it is also possible to draw a letter A, each with an existing reference. Whether or not the sound value of the letter A is used or known, the A can be seen as iconic, a shape that is immediately associated with script. As such, there are at least two ways in which a letter A can be incorporated in another script. It can be taught as part of a transmission process, or it can be part of independent invention after the transmission process has been completed. In the latter case, the letter is introduced as an additional shape—one to which the inventors have been exposed in their surroundings. In both cases, the sound value may or may not be part of this process.

Similar to, for instance, the Cherokee script, alphabetic signs may serve an iconic function in the Caroline Islands script when they are at the basis of new signs. For instance, an altered T sign is turned into signs for /ti/ as well as /ta/. The first is part of type 2 and the latter is part of type 1 script, indicating that they are part of different transmission processes. Other alphabetic signs—namely, R, M, N, L, S, and F—are also found in altered forms but without similar sound values. While Cherokee added versions of Cyrillic signs, a second writing system from which it sought inspiration, the Caroline Islands script has four signs that may be linked to Japanese characters. The Japanese signs do not correspond with the Japanese sound values. Instead, Riesenberg and Kaneshiro (1960,:296) suggest that they were present on imported goods, because the signs that have a strong likeness could make up the word 'Nippon' in Japanese characters.

Signs of other writing systems are not necessarily iconic according to the above definition, as the meaning of the sign is not always linked to its form. However, they are recognized as script signs, which is a sign shape that carries a sign value. The form is still connected to its meaning, if a general definition of iconicity is followed, but not necessarily to a specific sound.

Iconicity is also present in the traditional sense where images are used of natural/artificial objects close in name to the value of the sign. They include a sprouting coconut, a bird's wing, an ulcer/boil, a canoe, a forked branch, a portion of a bonito, a canoe outrigger platform, a fish backbone, a trigger fish, a perfume bottle, a woman's breast, a midrib of a coconut palm leaf, a saw, a coconut tree, a porpoise, a lure of bonito hook, a leaf, a leaf of Hibiscus, a fishhook, a canoe seat, and a plant. In a few cases the final consonant is omitted, as in *tüt* ('breast') and *pup* ('trigger fish') to create the syllabic sound that was needed for the script. But, while Riesenberg and Kaneshiro identified several such connections, they note that 'Carolinian dialects' are 'extremely deficient in words consisting of open-monosyllables, upon which the syllabary is based, and even more so in such words which can be concretely represented' (Riesenberg and Kaneshiro 1960, 298).

Riesenberg and Kaneshiro mention only a few additional origins for script signs that may meet the definition of iconic sign. Two signs appear to have the same name as tattooing elements, possibly taken directly from tattoo designs rather than the animals they represent. One sign based on the alphabet character *N* resembles the word for 'tooth', and perhaps the tooth itself, and this may suggest a rebus principle for generating its sound value. But, in the words of Riesenberg and Kaneshiro (1960, 298), most other signs are 'pure imagination'.

The type 1 sign inventory varies between users (Fig. 5.4), but at least fifty signs are broadly agreed upon and about thirty-five would be considered iconic, or at least not 'pure imagination', if the alphabetic and Japanese character signs are included. Considering that the total sign inventory of type 1 consists of more than seventy signs, even if not necessarily agreed upon among users, the non-iconic or imaginary signs form a significant part. More precisely, they form the majority of the script's inventory. This process of imagining signs was preferred to using images with multi-syllabic sound values creating a syllabic sound by way of acrophony, or using a systematic change of individual signs to indicate different vowel values, as is found for Cree, or any other system that would generate signs and sound values more systematically.

In this way, the Caroline Islands script informs the debate about iconicity and sign formation by indicating that it is neither necessary nor necessarily preferred to have an origin of a sign that is in some way iconic and that it may even be considered unlikely that all signs in a writing system have an origin that can be traced back in such a way. The widening of the definition of iconic signs to include shapes resembling script signs only strengthens this point. While the Caroline

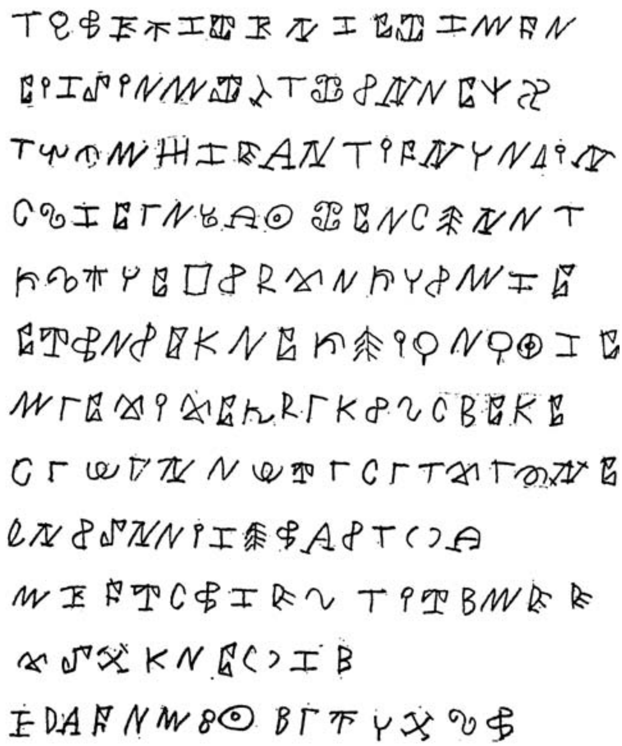

Figure 5.4 Example of a song text written by a man of Ifaluk using the Caroline Islands script
Source: Riesenberg and Kaneshiro (1960: 310, fig. 38).

Islands script is just one example of a script with such a history, at the same time it is one of few scripts where all signs could be interrogated and traced with reasonable certainty during the early stages of a script, a detail of documentation that is lacking for most other scripts. In the estimation of this author, detailed descriptions of, for instance, Cherokee, Vai, and other recent script creations are likely to amplify this point rather than weaken this outcome as an exception.

Script and State

Gelb mentions 'primitive societies', and Daniels introduced the term 'unsophisticated' inventors, which are unfortunate terms, as they suggest that certain inventors or societies are superior to others. The connection between state and script is based on the assumed necessity of an administrative tool for a 'complex society'. While the terms themselves can be judged as unfortunate, there is sufficient descriptive evidence to show that the connection itself also has little merit.

Script historians have made repeated connections between state formation and the development of writing. For instance, Knauf (1989), in a study of South Arabic, suggests that a state needs an elaborate administration so that growth into a state requires either a script or 'an alternative record-keeping method'. Cooper (2006: 83), an Assyriologist, formulated the connection between state formation and writing systems as follows: 'you cannot (easily) run a large-scale complex society without writing, or rather, the difficulties you encounter in doing so will usually, sooner or later, lead to writing's invention'. He also admits, however, that the emergence of writing in ancient societies, particularly Mesopotamia, Egypt, China, and Mesoamerica, does not show that writing met administrative needs (Cooper 2006: 84). Baines (2004) argued that commemoration was one of the original stimuli for ancient Egyptian writing, while Houston (2004) mentions identity and calendrical applications for Mesoamerican scripts, and Bagley (2004) suggests divination for early Chinese writing. In other words, an adaptation to bureaucratic purposes is possible but not universal from the earliest development of writing systems onwards, an observation made by Daniels (1996: 577) as well.

In 2004, Peregrine, Ember, and Ember tested universal patterns of cultural evolution using Guttman scaling. In a Guttman scale (Guttman 1950) cultural traits are in a hierarchical order. Only a few general Guttman scales of cultural evolution have been put forward, most notably the one by Freeman. This scale already included the absence or presence of 'written language' (Freeman and Winch 1957: 463). Peregrine, Ember, and Ember (2004) created their own 'Revised Freeman Scale' and used a fifteen-item Murdock–Provost Scale (Murdock and Provost 1973), which is commonly used for ethnographic data, to complement their method. In their scales the cultural trait of 'writing' is again featured prominently.

In the Freeman Scale, 'written language' is at the top, which means that the other items of the scale need to have been developed prior to written language if this evolutionary scale of society is deemed correct. The eight-item Revised Freeman Scale was mainly developed for explaining the development of prehistoric societies and again has 'writing' at the top of the hierarchy. This means, for instance, that only after a political state has attained a population of ten thousand and towns exceed one thousand inhabitants will there be a development of written language. The fifteen-item Murdock–Provost Scale used for the ethnographic record has 'writing of any kind' just below 'money of any kind' but higher in the order than anything else. This scale suggests that a state needs to have three or more levels or hierarchy, a population density of more than twenty-five people per square mile as well as 'wheeled transport' before writing is introduced or adopted. In all cases, it is suggested that writing develops only if all or nearly all of the other traits of the scale have been established.

In this debate on the evolution of the state, the example of the Caroline Islands script has a particular role to play. The knowledge of the Caroline Islands script was distributed over a distance of 300 miles between several islands, and, since few European traders or missionaries frequented those islands, Riesenberg and Kaneshiro (1960: 284) assume that the islanders themselves were more active agents in the cultural dispersal at that time than were traders, explorers, or missionaries. 'Wheeled transport' may be substituted by advanced sailing techniques, for which the Micronesians have been especially well known. One may even argue that script had a potentially important role to play in the communication network of islands that are dispersed across such a swath of ocean as encompasses the Caroline Islands. They never sported an urban centre of a thousand or a state of ten thousand people, as dictated by the Revised Freeman Scale, not even when the other neighbouring islands that adopted this script are taken into consideration, but perhaps the scale needs amending in the case of island states. In other words, the Caroline Islands take on a statelike appearance in terms of size and the possible functionality of a script in a society.

But as in most early states, with the notable exception of Mesopotamia, script in the Caroline Islands was not used for administrative purposes. The early Chinese, Meso-American, and Egyptian scripts did not serve an administrative purpose either that could help to explain the formation of a state. In the early twentieth century, one might argue that the administrative function of script is even more important than in antiquity, but the Caroline Islands script shows otherwise. The functions of the script were decorative, as in signs carved on canoes, on houses, or on people, as in tattoos. Longer messages were mainly personal, with letters to family members, and only occasionally included administrative parts. On the spectrum of what could be considered a state or a situation in which administration is likely to have been assisted by a script, the Caroline Islands confirm that script and state are not necessarily linked and that the function of script is diverse and regionally specific.

The scales used by Peregrine, Ember, and Ember (2004) do not fit the archaeological record and contradict the ethnographic record. Their publication was followed by another in 2007, in which they removed writing as an indicator of complexity for a society although without presenting the overwhelming evidence that contradicted their initial suggestion. Highly 'sophisticated' societies without a script operated successfully next to societies that used a writing system. For instance, the Kerma Kingdom lasted for a thousand years (*c.*2500–1500 BCE) as the main trading partner of ancient Egypt in present-day Sudan (see, e.g., Bonnet 2004: Edwards 2004). The urban centre of Kerma and the size of its empire are traditional indicators of a state, but there was no writing system in use, even after it had been exposed to the idea of writing for a millennium.

The debate of script and state is not settled with the example of the Caroline Islands script, but this script's history adds useful evidence that shows the connection of state development and script to be misguided (de Voogt 2024). Western or perhaps colonial ideas about the importance of a writing system when governing a state, region, or country continued in the Caroline Islands, as twentieth-century alphabetization efforts illustrate. In this case, even Riesenberg and Kaneshiro did not escape the trap of judging a writing system from their own experiences with writing.

Sociolinguistics and Script

The number of inhabitants who knew how to write the script in the 1950s was minimal, according to Riesenberg and Kaneshiro. On Faraulep, Woleai, and Ifaluk, there were a few elderly people who knew the script; on Elato and Satawal, the last experts had died. Riesenberg and Kaneshiro (1960: 277) found that in 1909 both types of script were known on Woleai, Faraulep, Puluwat, and possibly Satawal. In 1934, when Someki visited, both systems were known on Ifaluk and Elato as well. But, as suggested by the number of individuals able to write in the 1950s, the knowledge of the script was in decline.

In 1951, Smith developed the first official orthography for the Woleaian language. He distinguished fifty phonemes and used the Roman alphabet to represent each sound, which, in more than half of the phonemes, required the use of more than one alphabetic sign. Where the syllabary had symbols representing different sounds, Smith's alphabet used letters in different letter combinations to represent different sounds. It was the only orthography available to Riesenberg and Kaneshiro, who noted (1960: 299) that they were not satisfied that their transcription using his orthography provided accurate values to the various characters. It was one of several indications that the analysis of the Caroline Islands script in linguistic terms had important limitations.

Riesenberg and Kaneshiro (1960: 303) note that there is considerable variation and that 'it is obvious' that the Caroline Islands script is 'inadequate for truly phonemic representation' and that 'many of the 94 characters must serve for several combinations'. These comments are not surprising to any writing system historian, as most scripts do not come close to a truly phonemic representation. Even if such a system is reached, diachronic changes and dialectal variation make this an awkward pursuit. Riesenberg and Kaneshiro (1960: 311) conclude, however, that the writing 'represents only crudely the language it is used for' and that, even if 'more exact correspondence might develop', the script 'will probably die out before this occurs'.

Sohn wrote a grammar (1975) and co-authored a dictionary (1976) of the Woleian language. He noted that 'the spelling proposed by Smith (1951), which is an alphabetic writing, is an example of an orthography used on a poorly analysed sound system, in which Smith sets up too many letters and poor spelling conventions'. By this time the Caroline Islands script had already been dismissed as a possible writing system for Woleai, even though the analysis based on Smith's orthography was particularly inaccurate. In his analysis, Sohn (1984: 215) does not find the lengthening of vowels a necessary part of the orthography, and semivowels appear predictable in most cases, significantly reducing the inaccuracies that Riesenberg and Kaneshiro (1960: 311) had pointed out. However, Sohn also found the syllabary inadequate, but out of principle. Sohn (1984: 216) stated that 'WOL [Woleai] has a syllable structure as simple as Japanese, but has many more vowels and consonants. This fact makes it disadvantageous for Woleaians to have a syllabary.' More generally, he claimed that 'syllabaries are adequate only in such a language as Japanese where there are a relatively small number of different syllables'.

It is possible to argue that the Woleaian phoneme inventory is not that far removed from that of Japanese and that the syllabary could work well despite this criticism (de Voogt 2010), but the opinion of Sohn is more broadly in opposition to a syllabary as developed by the Caroline Islanders. In his appendix (Sohn 1984: 233–4) he explains that 'almost all native speakers seem to prefer tradition and convenience to linguistic simplicity and clarity', and that 'this is understandable when we take into account the popular notion that writing systems are only for those who know the language'. When the Caroline Islanders were offered alphabetic orthographies for the Woleaian language, these appeared to serve mostly the purposes of outsiders. Sohn took into account the perhaps popular notion among linguists that a writing system should mostly serve those who do not know the language.

The history of linguists analysing and dismissing the Caroline Islands script as late as the 1980s shows that both an appreciation and an understanding of writing systems has much to gain from script historians. Writing systems that would be considered flawed and impractical from a linguistics perspective survived successfully for hundreds and in some cases more than a thousand years. Scripts that can accommodate dialectal and diachronic changes may be preferred. The standardization of an orthography is not common in antiquity and removes the versatility that many of the world's writing systems have shown as exemplified in several recent studies quoted here. The contribution of the Caroline Islands script is found in the recorded prejudices of those who analysed the script, in particular the emphasis on linguistic accuracy.

The Debates and the Caroline Islands Script

The detailed description and analysis of the Caroline Islands script took place around the time that ideas about stimulus diffusion and cultural transmission entered more general scholarly debates. At the same time, the study of writing systems also gained momentum, starting with the work of Gelb (1952). Although Kroeber (1940) did not mention the Caroline Islands script in his seminal article about stimulus diffusion, Riesenberg and Kaneshiro (1960) made the connection and focused on the many details that allow this script to serve as an example in multiple debates. It is mostly thanks to these two researchers that the script continues to play an important role in our understanding of writing systems' history.

Perhaps the most significant illustration provided by the Caroline Islands script is the scenario of an alphabet that is reinterpreted as a syllabary. The presence of syllabaries among nineteenth- and twentieth-century scripts has intrigued multiple scholars (Kroeber 1940; Daniels 1996; de Voogt 2014), and the Caroline Islands script offers a rare description where the presence of a syllabary is explained. The added distinction of type 2 and type 1 script by Riesenberg and Kaneshiro showed a particularly diverse and complex transmission and innovation process.

The details offered by Riesenberg and Kaneshiro are most pronounced when it relates to the design of the individual signs. Their exhaustive account showed that iconicity could not explain the majority of the sign inventory, even if the use of sign shapes from other scripts is included in the definition of iconic. The absence of iconicity in the design of signs is a claim difficult to make for almost any other writing system, as it is most difficult to prove.

The Caroline Islands script is no exception in terms of its exposure to biases in the literature about the function of script. Both the association of script with state formation and the tendency of linguists to dismiss indigenous writing systems on the basis of phonemic accuracy are elements that have been discussed for several other writing systems (e.g., Scribner and Cole 1981 for Vai). Where the African continent has seen many writing systems appear in the nineteenth and twentieth centuries (see, e.g., Tuchscherer 2007), the Caroline Islands script is the only one in the Pacific Islands that has received extensive attention. Additional descriptions of indigenous writing systems in this region, such as the Otomaung alphabet in Bougainville (Kelly 2021), not only may further extend our understanding of writing systems in the Pacific but also may contribute to debates on writing systems in as many or even more ways than the Caroline Islands script.

PART II

THE FUTURE OF UNDECIPHERED SCRIPTS

6

Deciphering a Writing System

Luck, Intuition, or Method?

Ignasi-Xavier Adiego

> 'These hieroglyphics have evidently a meaning. If it is a purely arbitrary one, it may be impossible for us to solve it. If, on the other hand, it is systematic, I have no doubt that we shall get to the bottom of it.'
>
> (Arthur Conan Doyle, *The Return of Sherlock Holmes*, chapter III: 'The Adventure of the Dancing Men' (*Strand Magazine*, 26 (1903), 606)

Decipherment of unknown scripts is a subject that often generates fascination, not only among specialists but also among the general public. An extensive bibliography, written largely by serious scholars, is devoted to describing the adventures of decipherment, with suggestive titles such as *Forgotten Scriptures*, *The Story of Decipherment*, and *Cracking Codes*.

Therefore, I cannot claim that my approach to this subject is particularly original. Perhaps what the reader will find more unusual is this chapter's more theoretical and methodological reflection on the decipherment of unknown scripts and its focus on decipherments that are not usually discussed in books of the kind mentioned. Most publications on the subject, especially those aimed at an educated but non-specialized audience, tend to focus on the story of each individual decipherment process, as if reconstructing the intellectual adventures of important figures such as Jean-François Champollion, Georg Friedrich Grotefend, and Michael Ventris were more appealing than establishing general principles or identifying commonalities between the different decipherment processes. For this reason, the books mentioned tend to devote little attention to these aspects, although there are notable exceptions, including Friedrich (1954: 123–8; Italian translation: Friedrich 1961: 59–66).

Indeed, establishing aspects that are common to all decipherment processes may seem like an impossible undertaking, since each process is determined by unique characteristics (type of writing system, the quality, quantity, and character of the documentation, external decipherment aids, and so on). As we shall see, however, certain conditions, circumstances and characteristics are recurring features of many decipherment processes.

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Decipherment and Interpretation

Before turning to these common elements, it is important to establish some terminological ground. In principle, the word 'decipher' should be used for the decipherment of an unknown writing system. The work of the decipherer consists of establishing the inventory of signs used in a script, clarifying the functions of these signs, and, finally, establishing the phonetic and/or semantic value of these signs. In purely phonographic scripts—that is, those that use exclusively, or almost exclusively, signs with phonetic value (like our alphabet, for example)—decoding makes it possible to obtain a phonological representation of the language behind the script, but no semantic information. The next step is to interpret the language. This step is relatively easy, provided that the language is known. The most conspicuous example is the decipherment of Linear B, which yielded an archaic version of the Greek language dating to the II millennium BCE. In the case of the decipherment of Ugaritic, conversely, the language was not previously known, but its closeness to other West Semitic languages facilitated the linguistic analysis and translation of the documents. However, other cases are not so straightforward. Iberian, the language spoken on the eastern coast of the Iberian Peninsula and the south-western coast of France before the arrival of the Romans, was written with a purely phonological writing system that consisted of a combination of alphabetic and syllabic signs. This system is generally known as Palaeo-hispanic and has different varieties. In the case of Iberian, two varieties were used: Levantine Iberian and south-eastern Iberian. While the south-eastern variety still poses some decipherment problems, the Levantine form can be considered fully deciphered thanks to the work of Manuel Gómez Moreno (1922, 1925) and also to the fine-tuning process carried out more recently by Joan Ferrer (2005). However, virtually no Iberian inscriptions can be understood. Scholars can identify personal names, but the general meaning of the texts is disputed. The very recent suggestion that some words should be interpreted as numerals in some repeated sequences, owing to their affinity with Basque numerals (Orduña 2005; Ferrer 2009), which appears a rather convincing proposal, is still not accepted by some scholars. Note that some texts in Iberian are also written in the Greek alphabet, and it is not necessary to decipher these, as the script is entirely familiar to us. The hurdle is that they cannot be translated.

Therefore, once the script has been deciphered, the following step calls for the linguistic interpretation of the texts. Despite this crucial point, the term 'decipherment' is also very often applied to linguistic interpretation. Thus, Iberian is referred to as a largely undeciphered language, despite major advances in the decipherment of the script. A similar example is Etruscan, which is described as a language that has not been fully deciphered. The Etruscan alphabet is similar to other archaic Greek alphabets, and the phonological value of its signs has been understood for some time. Indeed, the special letter X was virtually the only character left to be deciphered, until Eva Fiesel deciphered it in 1936.[1]

Given the widespread use of the term 'decipherment' to mean linguistic interpretation, we should resort to accepting it, but it must always be specified that it refers to language decipherment—that is, the linguistic interpretation of a text, which is different from script decipherment, the actual deciphering or decoding of a writing system. This precise and correct distinction between decipherment and interpretation features in Friedrich's (1954) aforementioned book, *Entzifferung verschollener Schriften und Sprachen* ('Decipherment of Lost Scripts and Languages').

In general, decipherment and interpretation are two successive stages in the process of understanding ancient scripts and languages, and it seems that the comprehensive (or at least very advanced) completion of the first is a necessary but not sufficient condition for the second step. However, two important points must be borne in mind: first, if the writing system in question includes signs of semantic value (logograms), we can interpret them without knowing the actual phonological form of the words. This is the case, for example, of Hittite. Hittite was written using the Sumerian–Akkadian logographic and phonographic system, which had already been deciphered, so we can understand the logograms semantically. Conversely, in some cases, we do not know what the phonological form of the corresponding word was, because it is systematically written through a logogram. This is the case with a word as common as 'son'; so far, it is only attested logographically, so we do not know what the word sounded like in Hittite.

Secondly, the intuitive idea that, in the case of purely or almost purely phonographic systems, the first step, that of decipherment, is a necessary condition for linguistic interpretation does not mean that no progress can be made in understanding a text without the prior decipherment of the text. Perhaps the most noteworthy example of this scenario is Grotefend's analysis of two Old Persian inscriptions (see Figure 6.1). Before establishing the phonological values of the script, he was able to interpret correctly the formulas behind it ('Darius, great king, king of kings…', and likewise the other inscription, in this case referring to Xerxes). In fact, his decipherment was based on this interpretation of the text and, incidentally, he was more accurate in the linguistic interpretation than in the assignment of phonological values to the signs. Of course, this is an exceptional case, but other examples of significant advances in interpretation prior to

[1] Fiesel (1936). Certainly, our knowledge of the phonological system of Etruscan, and ancient languages in general, is limited by the written nature of the documentation and by the fact that these languages are extinct. In most cases, we operate by approximation when describing the phonological value of written signs, and there is often controversy about their precise value. Even with Etruscan, an apparently transparent case, Helmut Rix in his later works challenged the general view about the phonological reality behind the letters <φ>, <θ>, and <χ>, generally assumed to represent aspirated voiceless stops as in Ancient Greek (/p^h/, /t^h/, /k^h/), and proposed different phonological interpretations (1984; 2004: 947).

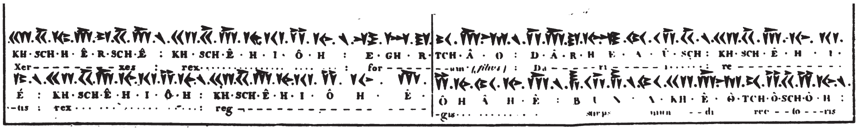

Figure 6.1 Grotefend's decipherment of the beginning of two Old Persian inscriptions
Source: Adapted from Grotefend (1815); also reproduced in Pope (1999: 100, fig. 65).

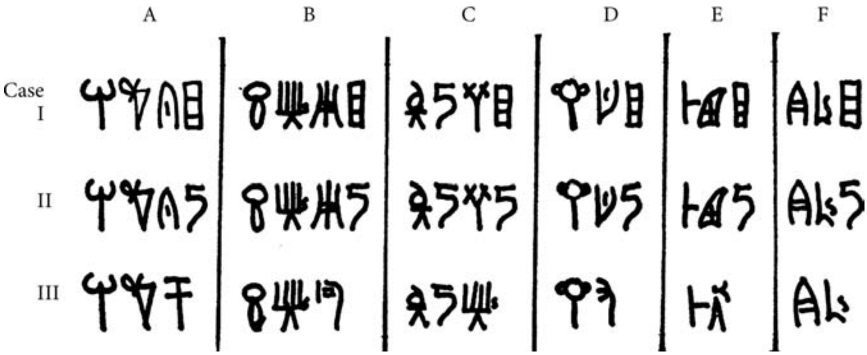

Figure 6.2 Kober's Linear B triplets
Source: Kober (1948: 97, fig. 8).

decipherment are known. For example, when reviewing Olivier Masson's edition of the Carian inscriptions of Saqqara and Buhen, published when the Carian alphabet had not yet been deciphered (Masson 1978), Piero Meriggi (1980) set aside any discussion of phonological values and tried to analyse the inscriptions in a combinatorial way, thereby offering interesting insight into their structure and possible content. Another, better-known example is Alice Kober's Linear B discovery of the so-called 'triplets'—that is, sets of repeated, similar sequences whose final signs changed and revealed inflectional patterns (Kober 1946, 1948) (see Figure 6.2). These triplets, which eventually proved very useful for deciphering Linear B, served to establish paradigmatic connections between words even before full decipherment had been reached.

Certainly, the problem with linguistic interpretation taking place before the decipherment of the script is that the results cannot be falsified. In the cases mentioned above, only when the phonological values of the signs had been established was it possible to validate or reject the linguistic analysis, and the possibility of confirmation depends to a large extent on other factors, such as our knowledge of the language behind the script, the identification of proper names, and the connection with other external references. These factors will be discussed below.

A final general point about decipherment is that it is important to differentiate between the decipherment or decoding of ancient scripts and the decryption of secret codes. In this case, both the terminology and the popular perception of decipherment can be misleading. In fact, the quotation at the top of this chapter was taken from a Sherlock Holmes adventure in which the famous fictional detective decrypts mysterious messages received by a woman. My choice of quotation deliberately plays on this confusion between the decipherment of ancient scripts and the decryption of secret messages, because the code used in the messages was in fact so naively simple (a one-to-one correspondence between signs and letters of the English alphabet) that the crucial difference between undeciphered ancient scripts and undecrypted secret codes is in this case practically non-existent.

The difference is that secret codes are created with the clear intention of remaining undeciphered unless the key is known. Decryption presupposes prior encryption. Writing systems, on the other hand, are created as visual devices that reflect spoken language. To be sure, understanding written texts implies knowledge of the written system, and this introduces an element of possible restriction to the learning and use of writing: elitism, identity statements, and other factors may contribute to keeping literacy limited to certain individuals or groups, and the complexity of the writing system may be a way of ensuring this limited access, as must have been the case with ancient logo-phonographic scripts. In some cases, we can even observe a tendency towards a more cryptic use of writing, as occurred, for example, in the final phases of the use of Egyptian hieroglyphic, when there was an exponential increase in the signs and twisted symbology that determined its use. However, all these aspects are possible derivations and consequences of the existence of a script, not the underlying cause for its creation or adoption.

Luck

Good (or bad) luck are preconditions of the decipherment process. Either depends on the quantity and quality of the documentation at our disposal. In this respect, cases differ so widely that it is impossible to generalize between decipherment processes. The materials and circumstances tied to an undeciphered writing system condition the possibilities of decipherment at the outset. In what follows, we analyse different points of support for decipherments whose existence is purely a matter of chance. This may explain why the Ugaritic script from Syria was deciphered so quickly, while the Phaistos Disc from Crete resists any interpretation. Certainly, these supporting points do not imply automatic decipherment. The role played by human agency is crucial here. What is essential is to discover sufficient material, interpret the texts correctly, and reject erroneous clues.

The Carian alphabet could have been correctly deciphered as early as 1956, when Olivier Masson and Jean Yoyotte's edition of pharaonic objects with Carian inscriptions was published (Masson and Yoyotte 1956), since this edition contained four

Figure 6.3 Carian–Egyptian bilingual of *Š3rkbym* (E.Sa 1)
Source: Masson and Yoyotte (1956).

bilingual (Carian–Egyptian) inscriptions. These eventually played a decisive role in the decipherment of the Carian alphabet but were misinterpreted and overlooked until the 1980s and 1990s. Masson and Yoyotte's book contains some significant passages in which it seems surprising that the authors did not make greater progress. For example, they correctly interpreted the name inscribed in the Egyptian part of the bilingual E.Sa 1, *Š3rkbym*, reconstructed as **Σαρκεβιωμος* (**Sarkebiōmos*), a highly plausible Carian name,[2] but were content to comment that 'il parait impossible de retrouver le nom du dédicant dans la partie carienne du texte' ('it seems impossible to find the name of the dedicator in the Carian part of the text') (Figure 6.3).

Also, in E.Me 8, the name *Prjm* in the Egyptian part was correctly identified as a Carian name, but, instead of trying to find it in the Carian part, Masson and Yoyotte invited scholars who were tempted to use the hieroglyphic text to understand the Carian inscription 'à la plus grande prudence' ('with the greatest prudence') (Masson and Yoyotte 1956: 47). The same lack of connection appears for the other three true bilinguals (E.Sa 2, E.Me 5, and E.Me 7). Masson had a second opportunity to interpret the bilinguals successfully when he published the corpus of funerary stelae from Saqqara (Masson 1978), in which two other true bilinguals appeared (E.Me 9 and E.Me 15), but he was again reluctant to attempt any decipherment, despite admitting that the Carian and Egyptian texts of the stelae were contemporary. It is noteworthy that, when commenting on the bilingual E.Me 15, Masson pointed out that transcribing the Carian F for *r* 'ne semble pas spécialement séduisant' ('does not seem particularly attractive') (Masson 1978: 26). We now know that *r* is the correct decipherment of this Carian letter and can

[2] The form **Σαρκεβιωμος* (**Sarkebiōmos*) given by Masson and Yoyotte represented the hypothetical form that the name would have in a Greek adaptation. More than thirty years later, a Carian name *Κεβιωμος* (*Kebiōmos*) was attested in a Greek inscription (Blümel 1990). *Σαρ-* (*Sar,* in Carian *šar-*) is an element that appears often in Carian as the first part of a personal name: *Sar-ussōllos* (vs simple *Ussōllos*).

conclude that Masson benefited from good luck but nevertheless missed the opportunity, like the gambler who carelessly rejects a good hand of cards. Good luck is necessary, but risk-takers are also indispensable.

The Bridge of Onomastics

In explorations of the history of decipherment to identify common elements, one aspect appears systematically in most cases: proper names as a bridge between the known and the unknown. We have already mentioned the examples of Carian–Egyptian bilinguals. The points of contact between the Egyptian and Carian sections of the inscriptions were the proper names, which were mostly Carian, but also Egyptian, and were written in both parts of the inscriptions. Any account of the most famous decipherment process in history, that of the Egyptian hieroglyphs through the Rosetta stone, must mention the decisive role played by the identification of the sequences of signs within the cartouches in the Egyptian texts as personal names (Figure 6.4).

Grotefend's first step was also to hypothesize that the names of Darius and Xerxes and their ancestors lay at the beginning of two Old Persian inscriptions. And as for the case of one of the most remarkable decipherment processes in history, Ventris's decipherment of Linear B, this was achieved without the aid of bilinguals and based largely on internal analysis, with the appearance of sequences interpretable as place names (toponyms such as *ko-no-so* = Knossos, *a-mi-ni-so* = Amnissos, and so on) providing a fundamental step towards the solution. Therefore, proper names can play different roles, but often crucial, in the decipherment process. They can act as triggers for breaking codes or form an essential trigger in the chain reaction that usually occurs in the initial phases of a successful decoding strategy, or as confirmation that the decipherment is successful.

PTOLMÊS

Figure 6.4 Egyptian 'cartouche' bearing the pharaoh's name Ptolemy
Source: Champollion (1824: 21, pl. I); also reproduced in Pope (1999: 72, fig. 35b).

The reason for this decisive role played by proper names in decipherment processes is evident: in general, proper names are not translated, but simply adapted from one language to another. As pointed out by Pope (1999: 95), it seems that it was Gottfried Leibnitz who first became aware of the importance of proper names in deciphering an unknown script on the basis of the predictable similarity between the forms. In a letter from 1714, which referred to the bilingual Greek–Palmyrene inscriptions, he remarked that the Greek parts mentioned proper names whose pronunciation must be very similar to that of the local language, so that they could serve as a key to 'know the nature of the language'.[3]

Thus, when it was necessary to write the Carian name *Šarkbiom* in Egyptian, for example, the only way to achieve this was to adapt the sounds of the name to the Egyptian script (*Šȝrkbym*). In the case of place names, the situation was similar. Gómez Moreno's decipherment of the Iberian script was based mainly on toponymy. He studied the sequences of Iberian signs that appeared on coins and correctly assumed that they represented the names of the cities in which they had been minted. These names were known from Greek and Latin sources, and many are preserved in modern toponymy, such as the examples in Figure 6.5 (not from Gómez Moreno; these serve only to illustrate the presence of toponyms on Iberian coins):

Certainly, names in one language are not always simple adaptations from another language. In the case of anthroponyms, there is the case of double names: in the trilingual inscription of the Letoon of Xanthos (Lycia), the same person

Figure 6.5 Some Iberian coin legends

[3] 'Extant apud Palmyrenos et alibi in Syria, et uicinis locis complures inscriptiones antiquae duplices, partim lingua et characteribus gentis, partim Graece expressae, quae magno studio ex ipsis saxis describi deberent. Inde enim fortasse constitui alphabetum posset, et linguae indoles tandem cognosci, cum Graeca uersio adsit, et nomina propria interueniant quorum eadem fere in patrio et Graeco sermone pronuntiatio erat' (Leibnitz 1718: ii. 193).

appears as *Ἀπολλόδοτος* (*Apollódotos*) in the Greek part and as *Natrbbijẽmi* in the Lycian part. In this case, thanks to our knowledge of Lycian, we can claim that *Apollódotos* is in fact not an adaptation, but a translation of *Natrbbijẽmi*; both names meant 'given (Greek -*dotos*, Lycian -*bbijẽmi*) by Apollo (identified with a local deity called Natri)'. But double naming may consist of the use of anthroponyms with similar but not identical sounds in the respective languages (a well-known example is the name of Ignatius of Loyola, the founder of the Jesuits, whose original name in Basque was Eneko (adapted in Spanish as Íñigo); Ignatius and Eneko-Íñigo are neither adaptations nor translations of each other, but simply two names with different origins that show accidental phonetic resemblance.

Place names can also be different: just as a Basque city has a Spanish name (Vitoria) and a Basque name (Gasteiz), which are completely different, Xanthos was called Arñna in Lycian, and the Carian name for Kaunos was Kbid. However, a glance at the place names of Lycia and Caria mentioned in Greek sources shows that most are simple adaptations of the indigenous names into Greek. The examples mentioned above of Iberian cities indicate how toponymy can persist over time. Moreover, in the case of personal names, it is common for individuals to retain their original name, regardless of language and script.

In short, the fact that proper names may be transmitted from one language to another with only the changes caused by adaptation to different phonetics and a different writing system has been a central theme in decipherment processes. If we can assume that proper names are present in undeciphered texts, this can then help to establish the phonological values of the signs. Certainly, there is a continuum from the most certain to the uncertain. If a bilingual text bears proper names in the known language, we can search for them in the unknown script, but this is an ideal and not always possible scenario, and, once again, we depend on the extent and nature of the material and the level of expertise of the decipherers. Gómez Moreno paid attention to the provenance of each class of coins to find a specific toponym in each coin inscription, and this was a decisive clue in deciphering the Iberian signs. As explained, Grotefend mentally 'fabricated' a bilingual and imagined where the personal names of the Persian kings should appear. John Ray brilliantly and rightly presumed that the sequence ΠΦΟΙ in Carian, the decipherment of which was not effectively aided by the bilinguals, represented the typical Carian name attested in Greek sources as *Υσσωλλος* (*Ussōllos*) (Ray 1981: 160). The speed with which Ventris associated some of the words that appeared in his decipherment with well-known Greek place names contributed to spectacular progress in the decipherment process.

Other Points of Support

Different scenarios can be painted by good or bad luck in terms of the datasets available. Rather than establishing general principles for decipherment, that can apply across the board, we here refer to conditions that prove decisive when they appear in a particular decipherment process, as shown by historical case studies of successful decipherments. However, it is also important to note that these apparent points of support are sometimes false clues, as discussed below.

Availability of Bilingual Texts

We have already mentioned bilingual texts numerous times. If we have a text in an unknown script and a text in a known script and language that may be translations of each other, decipherers have a powerful tool at their disposal. Bilingual texts can be useful not only for deciphering the script but also for interpreting the language, so they can contribute to both types of decipherment (see the first section above). It was for this latter reason that the discovery of Pyrgi's Etruscan–Phoenician bilingual in 1964 was considered so important: it had no relevance for the decipherment of the Etruscan script because, as pointed out above, it posed no problems, but it could contribute to a better understanding of the Etruscan language.

However, the ideal situation—that is, two texts with the same content, one in a known language and one in an unknown script (or language)—does not always occur. First, an inscription featuring two languages can be an example of a false clue if there is no correspondence between the two texts. This is not so rare: in a corpus as sparse as the Carian one, we simply find different typologies of bilingual texts that turn out to be barely useful, or even misleading. In the case of the sub-corpus of Egyptian–Carian bilinguals, we now know that there is no correspondence between the Egyptian and Carian parts in two of them. These are probably reused funerary stelae belonging to different individuals at different times, so that the names are completely different in each part. One of the first scholars who attempted to use the Egyptian–Carian bilinguals, Thomas Kowalski, took these inscriptions as true bilinguals and thus introduced significant confusion into his proposal (Kowalski 1975). Another type is what I refer to as 'complementary bilinguals', in which one text is not a translation of the other, but rather a complement to or continuation of the other. A good Carian example is the Carian bilingual E.xx 2; while the Egyptian text sounds like 'May Horus give life', the Carian part consists only of a personal name, *wliat*. The full inscription should therefore read 'May Horus give life to Wliat!'.

Even in bilinguals where the content seems to refer to the same subject, the texts are often not exact translations of each other. One text may merely summarize the content of another, or the respective texts may be written with different audiences in mind. In the Letoon Lycian–Greek–Aramaic trilingual, there are passages in which the Greek and Lycian versions coincide, while, in others, some things expressed in Lycian are not present in the Greek version. The Aramaic version, in turn, is a summary rather than a systematic translation of the other two versions. With respect to Pyrgi's Etruscan bilingual, its contribution to the interpretation of Etruscan has been rather disappointing; the Phoenician and Etruscan texts seem to refer to similar subjects, the same individual is mentioned in both languages and both refer to a goddess, but it is clear that the content is not easily comparable, so the bilingual served more to confirm existing knowledge about Etruscan than to offer major progress in the decipherment of the language.

In any case, bilinguals are always welcome. They formed the basis for the decipherment of the Elamite and Sumerian–Akkadian cuneiform scripts, for which the starting point was the trilingual inscription of Darius at Behistun. After the decipherment and interpretation of Old Persian, it was possible to decipher the texts written in Akkadian, in a much more complex cuneiform system, as well as those written in Elamite, a non-Indo-European/non-Semitic language that used a syllabary created from the Sumerian–Akkadian cuneiform.

A more modest decipherment process, but one that was very striking for its speed, was that of much of the Sidetic alphabet, the script used in the city of Side, Pamphylia, a region of Anatolia (now Turkey). The earliest two inscriptions to appear in this alphabet were both Greek–Sidetic bilinguals. In his publication of the second inscription in 1950, Helmut Bossert was able to identify in the Sidetic version the names that were present in the Greek parts of the text (Bossert 1950).

Figure 6.6 shows the drawing of the bilingual text and the transcription given by Bossert. Note that both the reading of the inscription and the transcription of some Sidetic letters are somewhat different now: *pulunij pordors pulunijas maśara τue*[. In any case, Bossert's analysis was essentially correct. The Greek part contains a clear onomastic formula: [Ἀ]*πολλώνιος Ἀπολλοδώρου* [*τ*]*οῦ Ἀπολλωνίου*, 'Apollonios, (son) of Apollodoros, (the son) of Apollonios', and Bossert's decipherment consisted in identifying these three names in the Sidetic part.

The other bilingual, which was first discovered in 1914, was more difficult to analyse because the Greek part was damaged, but the first name was clear: *Ἀρτέμων* (*Artemon*). When the values obtained from the Apollonios bilingual are used to analyse the Sidetic part, the second word, which consists of six letters, shows a scheme: *?-r-?-?-?-o-n*. Therefore, it is easy to decipher it as *a-r-t-m-o-n*, thus obtaining the letters *a*, *t*, and *m*.[4] The name of the father of Artemon was difficult to read in the Greek part, but it was clear that the first element of the name was *Ἀθηνο-* (*Athēno-)*. In the Sidetic part, the name began with *?-a-n-p-i*.., and Bossert suggested that the first letter, with the form O, was *θ*, which would correspond to the Greek *th,* so that *θan-* = *Athēno-*. With respect to the entire name, he suggested *Athenippos* because of the Sidetic *θ-a-n-p-i*... Today, the reading

[4] Bossert's transcription was *a-r-t-m-u-n*, since he interpreted as *u* the sign now transcribed as *o*.

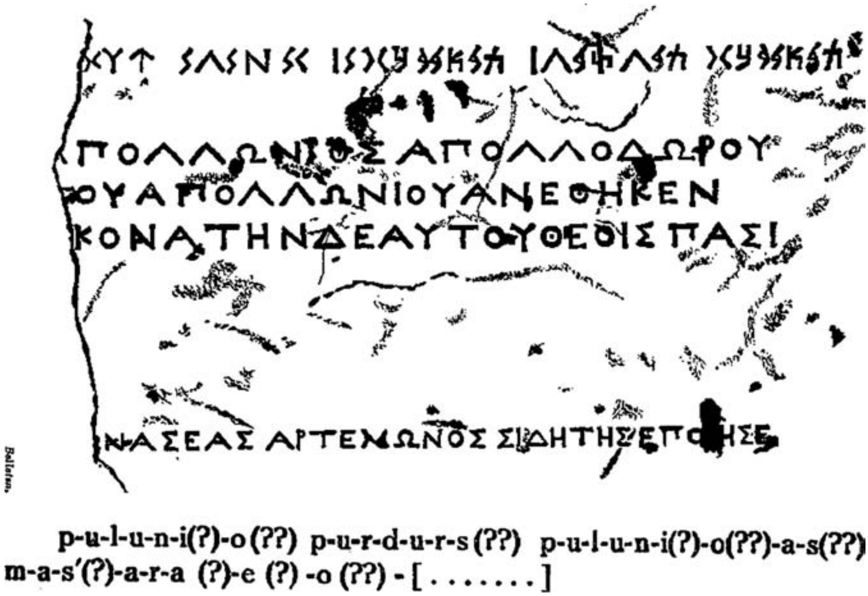

Figure 6.6 Greek–Sidetic bilingual
Source: Bossert (1950).

Ἀθηνοβίου (genitive of the name *Ἀθηνόβιος*, *Athēnobios*) is preferred, but, in any case, the correspondence between the names is clear.

Finally, he analysed a word written repeatedly on coins minted at Side in the Sidetic alphabet. He suggested that the name Side appeared. In fact, the second letter of the coin inscriptions is the sign deciphered as *i*; consequently, the initial letter ϟ would coincide with the initial S- of Side.

Bossert's decipherment included a rather ad hoc assumption that later turned out to be correct: he deciphered the final letter of names that appear as genitives in Greek as an *s*, assuming that the genitive ending was *-s* in Sidetic. As the sign used in these formulas was different from the first sign appearing on the coins, he transcribed the latter as *ś* (the signs are now transcribed conversely, but the sibilant value of both letters is sure).

Thus, with these two inscriptions and the coins, Bossert was able to decipher half the signs in the Sidetic alphabet. This decipherment process that took place in early studies on Sidetic has been confirmed by other evidence uncovered over time. Only in the case of the letter transcribed by Bossert as *w* was a different value (*j*) proposed some years ago by Diether Schürr (1997: 138; see also Pérez Orozco 2003, with stronger arguments), and this is now generally accepted. Less important is Bossert's *u*, now interpreted as *o*.

In the case of the Carian alphabet, bilinguals have played a decisive role in decipherment. We have already discussed some Egyptian–Carian bilinguals in

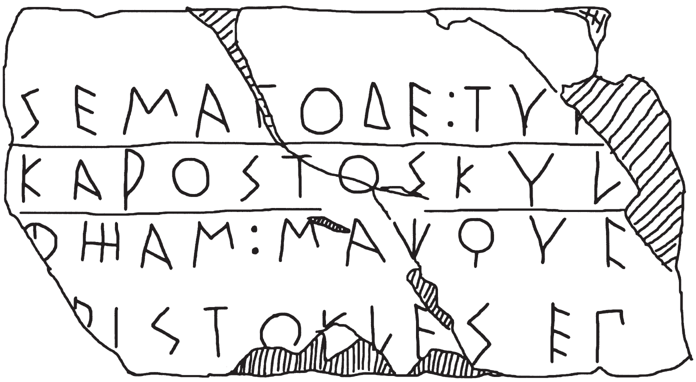

Figure 6.7 Carian–Greek bilingual From Athens (G.1 = IG I³ 1344)

which the same names were written in both Carian and Egyptian. These bilinguals, largely overlooked, were used by John Ray from 1981 onwards to pave the way for the definitive decipherment of Carian, which was achieved in the 1990s. The definitive impetus for the decipherment came from the analysis by Diether Schürr and myself of two other Egyptian–Carian bilinguals, neglected by Ray, and also from the analysis of two Carian–Greek bilinguals (Figures 6.7 and 6.8).

In Adiego (1990: 398–400), the beginning of the name mentioned in the Greek first line of the Athens bilingual was recognized in the Carian part:

ΦĦAM : MAΨ♀VƐ
σε͂μα τόδε : Τυρ̣[

The Greek inscription sounds like 'This (is) the tomb of Tur…' (the stone is broken). In the Carian line, the three final letters show precisely the same beginning of the personal name in the Greek line:[5]

♀ V Ɛ [
t u r [

Schürr (1992; see also *apud* Ray 1990) proposed that another fragment of a Greek inscription formed part of the same stone as the bilingual (C.Si 2). This Greek fragment contained a formula referring to the satraps Idrieus and Ada, sons of Hekatomnōs. Schürr was able to decipher it in the first line of the Carian inscription (Figure 6.8):

[5] In Adiego (1990), ♀ was transcribed as *t̲*.

Figure 6.8 Carian–Greek bilingual from Sinuri

]ᏞꞋIꞋᏅΨΧϘΝΦΟΦ · ΜΓΑᑫΑΧϘΝΦΟΦ
*ryin k̂tmñoś sb ad*ʔ*a k̂tmñoś*

The text poses some problems: the first letters of the name Idrieus in Carian are missing, and the form of the name was not exactly the same in Greek as it was in Carian. This is not surprising, because Idrieus shows a clear adaptation to Greek morphology given the suffix *-eus*. As for the name Ada, the letter ᑫ is puzzling, as its value, according to the decipherment of the Carian alphabet used in Egypt, ought to be 'š', but the form *aša* is difficult to reconcile with Ada. The expected letter would be C *d*. It is possible that ᑫ is a bad reading of ᶜ = *d*; as Schürr acutely observed, the forms of O in the inscription are smaller and elevated with respect to the other letters, so perhaps C *d* also had a similar form, and the vertical stroke that gives it the appearance of ᑫ is simply an accidental mark on the stone. Unfortunately, both the original stele and the squeeze of the inscription made by Louis Robert have disappeared, so only the photo published in Robert (1950) and the drawing by Deroy (1955) from the photograph can be used, both of which point to the reading ᑫ.

Despite these problems, Schürr's interpretation offers an impressive sequence, *k̂tmñoś*, which is repeated twice and strongly recalls the name Hekatomnos. This name also appears twice in the formulas of Idrieus and Ada, because they were brothers and shared the name of the father. Note that, for almost all the letters in the sequence XϘNΦO (-Φ is the ending that indicates genitive, 'of Hekatomnōs', as in Greek there is a genitive), Schürr found support for the decipherment of the Carian letters thanks to the Egyptian bilinguals. Only in the case of the letter Φ did he propose a nasal value (*ñ*) ad hoc. This was somewhat problematic, as a letter for *n* existed (Ѱ, Y) and it was also present in the inscription (note the name of Idrieus), so we can assume that the letter Φ represented a slightly different nasal value, but we cannot be sure which (see a recent analysis of the data by Simon 2019).

Relationship to Other Writing Systems

Many writing systems are not original inventions. In many cases, speakers of a given language learned a pre-existing writing system used for a different language and adapted it to their own. For instance, when the Gauls decided to write their language, they borrowed the Greek alphabet. In this case, the existence of a specific Gaulish alphabet is doubtful and the inscriptions give the impression of a simple Greek script. Only when a specific sound was absent in the donor language were the Gauls forced to find a way to reproduce it and adopted different strategies (see Adiego 2020: 1056–60).

The Gaulish alphabet is an extreme case, as the decipherment process is limited to identifying this specific graphic expression, which differentiates the alphabet from the simple and well-known Greek alphabet. But scenarios are less simple in other cases. First, the phonology of the donor and recipient languages may show strong differences. In this case, the adoption strategy may oscillate between adapting the language to the script and adapting the script to the language. The first case can be exemplified by the Linear B script used for Greek. We do not know for certain whether Linear A, the model script for Linear B, was particularly suitable to register the Minoan language, because we cannot interpret the language, but it is clear that the system of open syllabic signs (based on consonant plus vowel signs) was insufficient to reflect a language like Greek, in which consonantal clusters were common and word-final consonants, although limited to some classes of sounds (basically non-coronal stops, *r*, *l*, *n*, *s*, and consonant clusters with *-s*: *ks*, *ps*) were highly relevant, morphologically speaking. In this case, the process consisted of adapting the language to the script.

When a language is predominantly adapted to a script, the 'decipherment' is practically automatic if the script is understood beforehand. As such, it consists merely of attributing the known values of the letters in the donor language to the texts written in the recipient language. Note, however, that the adaptation might be rather clumsy, and a misleading picture of the language in question might emerge. Imagine that we had no Greek apart from the Mycenaean Greek registered in Linear B. We could interpret forms like *a-to-ro-qo* as representing something like /atorokwo/ and conclude that Mycenaean Greek was a language composed only of open syllables—that is, (consonant)–vowel syllables—such as Japanese and Hawaiian. This would be an erroneous conclusion: *a-to-ro-qo* actually represented a word /ant^{h}ro:k^{w}os/ (Classical Greek ἄνθρωπος (*ánthrōpos*) 'man'), with complex syllables (an, t^{h}ro:, k^{w}os).

In cases where the adopted script is adapted to a different language, differences may arise. Some unnecessary signs may be reused with a different value, or new signs may be created, either from scratch, or by modifying existing ones, or in turn by resorting to other writing systems. The latter is the case with the Coptic alphabet, based largely on a Greek model but to which some letters borrowed from the Egyptian script were added (more specifically from the Demotic variety, an evolved form of the ancient Egyptian hieroglyphs). Other factors that may distance the adapted script from its model are the lack of exact correspondences between specific sounds in the two languages and the fact that the adapted and model scripts may evolve separately after the transmission process. All these factors may cause divergences from the model alphabet that are so significant as to require a proper decipherment of some signs.

A good case study is the Lycian alphabet (Figure 6.9). This alphabet is undoubtedly derived from a Greek alphabetic model, as clearly shown by letters such ᚹ *a* B *b* Δ *d* Ϻ *m* N *n* Γ *p* P *r* ⟆ *s* and T *t*. However, Lycian had some sounds that were absent in Greek, and other signs were invented or reused to represent them. For example, Lycian had two nasalized vowels, for which many differently shaped signs were used, probably from two original letters invented ad hoc. Lycian also included an /h/ sound, for which the letter + was used. On the other hand, Lycian had only a rounded back vowel, with an intermediate articulation between /o/ and /u/. For this sound, which does not exist exactly in Lycian, the letter O was chosen. In the case of front vowels, Lycian had two, /e/ and /i/, but, instead of using the Greek E and I directly, a new arrow-shaped letter was used for /e/, ↑, while E was used for /i/ and I for /j/. The reasons for these changes are not entirely clear. It is possible that /e/ was actually a very open /e/ (/ϵ/, /æ/?) and that /i/ actually had an intermediate sound between /e/ and /i/ (perhaps /ɪ/?). This implied the use of E for this /ɪ/ and the adoption of a new letter for the open /e/. The letter I, freed from its original function in Greek, was then

Figure 6.9 The Lycian alphabet

adopted in Lycian to represent the consonant version of /i/, /j/, a sound that did not exist in the Greek language. These and other readjustments, transformations, and innovations meant that the Lycian alphabet was not simply a Greek alphabet re-used for Lycian. The alphabet had to be deciphered, and the task was undertaken by authors such as Walter G. Arkwright in the late nineteenth century.

In general, despite these problems associated with adapting the language to a borrowed script, the decipherment process is easier in these cases because the adaptation process is often governed by a principle of stability (Boisson 1994). Adopters of the script tend to maintain the original sound values for the signs if they are identical or similar to those that exist in their language. This explains the stability of letters such as T, which represents a dental sound in the Phrygian, Greek, Etruscan, Latin, Gothic, and Cyrillic alphabets.

However, the principle of stability does not work in Carian, in which the letters have apparently undergone an unusual reshuffle in sound values that remains unexplained. In other cases, it is very difficult to establish a relationship between a particular alphabet and its possible model, so we must assume strong transformations or simply ad hoc creations. This is also the case with the Sidetic alphabet, whose origin is the subject of debate (Greek or Aramaic). Other alphabetic scripts, such as Glagolitic and Armenian, clearly belong to the Greek alphabet tradition, but the shape of many letters remains unresolved. These last cases should serve as a warning against the direct use of other writing systems for deciphering unknown scripts.

In the case of Carian, the decipherment process did not advance for a century, because of the assumption that Greek-shaped Carian letters should have a Greek value in Carian. Another, more general problem in this use of other scripts as decipherment tools is that many writing systems may use signs of identical or similar forms only by chance. This is true for figurative writing systems and for more linear systems. In the history of decipherment, attempts to decipher a script by assuming a connection to a previously known writing system and establishing connections between the signs are not uncommon. Once again, Carian offers a good example of the caution that ought to be exercised. The first scholar to attempt to decipher Carian, the Revd Archibald Sayce, assumed that the Carian script was a mixture of an original alphabet with an 'Aegean syllabary'. He took as a representative of this latter syllabary the Cypriot syllabary, which had recently been deciphered, and he attached phonetic values on some Carian signs based on supposed similarities between some Cypriot syllabic signs and Carian letters. Even though, in theory, a mixed origin could not necessarily be rejected (compare the case of the Coptic alphabet), the resulting system of cherry-picked values and signs was chaotic and did not offer any convincing results. In general, one should be cautious with the so-called etymology of letters—that is, attempts to trace the history of a sign or a set of signs from a particular origin. If this caution is advisable when referring to the origin of a deciphered script, it is crucial when the script remains undeciphered.

Certainly, every rule has its exception, and it is interesting to recall that Michael Ventris resorted to a comparison with the Cypriot syllabary to assign values to some signs in Linear B at a crucial point in the decipherment process. He took advantage of the path set out by Alice Kober (see the first section above) to create, through a combinatorial and frequency analysis, a grid of syllabic signs, in which the rows included signs that presumably shared consonants and the columns included signs that presumably shared vowels (Figure 6.10). The problem for Ventris was that this was a 'mute' syllabary, since in principle there was no evidence for assigning sound values to each sign. At this point, however, Ventris attributed the values *na* and *ti* to two signs based on their resemblance to the corresponding syllabic signs in the Cypriot script, and these values, applied to the grid, enabled him to recognize the value *ni* behind 𐀛. This sign appears as the third in the sequence 𐀀𐀖𐀛𐀰, a word found on Cretan tablets that, according to Ventris, could be a place name. The first sign, according to the grid, was a pure vowel. Attributing the value *a*, Ventris hypothesized that the whole sequence might represent the Cretan toponym *a-mi-ni-so* = Amnisos, the port of Knossos, which was the most important city in Crete. The values *ni* and *so*, once transferred to the grid, offered a clue as to another possible Cretan toponym: 𐀒𐀜𐀰. The last sign was also *so* (𐀰) and the second sign, 𐀜, which shared the consonant with *ni* and the vowel with *so* in the grid, could be *no*. The first sign also shared a vowel with *so* and *no*. The resulting interpretation was then…*o-no-so*. With the value *ko* assigned to the first sign 𐀒, the transcription *ko-no-so* matched the name Knossos itself.

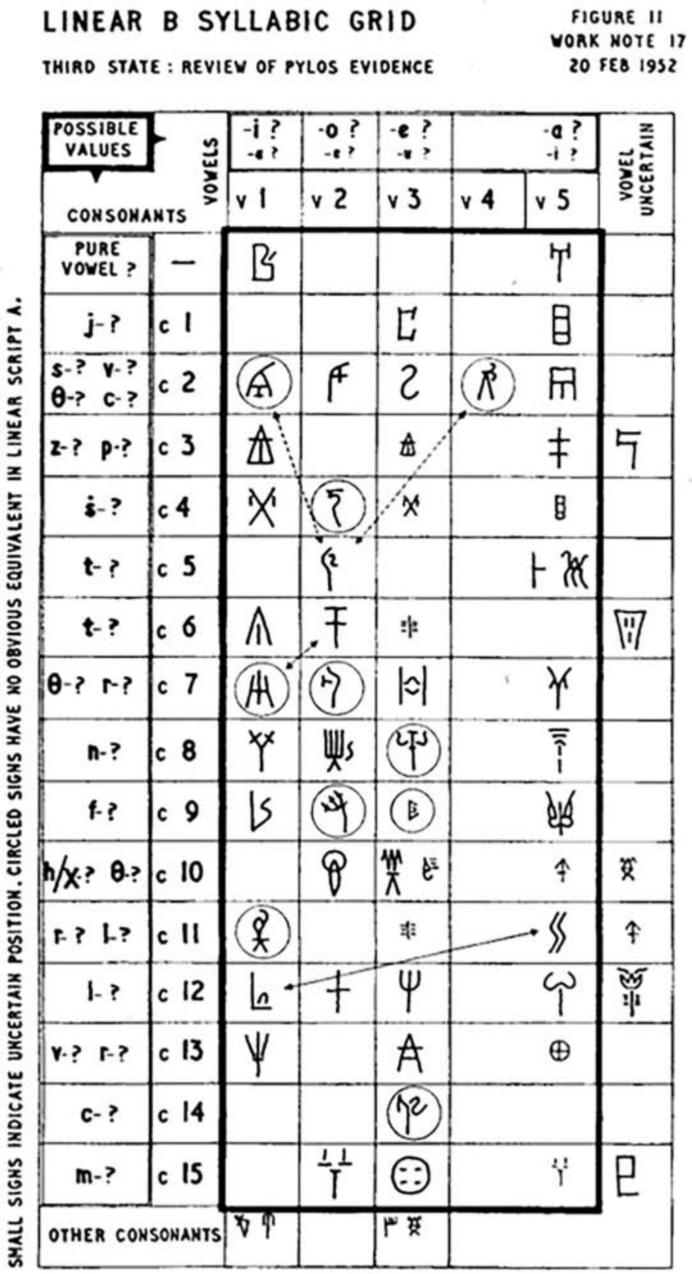

Figure 6.10 Ventris's third and final grid, from Work Note 17, February 1952

Hypothesis on the Language Behind the Script

If the language hidden behind a script is unknown, decipherment will be highly complex or perhaps even impossible without clear external support points, especially since there is no way to validate the results. For this reason, many decipherers start with a hypothesis about the language. For example, Ventris erroneously presumed that the language behind Linear B was Etruscan or Etruscan-like. It was only when evidence from his own decipherment process pointed overwhelmingly towards Greek that he had to change his mind.

If the cultural, geographical, and historical context favours a strong hypothesis tied to a well-known language or language group, a linguistic assumption can be promising. A good example of decipherment based on this kind of hypothesis is that of the Ugaritic cuneiform alphabet. Excavations at Ras Shamra in northern Syria, ancient Ugarit, uncovered tablets in the early twentieth century. The decipherment process was swift and was carried out independently by different scholars. The hypothesis was that the script recorded a West Semitic language, very close to Phoenician, Hebrew, and Aramaic. Despite the cuneiform shapes of the signs, the Ugaritic script is not related to the Sumerian–Akkadian logo-syllabic writing system. It is basically a consonantal alphabet, comparable to the Phoenician alphabet.

The decipherment of the Ugaritic alphabet can be considered one of the fastest in history. The first tablet written in Ugaritic was found on the 14^{th} May 1929. The new texts were quickly published by Charles Virolleaud in the journal *Syria* that same year (Virolleaud 1929). In April 1930, the German Assyriologist Hans Bauer announced to his French colleague René Dussaud that he had deciphered the Ugaritic alphabet, and Dussaud reported the news at the session of the Académie des Inscriptions et des Belles Lettres in Paris on the 23th May 1930. A few days later, on the 4^{th} of June, Hans Bauer published an article in the German magazine *Vossische Zeitung* in which he explained his decipherment, without going into excessive detail, and he then published another in the journal *Forschungen und Fortschritten*.

At the same time, Virolleaud and another French scholar, Édouard [Paul] Dhorme, had also carried out their own independent decipherment processes. The method used by the three decipherers was very similar: they took the alphabetic–consonantal character of the script and the fact that it was a West Semitic language as a starting point and attempted to identify possible words that would allow them to establish the sound value of the signs. For example, Virolleaud compared two sequences of signs, one on an object and the other in the first line of a tablet (Figure 6.11). In this latter case, the sequence of signs was preceded by a sign 𐎍 absent from the object. Based on the typological characteristics of this tablet, Virolleaud thought that this document could be a letter. Virolleaud then assumed that the matching sequence was a personal name and

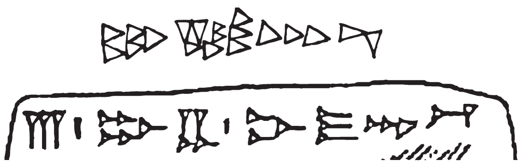

Figure 6.11 Example of Ugaritic word with (below) and without (above) the preposition *l*
Source: Pope (1999: 118, fig. 71a, c).

that the initial sign on the tablet could represent the preposition 'to', thus indicating the name of the addressee of the letter. Since 'to' is *la* in West Semitic languages, he assigned the value *l* to the sign. From there, Virolleaud began to look for West Semitic words containing *l* in the sign sequences showing the deciphered *l* sign. Bauer also used this *l*-value as a starting point, but looked for different words, which led to some minor discrepancies between the decipherments. These discrepancies were quickly resolved and, just two years after the first texts had been published, a complete decipherment of the Ugaritic alphabet appeared in Bauer (1932).

Certainly, Ugaritic is an extreme case. In the case of Carian, Vitali Ševoroškin assumed that it belonged to the Indo-European Anatolian language family (Hittite, Luwian, Lydian, Lydian) on the basis of indirect information about this language in Greek sources and also for geographical reasons. However, this assumption, which turned out to be correct, was of no use in Ševoroškin's decipherment, despite his attempts to find support in the etymological analysis of the forms he obtained. This is an interesting point to bear in mind: misuse of linguistic comparison in decipherment can be dangerous, because it can lead to a misleading impression of the results. Ševoroškin was able to offer etymological explanations for many Carian words that in reality do not exist, as they were simply the result of the erroneous transcription of Carian letters.

On the other hand, knowledge of the language behind a script is not always a necessary or sufficient basis for initiating decipherment. It was not necessary in the case of the decipherment of Linear B, since Michael Ventris was convinced, until forced by the evidence, that Linear B noted a non-Indo-European language, close to Etruscan, rather than a form of Greek.

Even this, however, does not suffice. A case in point is Rongorongo, the writing system of Easter Island. For geographical, historical, and cultural reasons, the language hidden behind the Rongorongo script must be Rapanui, the local language of the island that is still spoken. Certainly, the Rapanui written in Rongorongo would be expected to be more archaic than present-day Rapanui, which has been influenced by Tahitian, but texts in ancient Rapanui do exist. Moreover, it is a Polynesian language, a well-known linguistic group, so linguistic comparison to reconstruct earlier stages of Rapanui is also possible (see Valério, Chapter 10, this volume). Despite this fairly advantageous situation, Rongorongo remains undeciphered.

Hypotheses on the Content and Structure of Texts

It is important to place the texts to be deciphered in their context. If we know the purpose for which a text was written, we can hypothesize about its possible contents. The Carian stelae found at Saqqara are undoubtedly funerary in nature. Some of them even depict mortuary scenes typical of Egyptian iconography, while others are false-door stelae, a characteristic form for tombstones in Egypt. The texts are generally very concise and consist only of a few words and most probably register the name of the deceased and his family, as is common in ancient funerary inscriptions. This is what the decipherer expected to find on these stelae, rather than other types of texts. Such evidence was crucial for the decipherment process, because, as already mentioned, proper names can be a very useful avenue into the decipherment of a script.

Many erroneous or false decipherments overlook this and assume highly improbable, even fantastical, ideas about what an undeciphered text may contain. In other cases, no assumptions are made, and the text is directly 'deciphered' according to other procedures whose weaknesses have already been discussed (resorting to other writing systems or to linguistic comparison). In the case of Linear B, some unsuccessful decipherers searched for religious texts and attempted all kinds of fanciful interpretations of what formally and contextually seemed to be administrative texts, as demonstrated by its decipherment. A curious anecdote is that Ventris was initially reluctant to accept the presence of the names of gods on Linear B tablets precisely because of the negative tradition of erroneous decipherments carried out by those obsessed with finding religious references (as related by Chadwick 1970: 70–1; Robinson 2002: 115). Another case in point is the Phaistos Disc. One of its many problems is that it is a unique object whose function and purpose are entirely unknown, such that we cannot base our interpretation on any remotely sound idea about what lies behind the signs (could they refer to personal names, place names, names of months, or even an erotic poem, as someone has suggested?).

Hypotheses about the content and structure of undeciphered texts can help guide the decipherment progress down the right track. We mentioned at the beginning of this chapter the extraordinary case of Grotefend and the Old Persian cuneiform script, reporting how Grotefend 'fabricated' an imaginary bilingual to establish the content of some Old Persian inscriptions. This means that Grotefend assumed that these inscriptions began with the name of an Achaemenid king, followed by his title (including the typical Persian expression 'king of kings'), and his genealogy. The phrase 'king X, great king, king of kings, son of king Y, of king Z, etc.' meant that the word 'king' had to appear repeatedly in the inscription, and this was one of the elements that Grotefend was able to identify successfully. According to the name-plus-genealogy hypothesis, he noticed that the possible name of the king in A appeared as the name of the father of the king in B, and also noted an interesting detail: the possible name of the father of the king in A was not accompanied by the word supposedly meaning 'king', unlike in B. Ancient Greek sources offered a simple explanation that served as a definite clue: King Darius was the son of an individual, Hystaspes, who was not a king, and King Xerxes was the son of King Darius. Thus, inscription A, Grotefend quite rightly thought, referred to Darius, and inscription B to Xerxes.

Hypotheses on the Writing System

The nature of the script is one of the key points in the decipherment process. It is crucial to know or at least to hypothesize about the type of writing system to be deciphered, whether it is an alphabet (phonological or consonantal), a syllabary, a semi-syllabary, or a logo-syllabic system, or if it comprises a combination of logograms and consonantal, biconsonantal, and triconsonantal signs, as in Ancient Egyptian.

We now have a good typological understanding of writing systems. Early decipherers had to make use of intuition and imagination when reconstructing the rules of the writing system as they tried to decipher it. The story of the decipherment of the Ancient Egyptian script is a good example of the tremendous difficulties faced by Jean-François Champollion and others upon encountering such a complex and completely unfamiliar system. The decipherment of the Sumerian–Akkadian cuneiform system was an equally challenging task, although the trilingual texts and previous experience helped. Yuri Knorozov's excellent knowledge of these writing systems and their decipherment was crucial to his correct interpretation of the rules of the Maya hieroglyphs, as demonstrated in his decisive article published in 1952 (Knorozov 1952).

In approaches based on the typology of writing, scholars can work in a similar way to decrypters of secret codes. This is, therefore, the clearest point of contact between two tasks that, as mentioned at the beginning of this chapter, are different. The preliminary step consists of knowing the inventory of signs in a writing system. In some cases, this may be easy, but in others it may be tremendously complicated. In both figurative and linear systems, the boundaries between different signs and simple variants of the same sign can be difficult to establish. In Carian, the idea of a semi-syllabary (see above) was fuelled by the belief that the Carian script consisted of a large number of signs, when in fact some were merely variants of the same sign. With the Maya hieroglyphs, it was crucial to recognize that the syllabic signs took different forms. In Rongorongo, variants can be observed in the form of the elements linked to each other, but we do not yet know what this means in terms of the rules of the writing system. Since the language behind the glyphs of Rongorongo is possibly known, as mentioned, it is clear that one of the elements that prevent this script being deciphered is our ignorance about the exact inventory of signs (see Valério, Chapter 10, this volume).

If the inventory can be established with certainty, an obvious approach followed in many decipherment processes is to consider the number of signs and relate this to the possible writing system. In general terms, alphabetic systems need far fewer signs than syllabic systems, and syllabic systems need far fewer signs than systems that use both phonographic and logographic signs. To be sure, the number of signs may vary in each type of writing system for a variety of reasons: the number of sounds in the language, the degree of precision in the representation of phonemes or syllables, the number of logographic signs used, and so on. For example, Hawaiian has only eight consonants and five vowels, and its syllables are of the consonant–vowel type, so a syllabary for this language would need only forty-five signs ($8 \times 5 = 40$ for consonant + vowel syllables and 5 for vowels). Abkhaz, a Northwest Caucasus language, has a sixty-two-letter alphabet, although twenty-four of these letters are digraphs representing labialized and palatalized sounds. The inventory consists of a total of forty different signs, still a considerable number. The complete inventory of letters used in the Avestan alphabet is fifty-three. Again, some letters can be analysed as diacritical modifications of others, but, if Avestan texts were undeciphered and the origin of their script (an adaptation of the Pahlavi alphabet) was unknown, this information would not be available.

In addition, there are mixed or defective systems, such as the Palaeo-hispanic semi-syllabic system, in which syllabic signs are used only with occlusive consonants, and the Old Persian cuneiform, which shows an incomplete syllabary. Another problem posed by logographic systems such as Egyptian and Sumerian–Akkadian is the possibility that the same sign may have different functions and values. All these factors can influence the progress of decipherment.

There is another crucial question: is what we are attempting to decipher truly a writing system, or is it a system of symbolic representations? Of course, there are two precedents in which it was thought that the system was not really a writing system, but this was later revealed to be a false assumption: Egyptian hieroglyphs and Maya hieroglyphs. However, even if we accept that it is a writing system in the sense that the signs reflect a a close linguistic notation, does the system contain signs of phonological value? This problem arises in cases such as Rongorongo. In principle, all known writing systems present phonological elements in some way. Even the Chinese script, which makes extensive use of logograms, uses complex signs in which part of the sign has a phonological value. There is no evidence of a complete writing system that is purely logographic, and it seems difficult to imagine one on a functional level. Graphic systems that function without any phonological component fall more into the category of semasiography, in which there is no visual register of the spoken string, and which therefore cannot properly be considered writing.

In any case, a purely logographic writing system would be indecipherable: if the signs represent only words, how can we work out their meaning? Even in the case of a pictographic script, it would be impossible to find out whether the signs directly signify the objects represented or have other symbolic values. And, more importantly, it would be impossible to confirm whether the decipherment was correct or wrong: the 'deciphered' texts would have a meaning, but this meaning would be assigned by the decipherer according to the semantic values he or she has previously given to the logographic signs. The result would be a clear fallacy of circularity. It seems, then, that the presence of signs of phonological value is a necessary condition for successfully deciphering a writing system.

Minor (or Not So Minor) Details

Unique and idiosyncratic features of each graphic system and the intuition and intelligence of scholars have harnessed minor (or not so minor) details of a writing system as points of support. Often, these details were seen not by the final decipherers, but by the precursors of the decipherment. Nonetheless, they are vitally important because they showed the way forward. A well-known example of a 'minor detail' was the identification of Egyptian cartouches containing names of kings written with phonetic signs. According to Pope (1999: 66), this idea was first clearly formulated by Silvestre de Sacy following some previous ideas presented by Jean-Jacques Barthélemy and Jörgen Zoëga, and offered two decisive clues for deciphering the Egyptian script: it offered possible 'bridges'—personal names—and rebuked once and for all the idea that Egyptian hieroglyphs were not a proper writing system but simply a symbolic representation of ideas. Another detail is found in Grotefend's brilliant decipherment of Old Persian, namely the prior identification by Olav Gerhard Tychsen and Friedrich Münter of the slanted wedge sign as a word divider. This device simplified the task of identifying names and formulas. In the case of the Luwian hieroglyphs, an important detail emerged when the signs  and  were recognized as the signs for 'city' and 'country', respectively (see the example in Figure 6.12). Thanks to this identification of the logograms signifying place names, it was possible to identify some possible toponyms represented by syllabic signs, since they were accompanied by these logograms, which acted as classifiers.

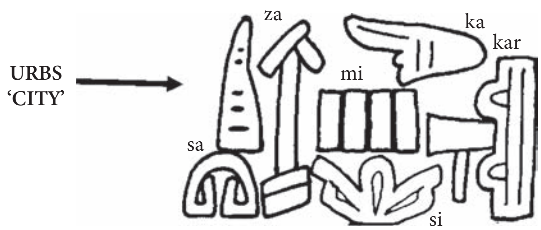

Figure 6.12 (URBS)*kar-ka-mi-si-za-sa* 'man of Karkemish' in Luwian hieroglyphs

With respect to the decipherment of Linear B, Alice Kober established the existence of paradigms in the language behind the writing by means of combinatorial analysis of the signs. Emmett L. Bennett Jr is also worth mentioning, since he managed to establish differences between phonographic and logographic signs, which represented a crucial step in the analysis of the structure of the Linear B tablets and in the development of the grid by Ventris. In the case of Carian, Helmuth Bossert put an end to the idea that the Carian script was a mixture of alphabet and syllabary; when a new, long Carian inscription was uncovered at Kaunos, consisting of some 240 signs, he noted that only 27 different letters were used and thus concluded: 'Nach dem Zeichenbestand der Kaunos-Inschrift zu urteilen kann von einer Mischung von Alphabet- und Silbenschrift nicht die Rede sein' ('Judging from the character set of the Kaunos inscription, one cannot speak of a mixture of alphabetic and syllabic writing') (Bossert *apud* Steinherr (1950–1: 332)). This assessment paved the way for a renaissance in Carian studies: in the years that followed, Vitali Ševoroškin assumed that the Carian script was purely alphabetic and that some supposedly independent signs were in fact variants of a smaller inventory. As we have mentioned, Ševoroškin did not succeed in deciphering Carian, but he made a crucial contribution to the understanding of the Carian writing system when he established the different local alphabetic variants of Carian (Ševoroškin 1965).

Finally, Yuri Knorozov's brilliant explanation of the so-called De Landa alphabet was fundamental to the decipherment of the Maya hieroglyphs. This 'alphabet' appears in a sixteenth-century manuscript on the Maya civilization written by Bishop Diego de Landa. De Landa provided a set of Maya glyphs in the form of an alphabet, with their respective vowel or consonant values (Figure 6.13). This information was overlooked or misunderstood until Knorozov proposed that De Landa's 'letters' were in fact syllabograms. Thus, the letter *k* in De Landa was *ka*, the letter *l* was *lu*, and so on. The idea had already been contemplated by Benjamin Whorf, but it was Knorozov who developed it coherently and who quite correctly claimed that the Maya hieroglyphic script was a writing system comprising syllabograms and logograms.

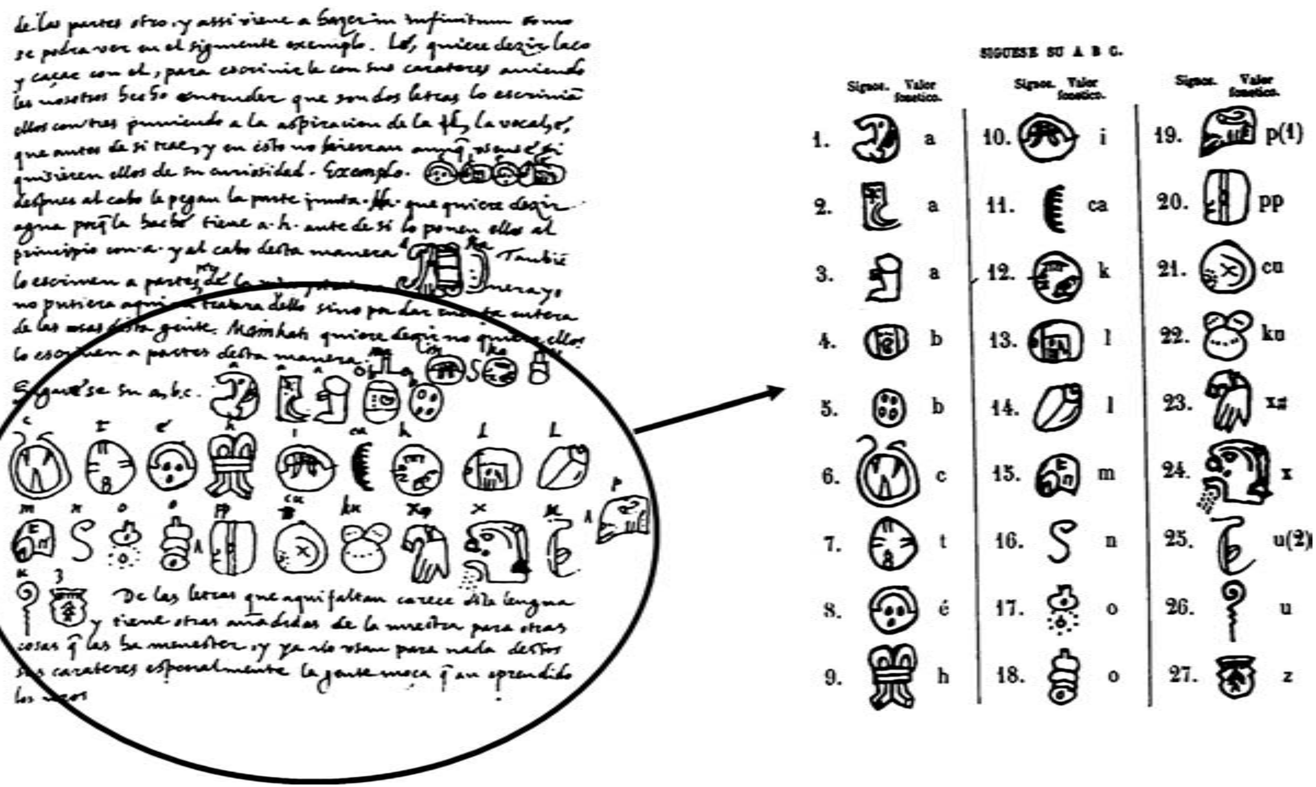

Figure 6.13 On the left, de Landa's 'alphabet' from *La relación de las cosas de Yucatán*, *c*.1566; on the right, the transcription given in the *editio princeps* by de Bourbourg

Sources: Wikicommons, public domain; de Bourbourg (1864: 320).

Innovation, Resistance, and Confirmation

As pointed out by Maurice Pope (1999: 189), 'there is […] a moral [of decipherments] […] which concerns the introduction of new ideas'. Innovative thinking seems to have been crucial in decipherments that remained stagnant for years. The parallel case of the Egyptian and Maya hieroglyphs is well known. In both cases, the traditional concept that they were not proper writing systems, but symbolic representations, impeded progress in their decipherment. Here, the innovation consisted precisely of assuming that they were scripts *stricto sensu* containing phonological signs. In the case of Carian, the lack of progress was overcome when the Egyptian–Carian bilinguals were finally considered. With the Palaeo-hispanic scripts, Gómez-Moreno's innovative idea was that he assumed the writing system to be a semi-syllabary.

In the case of the decipherment of Linear B, Pope (1999: 189) commented that the multitude of new ideas that made it possible were not introduced by Ventris, but were already present in the history of Linear B research: the usefulness of personal names, use of the syllabic grid (which had been used in the nineteenth century for other decipherment processes), and the establishment of possible grammatical patterns (a task carried out by Kober). Pope concluded that 'the only equivalent idea of this nature contributed by Ventris was the realisation of how the Linear B spelling rules must differ from the Cypriot. Everything else was application, brilliant though it often was, of ideas that had been introduced by others'. This is true if the innovation concentrates on methodology alone, but the most notable innovation of Ventris's decipherment was that the language behind Linear B was Greek. Certainly, we may have the impression that the chain reaction triggered by the correct decipherment of some signs was so solid that the Greek interpretation would win out, even against the erroneous hypothesis, held right up until Ventris's decipherment, that the language was Etruscan or Etruscan-like. But a close look at Ventris's notes and letters during the breakthrough reveals his doubts and his fear of making a very serious mistake. Greek clues were entirely unpopular in those days, and to follow this approach was certainly an innovation.

A test of the innovative character of decipherment is precisely the resistance it can meet. All the decipherments I have mentioned as examples of new and novel approaches to a script were met with caution and even hostility from other scholars. One of the most significant cases was Knorozov's proposal, which was systematically attacked by Eric Thompson, the leading figure in Maya studies. Moreover, many of the early reactions to the decipherment of Linear B were lukewarm, or even downright hostile, and a determining factor for the effective dissemination and reception of Ventris's achievements by scholars was undoubtedly the early assistance offered by a scholar specializing in Ancient Greek dialectology, John Chadwick.

The reasons for such reactions, which imply that it may take years for a successful decipherment to be widely accepted, are understandable. First, the decipherment may challenge a well-established *communis opinio* among scholars: the purely symbolic character of the signs in the case of Egyptian and Maya hieroglyphs, the non-Greek character of the Linear B documents, and the expected Greek values of Carian letters. Secondly, it may provoke a reaction from scholars attempting to decipher the script in question by means of different methods. Thirdly and finally, the decipherment process and its results may not be easy to understand.

The history of research shows that this is perhaps one of the most important factors in the reception of a decipherment. One criticism of the Linear B decipherment was that the process followed by Ventris in deciphering the writing was not well explained. One could argue against this criticism by pointing out that, if the results are convincing, consistent, and even evident, as was the case with Ventris's decipherment, this becomes a secondary issue. This is certainly true in retrospect, but, in the early days, when scholars are asked to assimilate such revolutionary proposals, a failure to explain the process that led to the decipherment would indeed represent a shortcoming. An example of this is the case of Thomas Kowalski, who deciphered Carian. He certainly did not offer a complete decipherment and his proposal contained major errors (see above), but his paper, which preceded John Ray's approach to Carian by six years, not only indicated the right approach to deciphering Carian with the use of Carian–Egyptian bilinguals, but also offered some revolutionary but correct values for Carian letters, such as *k*, *m*, *š*, *r*, and *p*. The problem is that the publication that ensued did not offer a systematic explanation of how to obtain the values for the signs, and the discussion focused on trivial and generally abstruse issues. This contrasts with the clear, even educational style followed by Ray in his articles, which contain a methodical, orderly presentation of his decipherment process.

Although the presentation of the decipherment process and the explanation of the values proposed are correctly and clearly stated, there is a further problem in terms of the accessibility of the work, which is perfectly summed up in a sentence by Knorozov, albeit in the context of his dispute with Eric Thompson: 'As a result of decipherment, the study of texts becomes a branch of philology' (Knorozov 1958: 287), in which 'branch of philology' is understood as linguistics (see Coe 1992: 162). This means that scholars in other fields (archaeology, history, and even philology if their interests are not predominantly linguistic) may not feel able to evaluate a decipherment. Chadwick (1970: 69) described a confession by the great archaeologist Sir John Myres about Ventris's notes: 'I don't know what to make of it. I'm not a philologist.' It is curious that the history of decipherment is littered with examples of what might seem like narrative cliché if it were fiction: to prove that a decipherment is correct and to overcome scepticism, the new system of decipherment is subjected to an examination. The most famous case is that of the Akkadian cuneiform; in 1857, the Royal Asiatic Society of Great Britain and Ireland gave a new cuneiform text to four scholars (Rawlinson, Hincks, Fox Talbot, and Oppert) so that each could offer his own separate interpretation. A committee studied the work of the four men and concluded that there was 'a very remarkable concurrence' (Pope 1999: 116). When Ventris and Chadwick received drawings of some of the new tablets found at Pylos in 1952, sent by Bennett, they decided to examine them themselves. Each man analysed the tablets independently of the other and compared the results (Robinson 2002: 129–30). I can add a personal anecdote to these examples: when a bilingual Carian–Greek inscription was found in Hyllarima in 2005, some years after the decipherment of Carian had been confirmed thanks to the Kaunos bilingual (see below), the historian Pierre Debord, who was to publish the inscription, still harboured doubts about the decipherment. He tested me to see whether the new decipherment was convincing, as he confessed to me some time later. I transcribed the Carian part using the new decipherment values and identified, among other words, a new Carian name, *tñu-*, which had not been attested in either Carian or Greek sources until then. This identification ultimately convinced Debord that the decipherment was correct, as a new Carian name was also present in the Greek part, adapted in Greek as *Τοννους* (*Tonnous*), undoubtedly the same name.

In general, the widespread acceptance of a decipherment takes time. An element that can accelerate success is the appearance of new documents that serve to confirm it. In the face of a decipherment there may be suspicion that the words cited as evidence are the same as those used to establish the values (Chadwick 1970: 91), and the decipherers themselves may even question the soundness of their evidence. This explains the impact that the so-called tripod tablet—a document that became well known shortly after Ventris had cracked the Linear B code—had on Ventris and Chadwick (Figure 6.14). Once they were transferred to a document that had not been used during the decipherment process, the proposed values for the signs made sense. The tripod tablet was a kind of visual bilingual: the correspondence between the objects represented by the logograms and the Greek words obtained through Ventris's Linear B reading system was striking.

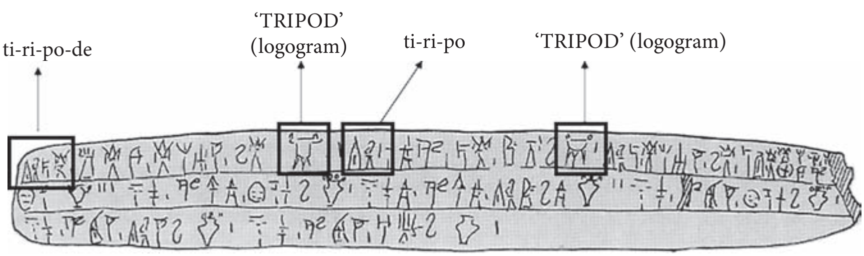

Figure 6.14 The Linear B 'tripod tablet' (PY Ta 641)

In the case of Carian, an actual bilingual was available as evidence. Three years after the 1993 Rome workshop, where a complete version of the new system based on the Egyptian approach was presented (Adiego 1994), a Carian–Greek inscription was found at Kaunos (Figure 6.15). On the Greek side, the above-mentioned inscription revealed the names of two individuals honoured by the city: Nikokles, son of Lusikles, and Lusikles, son of Lusikrates, both Athenian citizens:

…*Νικοκλέα Λυσικλέους Ἀθηναῖο*[*ν*] *καὶ Λυσικλέα Λυσικράτ*[*ους*] [*Ἀ*]*θηναῖον*
/Nikokléa Lusikléous Athēnaîo[n] kaì Lusikléa Lusikrát[ous] [A]thēnaîon/:

In the Carian part, with the new decipherment values, the text in lines 2–6 appeared like this:

…ΨΘ∇[---]ΔAΨΔEMΘ∇ΔAM[-]OPOΨOMΨ
….nik[---]lan lùsiklas[-] oPonosn

MΓΔEM[---]AΨΔEMΘ∇FAPAMOPOΨOMΨ
sb lùs[---]an lùsikraPas[-] oPonoson…

In this text, the names of the Greek part could easily be identified. The only problematic point regarding the decipherment system was sign P; in other Carian

Figure 6.15 Carian–Greek bilingual of Kaunos; lines 2–6 (Carian) and lines 2–5 (Greek)

alphabets, this or a similar sign represented the sound *š*, but it is clear that at Kaunos it had a *t* value, as is clear in the forms *lùsikra*P*as* = Lusikrates and *o*P*on-osn* = 'Athenian'. In the other Carian alphabets, the sound *t* was represented by a letter ♀, which was significantly absent in the Kaunos alphabet. Moreover, the Kaunos alphabet had an idiosyncratic letter, R, which looks like P with an added mark. It was now clear that, in Kaunos, the ♀ adopted a form identical to P and that, to avoid confusion with the letter for *š*, the latter was provided with a distinctive stroke, hence R. Nowadays, these lines are transcribed as follows:

....*nik*[---]*lan lysiklas*[-] *otonosn sb lys*[---]*an lysikratas*[-] *otonoson*...

Note that the final *-n* indicates the accusative case (in Greek, the names of the two citizens, Nikokles and Lusikles, also appear in the accusative case) and that *sb* is the Carian word 'and'. *y* instead of *ù* is the current transcription of the letter E.

If the tripod tablet in Linear B was a kind of visual bilingual, a good test example for the decipherment of Maya hieroglyphs can be considered as a 'taste bilingual'. This is an inscribed vessel found in a tomb in 1984 in Río Azul (Petén), on which the inscription, part of the owner's name, shows the word *ka-ka-w*(*a*) 'cacao' twice (Figure 6.16). Once the residue inside the vessel was chemically analysed, it emerged that it originally contained 'some liquid form of cacao' (Stuart 1988: 156; see also Coe 1992: 247–8).

Method and Intuition

Starting with the question at the very beginning of this chapter, it should be now clear that good or bad luck have to be attributed mainly to the material, not to the

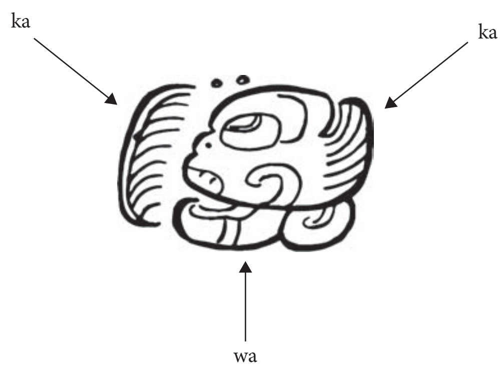

Figure 6.16 The two glyphs with the word *ka-ka-w*(*a*)
Source: Stuart (1988: 155).

researchers. The history of research shows that, if the documents offer us the slightest opening into an unknown writing system, the writing system will eventually break down. The question now comes down to this: method or intuition? The cases discussed in this chapter show that the two elements are always combined and occur to varying degrees in each particular decipherment process. Grotefend's analysis of the Persian cuneiform was the epitome of intuition, while Ventris's decipherment of Linear B was methodologically exemplary. In both cases, however, one of the two elements alone cannot explain the ultimate success. Grotefend's intuition resulted in an unsatisfactory decipherment, which had to be corrected by later scholars based on comparative linguistics and on a more thorough study of the Old Persian writing system. In the case of Ventris, he incontrovertibly succeeded in the decipherment process, but we have seen how he relied on the similarities of the Linear B signs with the Cypriot syllabary at some point to assign phonological values to Linear B. This was a purely intuitive approach that served to find the 'trigger' for breaking the code.

Ventris's example perhaps clarifies why it is often difficult to offer an accurate account of the decoding process. In fact, it was a wonderful demonstration of methodological rigour until the moment Ventris sensed that the place name 'Amnisos' was attested and that he could recognize it by connecting a Linear B sign with a Cypriot sign: by paradox, a methodologically rather unsound procedure, as we have described.

7

The Cat in the Cretan Hieroglyphic Script

ma, What It Means, and Where It Leads

Judith Weingarten

Introduction

The focus of this chapter is on the earliest widespread writing system on Crete, Cretan Hieroglyphic, which most probably appeared in Middle Minoan II and is found in its most developed form in the north and north-east of the island, especially at Knossos, Malia, and Petras.

A possible precursor, however, was the so-called Arkhanes script,[1] which most likely emerged in the late Prepalatial period (*c.*2100–2000 BCE) or was almost contemporary with the foundation of the first palace at Knossos, some time shortly after 2000 BCE. The evidence for this script is limited to seals, usually made of bone, for there are no extant clay documents from this time. The Arkhanes script is almost entirely repetitive, in that many seals repeat the same five signs (e.g. Figure 7.1), conventionally transcribed as A-SA SA-RA-NE, which most scholars see as the hieroglyphic predecessor of the so-called libation formula of later Linear A. Some of these seals also depict animals, humans, and/or geometric designs. An unusually large seal (1.85 × 1.28 × 5.67 cm), a triple stacked bone-cube from Arkhanes, *CMS* II.1 391/*CHIC* #315 (Figure 7.2), is unique in having fourteen distinct faces, each bearing a picture or sign(s), for example, the leg, hand, and sistrum signs, which will be incorporated into the developed Hieroglyphic script. That hand appears again on another early hieroglyphic seal from a Middle Minoan IIA workshop just outside the palace at Knossos. Its impression (Figure 7.3), stamped by a seal made of ivory or bone, shows a very naturalistic hand and attached to the hand, a small ivy-shaped sign, which does not recur in the later script.[2]

This chapter was initially presented in a seminar held online in the framework of the SCRIBO series of seminars (University of Bologna, 20 May 2020).

[1] Recent studies of the script: Decorte (2018, with full references); Ferrara (2018); Weingarten (2022).

[2] Seal impression with the hand sign (CH 008): Weingarten (2007: 136–7, fig. 4.6) = *CMS* II.8 15 (however, the *CMS* drawing omits the attached 'ivy-shaped' sign, the existence of which has been confirmed by various autopsies). From the same period (Middle Minoan IIA) comes a vase fragment, MA/V Yb 04, in Bâtiment Pi at Malia with three incised signs, probably in Cretan Hieroglyphic (Pomadère 2012–13: 649).

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Figure 7.1 Arkhanes Script seals: (a) *CMS* II.1, 393, bone three-sided gable; (b) *CMS* II.1, 391, triple stacked bone-cube; (c) *CMS* II.1, 394, bone two-sided disc
Sources: Photographs courtesy of *CMS*, as it is in source note for Fig. 7.2 by Decorte (2018: fig. 1).

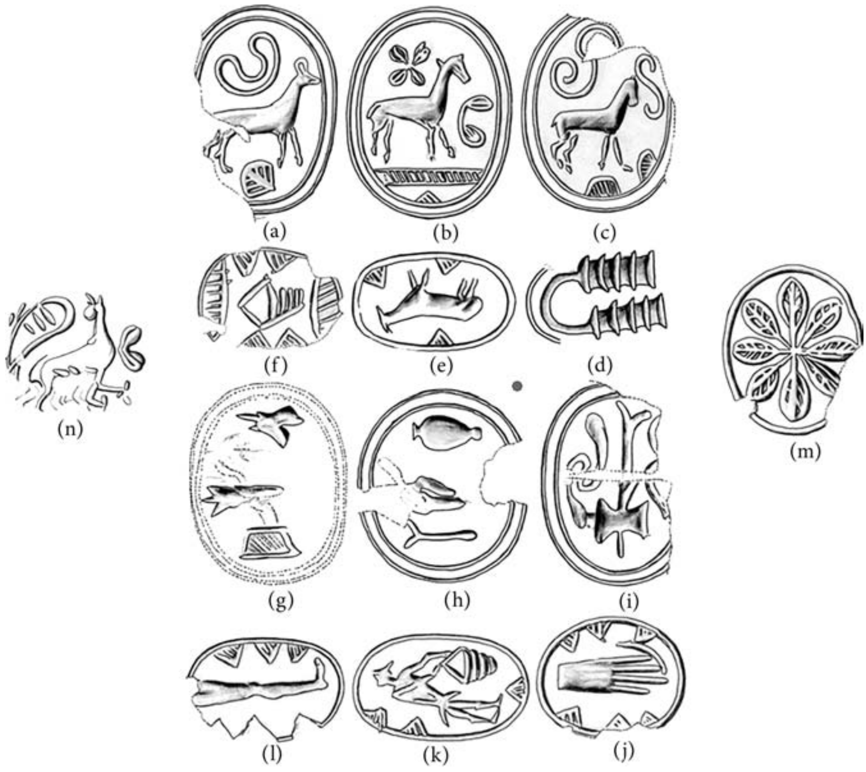

Figure 7.2 *CMS* II.1 391. Drawings of seal faces as seen in impressions; positions of seal faces as corrected by Decorte 2018.
Sources: Courtesy of the *CMS* Heidelberg; Decorte (2018: fig. 6, with the kind permission of the author).

At the end of Middle Minoan IIB, or, in some places, possibly a little later, we find relatively rich deposits with clay documents written in Cretan Hieroglyphic, as well as seal impressions at Malia Quartier Mu, and the Hieroglyphic Deposit at Knossos and at Petras in the east. And, of course, we find hieroglyphic sealstones scattered throughout eastern Crete, with occasional outliers elsewhere. There are three main seal shapes (Figure 7.4), the *Petschaft*, the three-sided prism, and the

Figure 7.3 Middle Minoan IIA seal impression from Deposit E (Workshop) in Southwest Houses, Knossos
Source: Photograph C. F. Macdonald.

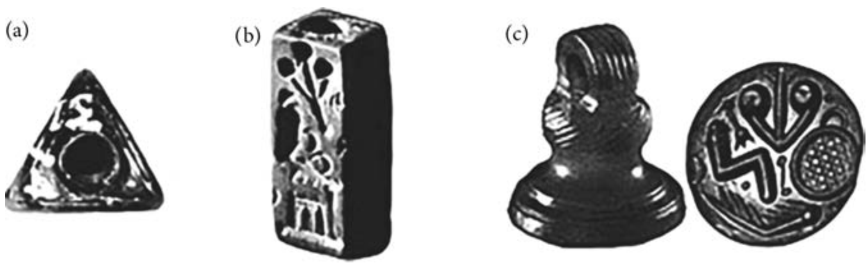

Figure 7.4 Characteristic Cretan–Hieroglyphic seal shapes: (a) three-sided prism; (b) four-sided prism; (c) *Petschaft*

four-sided prism. The *Petschaft* is really the best designed of the three for making seal impressions, especially on clay, because it is easy to hold by its handle, stamp, and lift it out cleanly (Ferrara and Jasink 2017). It does seem designed, in fact, for a career of palatial administration.

With that as a very quick background, what can we say about the script itself? Reading and interpreting Cretan Hieroglyphic is obviously problematic, a difficulty faced across the board in all early writing systems (whether Egyptian, cuneiform, Chinese, or Maya in their earliest phases). But the Cretan situation is extra complicated because of the difficulty of distinguishing between signs for words (logograms) and signs for sounds (phonograms). This is especially true when we try to 'read' the *seals*. In fact, the signs engraved specifically on the seals were long considered not to be true writing. True writing was recorded only on administrative documents, such as those incised on clay bars, medallions, and so on, while the symbols on the seals were demoted to what was called 'ornamental writing'.

This distinction was based on two main points: First, several sign sequences were found only on seals and not ever on the archival clay documents. Second, many such sequences were so often repeated in the *seal* corpus that they came to be defined as *formulas* (Table 7.1). The catalogue of Cretan Hieroglyphic inscriptions published in 1996, *Corpus Hieroglyphicarum Inscriptionum Cretae*, known as *CHIC*, chose to disregard all the signs that disrupt the harmony of these formulas, dismissing them as *insignificant* and omitting them in the transcriptions, or placing them within brackets, another way of saying 'dubious' or 'do not read this'.

One of the most frequent of formulas is the combination of two signs, one shaped like a human eye (), and the other seemingly an instrument or tool, conventionally called a 'trowel' (). Other symbols are added on many seals, such as a double axe (), or the head of an animal (e.g., , , , ), and so forth. These signs allegedly operate according to no rules and pirouette about, changing their positions and order—in ways that, for the authors of *CHIC*, are not phonetic. The 'trowel-eye' () group is just one example, but such omissions are applied throughout the corpus, signs that should be recognized in the repertory being struck out.

More recently, a counter-reaction has set in. In 2009, Anna Margherita Jasink (2009) published *Cretan Hieroglyphic Seals: A New Classification of Symbols and Ornamental/Filling Motifs*. This rehabilitated a number of signs and symbols that had not been included in *CHIC*. In part, she was following Arthur Evans (1909), who had originally included many of these signs in his *Scripta Minoa*—such as the full-bodied cat or cat mask, and various other animals and designs. Her approach stimulated a number of younger scholars to reopen this and many of

Table 7.1 Cretan Hieroglyphic sequences most frequently found on seals

Formula	**Frequency**	**Formula**	**Frequency**
	70		9
	29		9
	14		7
	23		3
	12		3

the other questions pertaining to the hieroglyphic script, especially as it appears on sealstones.

Discussion also revived about another aspect of hieroglyphic seals—that is, the occurrences of single signs on seals (Figure 7.5). Such isolated signs hark back, as we have seen, to the bone seals of the Arkhanes script. Oddly enough, many of these same signs *are* recognized as part of the Cretan Hieroglyphic script but only when they are not isolated. When they stand alone, they fall outside the conventional definition of an inscription (which is 'at least two consecutive signs aligned together in coherent succession')—and therefore they were banished from *CHIC*. However, if we look at them closely, we notice features that nonetheless point to the images representing, in all likelihood, some form of language notation. The small crosses scattered on the faces of some of the seals are defined as stiktograms—that is, punctuation, normally understood to indicate reading direction; and the same function is said to apply when stiktograms appear on hieroglyphic seals. Is that really the case? How can it possibly give the reading

Figure 7.5 Cat mask / stiktogram, *CMS* VI 131; full-bodied cat / stiktograms, *CMS* X 280; bucranium / stiktograms, *CMS* VII 34

Sources: Photographs and drawings of seal faces courtesy of the *CMS* Heidelberg.

direction for a single sign, which has no direction to be read? In such cases it must have a different purpose. Still *another* explanation is needed when the cross stiktogram is doubled or even tripled, as happens on some seal faces.

We suggest that the explanation must lie on the fluid boundaries between icons and images. The question is: when does an image become a sign? In order to distinguish what is iconic and what is writing *stricto sensu*, we suggest that the Minoans applied a conventional cross, to underline (as it were) that the symbol is not a picture, but a sign. In other words, the stiktogram can indicate on seals the way that the symbols are to be understood. If this is the right way to view these single-sign seals, we clearly need to develop a new methodology for understanding this script on seals; and from the bottom up.

The new methodology we propose entails considering *every single element* that is engraved on the seal face; not disregarding or dismissing any mark that meets the eye. We argue that Minoan engravers made every single mark on the seal for some reason and that this reason might be to record specific linguistic or administrative features. If patterns emerge, as they do, it is our job to try to understand them rather than to neglect or understate them.

A good example of how this works is seen on a jasper prism from Myrtos-Pyrgos (see Figure 7.6, and also Ferrara, Weingarten, and Cadogan 2016: fig. 2, in a first attempt to apply a holistic understanding of hieroglyphic glyptic; and *passim* Ferrara and Weingarten 2022). Not only are the 'trowel' () and the 'eye' () (side *α*) divided by a cat sign, but also the 'trowel' is 'cartouched' (as it were) by S-spirals, while the eye is encapsulated by so-called fillers—which act to stress the separation of the signs. And this is true, whether or not the cat has phonetic value. When we look carefully at the trowel and eye on this prism, now viewed through a more holistic filter, we see that the cross stiktogram is at times repeated, and that other designs, such as small dots, intersperse the signs, accentuating some as if singling them out. The effect is often one of separation of elements, rather than of unity. The trowel sign appears particularly emphasized, as if it were an entity on its own, and not meant as the initial sign in a two-sign text.

What should be emphasized is the visual 'tinkering' with the so-called trowel-eye () formula, and this is really very common: 'tinkering' in this sense means that it is almost never laid out plainly on the seal face. The figures for the 'trowel-eye' formula on seals are given in Table 7.2: 'Aligned, by itself, in proper linear form, none; Decorative or supplementary elements in initial position, 10; in in-between position 3; in final position, 7; Rotated or cartouched, 14; with cross stiktogram, often repeated, 7.' In fact, we never actually have an untinkered 'trowel-eye' formula on seals.

Very much the same thing happens when we examine the 'trowel-arrow' formula () (Table 7.3), which is the most common of all the formulas on hieroglyphic seals. There is almost always something setting the signs apart: that may be signs placed between the trowel and the arrow, or stiktograms, or signs rotated

Figure 7.6 From top to bottom: sides α–δ of the seal from Myrtos-Pyrgos
Sources: MP/75/3; HM *Σ*2595; *CHIC* #309; photographs courtesy of the *CMS* Heidelberg.

or cartouched; just *three* examples have the signs in supposedly readable, linear form. All the others are 'tinkered'.

In short, the Minoan engravers almost always tinkered with the trowel, either adding an iconographic symbol that might look to us like decoration—at the beginning, or in between, or they rotated, or they wrapped it up in a cartouche of decorative fillers, or they put in a cross stiktogram, which might be duplicated or triplicated. Surely, something is telling us to look at the trowel sign more closely, in a more systematic way, to capture—rather than dismiss—the richness of the

Table 7.2 Attested layouts of 'trowel-eye' formula on Cretan Hieroglyphic seals

Formula (signs 044-005)	
Aligned, 'linear formula'	---
Decorative or supplementary elements in *initial* position	#147, #246, #247, #250, #253, #261, #264, #266, #268, #288
Decorative or supplementary elements in *in-between* position	#140, #158 (divider?), #309
Decorative or supplementary elements in *final* position	#138, #145, #165, #295, #297, #301, #308
rotated or 'cartouched'	#144, #165, #174 (division marker?), #194, #254, #261, #263, #274, #287, #299, #305, #308, #309, #311
×	#138, #158, #247, #283, #295, #301, #309

Source: Ferrara and Cristiani (2016: 32, tab. 1; inscribed seal numbers cited after *CHIC*).

Table 7.3 Attestations of the 'trowel-arrow' formula

Formula (004–049)	
Aligned, 'linear formula'	#210, #233, #297?
Decorative or supplementary elements in *initial* position	#157, #161, #188, #208, #209, #217, #230, #237, #240, #244, #249, #253, #258, #260, #264, #266 (×2), #274, #285
Decorative or supplementary elements in *in-between* position	#261, #266, #270?, #300, #301, #314
Decorative or supplementary elements in *final* position	#207, #215, #278, #293, #295
rotated or 'cartouched'	#150, #159, #170, #213, #216, #220, #221, #223, #224, #225, #231, #247, #277, #278, #284, #287, #290, #293, #299, #301, #303, #305, #311
×	#207, #211, #219, #235, #258, #274, #283, #301

Source: Ferrara and Cristiani (2016: 33, tab. 2).

glyptic message. And what we actually see, in almost all cases, is that the trowel sign is *formally* emphasized, if not virtually separated or isolated. There is, in other words, a deliberate attempt to make it stand out, as a singular feature. And, despite the trowel being so frequently found on seals, it is *always* accompanied by only one of two other signs, *either* the eye *or* the arrow, *or* both.

Are we still sure these are formulas? Probably not, but, rather, 'trowel-eye' ( ) and 'trowel-arrow' ( ) ought to be decoupled and deconstructed. If correct, that means *that what we have here is probably logographic writing, not syllables.* To verify this, Ferrara and Cristiani (2016) extended the analysis to all the formulaic patterns that we find on seals, to see if such readings should, and could, be extended. There are half a dozen more such formulas (Table 7.1, in descending order of frequency). The third most common formula is the famous ‘gate + leg’ (), mostly but not always followed by a three-branched plant (). Arthur Evans (1909: 265 ff.) interpreted this formula as a mark of princely status: the ‘leg’ (), as that of a ‘Leader’, and the ‘gate’ () the sign of a ‘Guardian’). Rather more soberly, when examining its appearances on seals (Table 7.4), the ‘gate formula’ clearly generally behaves in a more linear manner—that is, as a sequence of signs to be read consecutively, rather than as single signs, meant to be isolated from each other. Compared to ‘trowel-eye’ () and ‘trowel-arrow’ (), it does look, quite literally, straightforward, as if meant to be read.

Returning to the seal from Myrtos-Pyrgos (Figure 7.6), in addition to the ‘trowel-eye’, the seal bears two more identified formulas: the ‘gate + leg + three-branched plant’ (), which, for convenience, I simply call the ‘gate formula’. And it also has the fourth most common formula (see Table 7.1), composed of the ‘template’ + ‘pronged instrument’ signs ()—usually, but again not always, ending with the three-branched plant; the ‘template formula’. Obviously, both the ‘gate’ and ‘template’ formulas have a lot more activity on their seal faces than just the dry signs themselves. What I would like to stress in this chapter, however, is that the ‘template formula’ is almost always partnered with the ‘gate formula’. There are altogether sixteen seals with the ‘template formula’, and thirteen of them share the seal with the ‘gate formula’. In other words, the great majority of seals with the ‘template formula’ must work, in some sense, with the ‘gate formula’. The opposite, however, is not true. The ‘gate formula’ frequently appears on its own and does not have the ‘template formula’ with it. So, it seems reasonable to hypothesize that the function of the ‘template formula’ all but requires the

Table 7.4 Attestations of the ‘gate-leg’ formula

Formulas (038-010) and (038-010-031)	
Aligned, ‘linear formula’	#162, #169, #195, #242, #248, #250, #254, #257, #258, #261, #263, #269, #270, #274, #279, #284, #293, #299, #300, #302, #312, #314
Decorative or supplementary elements in *initial* position	#288
Decorative or supplementary elements in *in-between* position	Petras TSK05/259c
Decorative or supplementary elements in *final* position	#275
Sign rotated or ‘cartouched’	#257, #309
×	#265, #271, #272, #298

Source: Ferrara and Weingarten (2022: 116, tab. 3) additional presence of the 'gate formula'. Whatever job, or rank, the 'template' represents, it seems to need additional support from the 'gate formula'. But not the other way round. What we can surmise is that the two sequences often work in combination and that, together, with 'trowel-eye' ( ) or 'trowel-arrow' ( ), they create a hierarchy of functions.

But the big question, of course, is: to what extent is Cretan Hieroglyphic *on the seals* involved in language notation? Despite the presence of highly iconic symbols, such as the trowel sign, there is no reason to assume that the Cretan Hieroglyphic script on the seals was not already at the stage of language recording. How the seals might work can be elucidated by a sign that was mysteriously expunged from the repertory of signs in *CHIC*: that is the cat sign, which not only should be reinstated in its own right but can also give us an avenue into explaining what category it may represent.

We can be certain that this sign on the seals is a phonogram that has a long life throughout the Aegean tradition of scripts, ending up as our deciphered *ma* syllabogram of Linear B, where it is also used in the LANA or WOOL (*MA+RU*) logogram, having passed from Cretan Hieroglyphic through Linear A. Its genealogy can be reconstructed diachronically and phonologically. There is every reason to believe that *ma* was exactly what a Minoan cat would say, an unsurprising example, perhaps, of onomatopoeia at work.

One of the most beautiful seals in Minoan glyptic, the Lasithi(?) carnelian cat seal (Figure 7.7, *CMS* VI 93, *CHIC* #257), now in the Ashmolean Museum, is our model: this three-sided prism contains both the 'template formula' and the 'gate

Figure 7.7 *CMS* VI 93 = *CHIC* #257 from the 'Lasithi district'
Source: AM 1938.791; photograph © courtesy of Ashmolean Museum.

formula'—like the Myrtos-Pyrgos four-sided prism—but now with the CAT plump in the middle of the 'gate-leg formula'; in fact, the 'gate' sign () has been rotated to make a platform on which the cat seems to be sitting. I would be willing to wager that the CAT is already saying '*ma*'; and that it could already be a logogram connected with Cretan wool, the precursor of the Linear A WOOL sign, as will be argued in the following section.

The Late Minoan I Cat

We now advance some fifty to one hundred years (*c.*1700 BCE) when another script, Linear A, began to be used across the island. The Cretan Hieroglyphic script has essentially disappeared, and with it has gone the concept of script on seals. All written documents, whenever they appear, are now written in Linear A. In addition to tablets, there is a rich variety of sealed clay documents, including the Minoan roundel, a document unique to Minoan culture (Figure 7.8).

Roundels are flattened clay discs, with (usually) a very brief Linear A inscription on one or both sides and one or more seal impressions on the rim. The documents are coeval with Linear A administration: they appear along with the script in Middle Minoan IIB and vanish after the Late Minoan IB destructions. Most of the *c.*182 published roundels are stamped by a single seal-type—once or repeatedly—with the number of impressions varying from one to fifteen. They are generally interpreted as receipts for commodities, the recipient of goods acknowledging units of 'debt' by marking the rim of the roundel with the

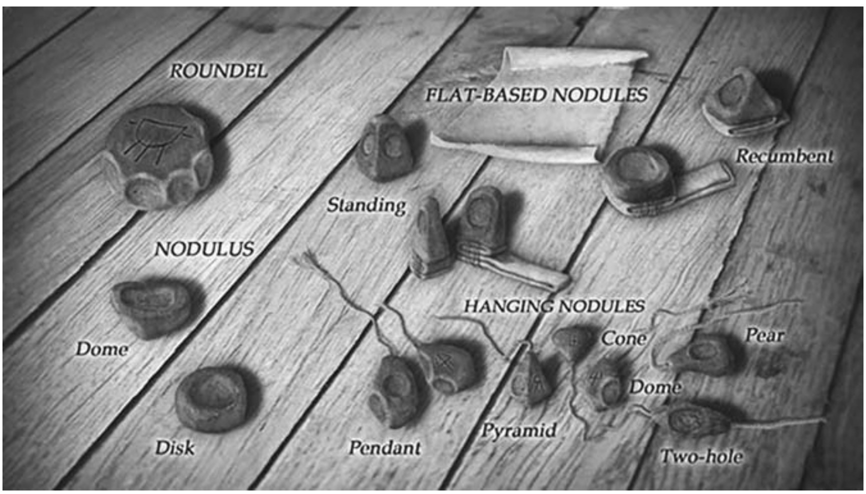

Figure 7.8 Minoan Neopalatial sealed documents
Source: Krouklidis (2016: 25, fig. 5).

equivalent number of seal impressions, thereby accepting responsibility for removing that number of units from palatial or villa storerooms (Hallager 1996: 117, with citations). Or, on the contrary, as I have recently argued, they might rather be marking the *entry* of these goods into those storerooms (Weingarten 2017).

Two sealstones that stamped roundels at Late Minoan IB Khania in western Crete may provide a breakthrough in our understanding of these Minoan documents. The two seal-owners were specialists: their extant roundels show them dealing with only a single type of cloth, described by the rare logogram AB 164: one used a soft-stone lentoid depicting a butterfly (Figure 7.9(a); *CMS* VS 1A 169), which was stamped on eight surviving roundels (one to five times each), all roundels marked with the logogram *164; the second seal was a soft-stone amygdaloid of slightly irregular shape (Figure 7.9(b); *CMS* VS 1A 165), with the image of a flying bird; in front of the bird is an enigmatic cone-shape object with protruding 'horns'. This seal-owner stamped four (or five?) roundels, three fully preserved with three to five seal impressions each and a fragment with at least two impressions; all are inscribed with the same ideogram *164.

Because logogram *164 survives into Linear B, we can glean some information from a later record at Knossos (KN L 520 in Figure 7.10).

Tablet KN L 520 shows three records of wool and some sort of cloth represented by logogram *164 (Del Freo et al. 2010: 353). It probably means that at three villages a total of fifty-four units of wool were 'made into' or 'woven for' nine cloths of *164 type (Lane 2012: 99, n. 123). Since one Mycenaean unit of WOOL weighed *c.*3 kg, it obviously required six units (18 kg) of WOOL to produce one unit of *164. Assuming that the proportions in earlier times were the same,

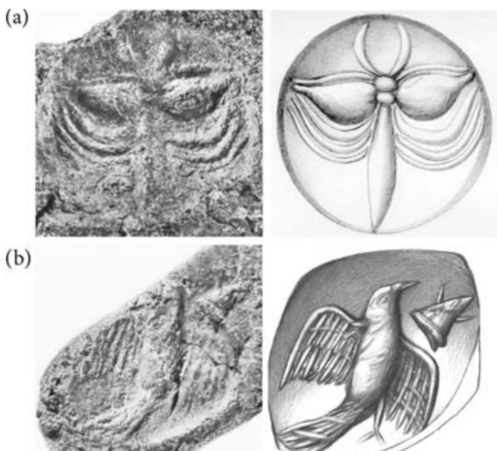

Figure 7.9 *CMS* VS 1A 169 (a) and *CMS* VS 1A 165 (b)
Sources: Photographs and drawings courtesy of the *CMS* Heidelberg.

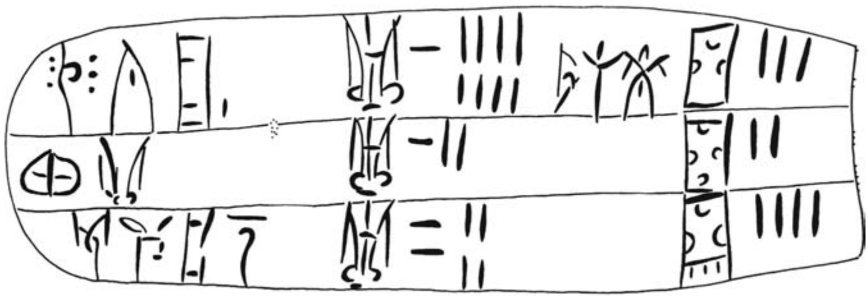

Figure 7.10 Drawing of Linear B tablet KN L 520
Source: Del Freo et al. (2010: 362, fig. 17.22).

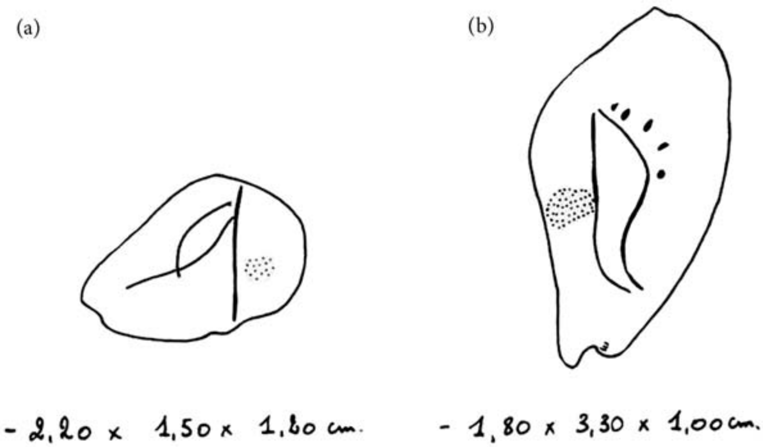

Figure 7.11 (a) A 301 on KH Wa 1011; (b) A 74 on KH Wa 1010
Source: GORILA 3.

the Late Minoan I owner of the butterfly seal and the owner of the bird seal would have needed some 250–300 kg of WOOL to make the thirty pieces of cloth marked on their roundels.

In addition to impressing roundels marked with *164, the butterfly seal *also* stamped eight hanging clay nodules (see Figure 7.8), each inscribed with a single Linear A sign: two were marked with sign A 301 (Figure 7.11(a)) and six with A 74 (Figure 7.11(b)). This is the only seal-owner at Khania whose documents were inscribed with these particular signs; indeed, inscribing clay nodules with any sign(s) at all is rare at Khania.

We have no information on the meaning of the signs, not even whether they are used as logograms or abbreviations. However, the same combination of A 301 and AB 74 is very well known from Late Minoan IB Ayia Triada, where about 70 per cent of the more than one thousand stamped clay nodules were inscribed—most commonly with one of six Linear A signs—which cluster into just two groups (Weingarten 1987: 15–17). Group II uses these same two signs, A 301 and AB 74—one or the other on their nodules, never the two together. Apparently, members of Group II work with just two signs, or two product(s), or in two specialist storerooms; and the procedure looks exactly the same at Khania. At Khania, however, we now have an *added* link through the butterfly seal, which stamped hanging nodules marked with A 301 and AB 74 but also roundels featuring (only) *164 CLOTH. Naturally, one wonders whether signs A 301 and AB 74 were also connected with textiles in some manner. The evidence is quite indirect, but surprising, nonetheless. The butterfly seal and the bird seal, as we have seen, exclusively handle the same cloth product *164 on roundels.

It may be no more than coincidence that well over half of Group II nodules at Ayia Triada—133 of 238 nodules—also happen to be stamped by a seal with the image of a flying bird (*CMS* II.6 110). But what *cannot* be coincidence is the enigmatic horned object floating before the Khania bird, which strongly resembles the Linear A sign, AB 80 (see Figure 7.9b),[3] that is the Linear A syllabogram *ma*, and the clear 'descendent' of the Cretan Hieroglyphic cat-mask. In Linear A, *ma* combines with *ru* to make a monogram, A 559, spelling out the Minoan word *MA+RU*, which is used as the logogram for wool.[4] The monogram survives into Linear B as logogram *145/LANA (Salgarella 2020: 33), hence our certainty that we are dealing with wool.

In short, this seal-owner put the sign of his trade on his seal: whether this was as an abbreviation or an emblem, he deals in WOOL or woollen goods. So, we can be reasonably sure that the seal-owner was regularly dealing with WOOL (some of which, at least, would be turned into *164 CLOTH). A 'trademark' on a Minoan seal is unique. Recalling the Cretan Hieroglyphic seals we examined above (the jasper four-sided prism from Myrtos-Pyrgos (see Figure 7.6) and the carnelian three-sided prism (see Figure 7.7)): both have 'full-bodied cat' () signs as well as the 'gate-leg-plant' () and 'template' formulas (), but the Myrtos-Pyrgos seal, with four engraved sides, has an whole extra side of information (its side b/c 4). Usually, signs on side δ of prisms do not match any other known sign-groups; hence, they are thought to represent something like personal names or local villages, or in some way refer to different individuals. Side δ on the Myrtos-Pyrgos prism is also a hapax (CH 042-040-053-041). The final sign, CH 041 (), is the sign for CLOTH, possibly a phonogram as transcribed by *CHIC* #309. Holistically seen, however, it is separated from the previous two signs by their

[3] Also independently noted in *CMS* VS 1A 165, p. 168.

[4] Apparently, *ma* can also appear alone, possibly as an abbreviation or even the logogram for 'wool': most pertinently, the Late Minoan IA ostracon THE Zb 5.1 (Michailidou 1995: 11–12, 18); also on Late Minoan IB tablets HT 110.b.5, HT 146.3. The Minoan word *ma-ru* probably survives in the later Greek *μαλλός* 'tuft of wool' (cf. also Hsch *μάλλυκες· τρίχες*) (Salgarella 2020: 33, n. 94).

rotation (180° and 90°, respectively) and also interrupted by a large triangular 'filler' (and possibly the cross-hatching above CH 053); at the very least, it cannot be said to be 'aligned together in coherent succession', which makes it a strong candidate for a self-standing logogram. So, I suggest that this seal is telling us, as clearly as it can, that its owner deals with wool (i.e. side α: the CAT sign, whether an acrophonic abbreviation or an emblem) and also produces CLOTH (Side δ: the CLOTH sign).

Its message, therefore, is similar in a very real way to that on the Late Minoan I bird-seal, which also has a specialized cloth sign (*164) incised on his roundels and whose seal is also marked with the cat-mask icon for WOOL (AB 80). That seal, in turn, has business, at least indirectly, with the butterfly seal whose eight roundels are also exclusively marked with *164 ()—the only two seals at Khania to deal with this type of CLOTH; and whose eight hanging nodules (all inscribed with A 301 or A 74), suggests the possibility of the textile implications of these signs in Linear A administration. More is bound to follow, but, for now, we can say that the Cretan Hieroglyphic cat has jumped out of the bag.

8

The Phaistos Disc

Placing an Enigmatic Artefact in its Cultural Context

Giorgia Baldacci

Introduction

The Phaistos Disc (Figure 8.1) is one of the most iconic objects of Minoan material culture, its reputation resulting from its uniqueness and its enigmatic nature, as it is of a peculiar appearance and displays an undeciphered script.[1] Owing to the disc's utter uniqueness in every way, many contrasting views and theories on the artefact have developed. On the one hand, the disc has attracted enthusiasts of mysterious objects, who have dabbled in interpretations and decipherments, many of which are pseudo-scientific or sometimes quite esoteric.[2] On the other hand, in academia, the disc has sometimes been regarded with suspicion;[3] more than once since its finding, the object has been considered a forgery.

Although we lack scientific analysis of the artefact, such as thermoluminescence, that could offer final answers,[4] some key aspects about the disc can be clarified by

This chapter is the elaboration of the SCRIBO Seminar held online in October 2020. I would like to express my gratitude to Silvia Ferrara, Barbara Montecchi and Miguel Valério, for inviting me to take part in the seminar and to contribute to the present volume. My warm thanks go also to Alessandro Sanavia, for giving me permission to use his photographic and graphic documentation pertaining to the Impressed Fine Ware from Phaistos.

[1] Many decipherment attempts have been proposed, but not one can be considered sufficiently safe, owing to the lack of other documents written with the same system: actually, a meaningful analysis would require a good number of documents, in order to substantiate the reading and verify its validity (see Godart 1994: 136–40). For a critical review about the disc's decipherment attempts, see Duhoux (2000).

[2] An exhaustive treatment regarding the proposed decipherments and interpretations of the disc would require a separate discussion. Just to give an idea, in the Wikipedia webpage *Phaistos Disc decipherment claims* (https://en.wikipedia.org/wiki/Phaistos_Disc_decipherment_claims) there are listed eighteen decipherment attempts in six different languages plus some interpretations of the script as ideographic writing. Moreover, there are some interpretations of the signs of the disc as not belonging to an actual inscription: see Whittaker (2005: 32, 36 and 2013, 108 - pseudo-writing) and Pomerance (1976 - astronomic calendar).

[3] The disc, despite its fame, is not even much mentioned in Aegean Bronze Age handbooks (Cucuzza 2015: 96).

[4] Such analyses would require the destruction of a small sample of the disc and the Museum authorities will not grant permissions.

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 DOI: 10.1093/oso/9780198908746.003.0009

Figure 8.1 The Phaistos Disc, side A (left) and B (right)
Source: Pernier (1909).

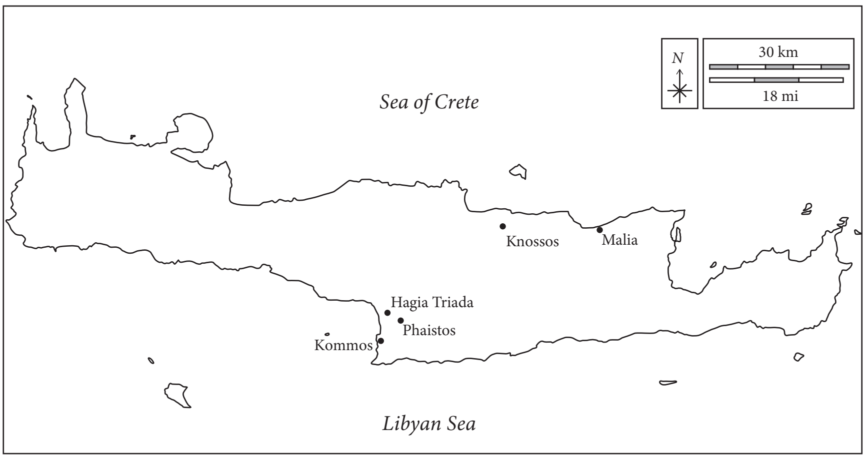

Figure 8.2 Map of Crete, with the location of the sites mentioned in the text

looking at the archaeological record of the site where the object was found—namely, Phaistos, one of the most considerable Minoan palatial sites, located in southern Crete (Figures 8.2 and 8.3). Recent research on the Protopalatial material culture of the site has shown that there do exist some elements that allow a better contextualization of the disc, thus (1) qualifying the item as an authentic Minoan object, and (2) clarifying its chronological context.

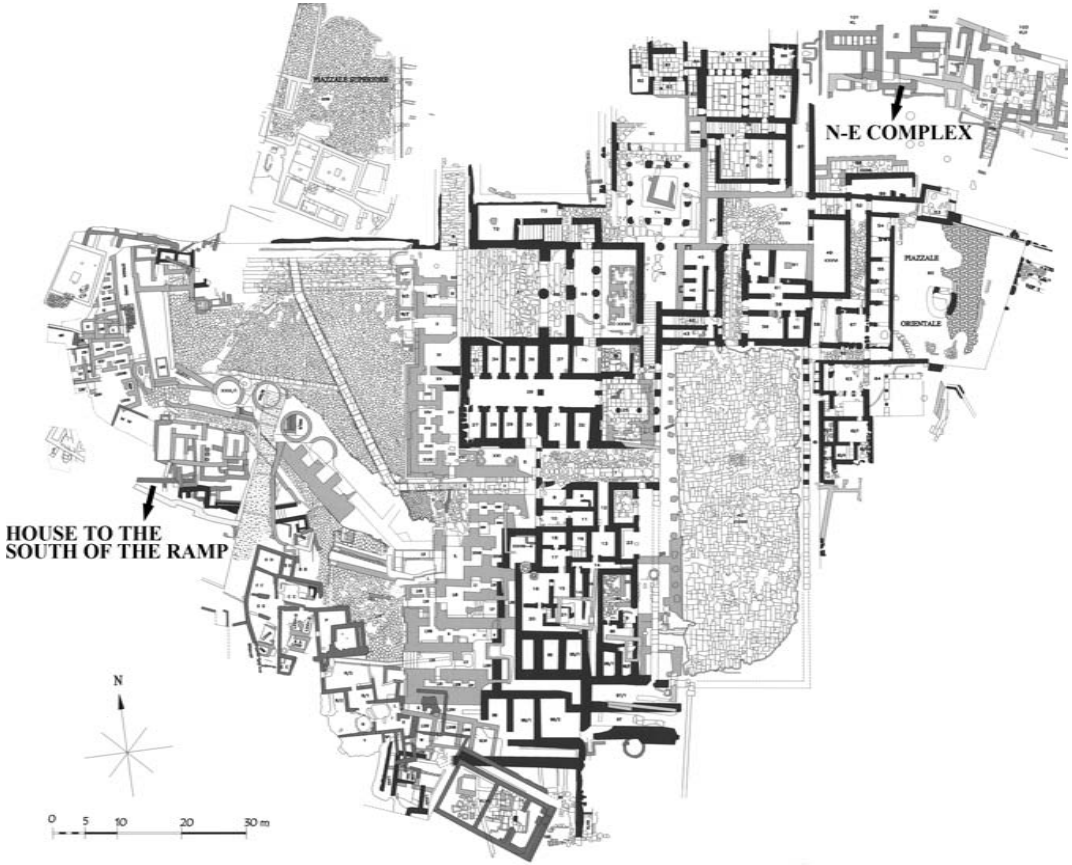

Figure 8.3 Phaistos, map of the site
Source: Courtesy of the Centro di Archeologia Cretese.

The Find-Place of the Disc: Old and New Data

The mystery and allure that surround the disc are only enhanced by the circumstances of its discovery, as it was not recovered during regular excavations. The disc was found in 1908, during the fieldwork activities carried out by the Italian Archaeological Mission, at the time under Luigi Pernier's direction (Pernier 1909). It was spotted after the completion of the daily excavation, during an evening inspection by the local foreman, Zakarias Iliakis.[5] The disc lay in the so-called North-Eastern Complex,[6] located next to the north-eastern edge of the palace (Figure 8.3). More precisely, the artefact was found in Room 101, an L-shaped unit, with its northern segment comprising seven cists (called 'casselles' by the excavators) defined by mudbricks (Figure 8.4). New studies on the building suggested that Room 101 had an industrial function and was used for processing liquids, an activity

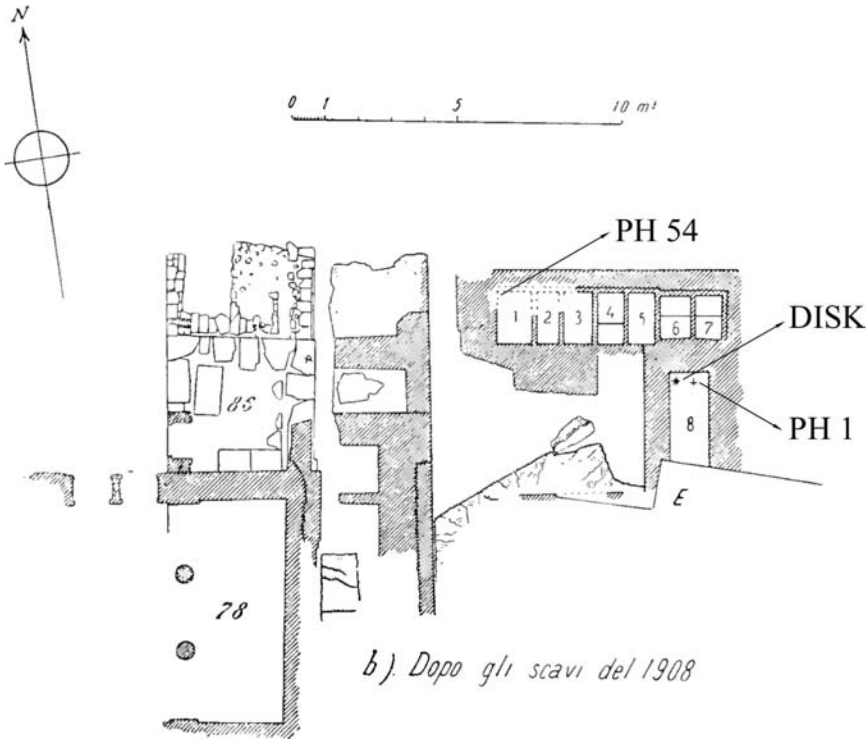

Figure 8.4 Plan of Room 101, Phaistos
Source: Pernier (1909), reworked by the author.

[5] For the detailed circumstances of the recovery, as reported in Pernier's daybook, see La Rosa (2009) and (Cucuzza 2015: 101–2).

[6] The complex was discovered with some test pits during the 1901 and 1903 campaigns and then quickly investigated after the disc's discovery in 1908 (Pernier 1904: 379; 1909; 1935: 353–81).

probably connected to textile production (Baldi 2012; Militello 2014: 156; 2015: 291; La Rosa et al. 2015: 445, 447). The disc lay in the east part of the room, in the north-western corner of space 8, as numbered by Pernier (1909: 257, 261; Carinci and La Rosa 2013: 116). The stratum in which the object was found was a destruction level, disturbed during the Hellenistic times. Luca Girella, in his reassessment of the Middle Minoan III pottery from Phaistos, on the basis of the material published by Pernier, showed that the bulk of the pottery coming from the level was homogeneous, dating to a mature stage of Middle Minoan IIIA.[7]

Recent fieldwork, carried out in 2013 and 2015 by Pietro Militello (2015: 255–92; see also La Rosa et al. 2015: 445–7), offered new clues about the context in which the disc appeared. A fragment of a Linear A tablet (PH 54) was identified in Room 101, inside the room's westernmost cist, at the north-western corner of the building (Militello 2014) (see Figure 8.4). The area had already been excavated, and the context in which the tablet was found was a fill from the old excavations. Such fill was nonetheless deemed meaningful, as it was the habit of the first excavators, when circumstances dictated, to refill an area using the very earth and pottery fragments that shortly before had been removed from the area itself (Militello 2014: 156; 2015: 264). Militello has therefore argued that the new tablet was part of the original deposit of the room, and that to this original deposit belonged also the Linear A tablet PH 1 (Pernier 1909: 261; *GORILA* I, 286–7, no. PH 1), which was found here together with the disc by Pernier, just a few centimetres distant (see Figure 8.4). The pottery that the new tablet was associated with was shown to be substantially homogeneous—dating to a mature stage of Middle Minoan IIIA (Militello 2014: 158; 2015: 272), which is coherent with the chronology proposed by Girella for the deposit of Room 101, as previously published by Pernier.

The Disc: A Unique Object

The disc shows a mix of features that make it a singular object (see Figure 8.1).[8] It has a unique circular shape (Duhoux 1977: 17; Whittaker 2005: 33), with a diameter of 16 cm, and is 2 cm thick. It is made in fine clay, arguably baked intentionally (Pernier 1909: 271; Whittaker 2005: 33; Flouda 2015a: 80), thus differing from the preserved Linear A and B tablets, which were made in raw clay and only accidentally became fired. It is stamped on both sides, and the inscription follows a spiral pattern. The incised spiral, which serves as a guide for the inscription, runs from the periphery to the centre (Pernier 1909: 272–3; Godart 1994: 47–51). Some

[7] Girella (2010: 59–61, Deposit 4a, and 52, table 4). For general observations about the chronology of the building, see Carinci and La Rosa (2013).

[8] For an in-depth description and discussion of the disc's features, see Pernier (1909); see also Della Seta (1909); Evans (1909); Duhoux (1977); Godart (1994, 2009). For an excellent photographic documentation, see also Olivier (1975).

small vertical lines define sixty-one fields that contain groups of signs, with between two and seven elements in each. Such signs, in total 242,[9] are made from 45 different stamps (Duhoux 1977: 37–8) (Figure 8.5).[10] Besides the stamped symbols, that seem to be naturalistic representations of living beings or of objects, there is an oblique line incised on the lower part of certain signs located at the end of a group (Duhoux 1977: 36–7; Godart 1994: 60) and five dots at the

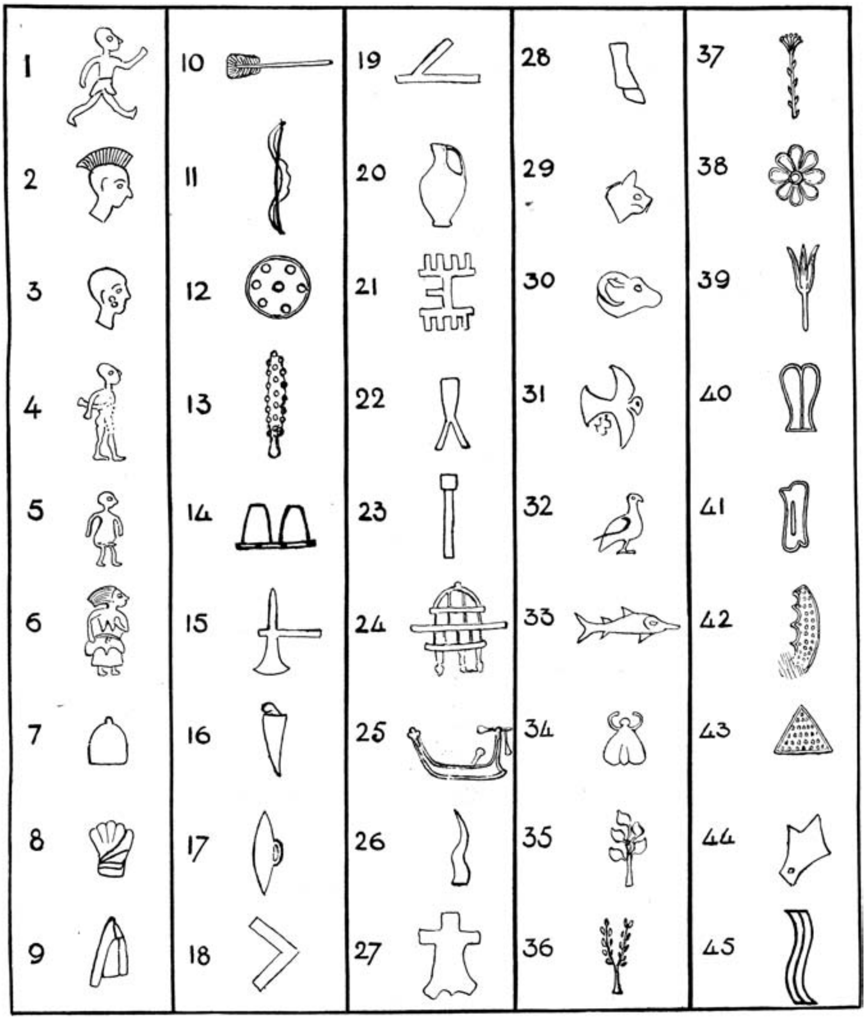

Figure 8.5 Signs on the Phaistos Disc
Source: Evans (1909).

[9] In Duhoux (1977: 36) and Flouda (2015a: 80) there are 241 signs mentioned.
[10] No such stamps have been found, and the material used is debated: see, e.g., Neumann (1968: 28); Godart (1994: 81–3; 2009: 194).

beginning of both faces (Godart 1994: 51; Duhoux 2000: 597). The number of the signs used, forty-five, much lower in comparison to those required by an ideogrammatic system, identifies the Phaistos Disc script as a phonetic syllabic one (Godart 1994: 139; Duhoux 2000: 597). The signs were read following the incised spiral, from the exterior to the interior—that is, from right to left.[11]

The Disc and the Archaeological Record from Phaistos: An Object in its Context

The uniqueness of the disc as well as the knowledge that its discovery lacked clear contextual and chronological data has condemned the disc to be considered a forgery, more than once since its discovery (Anastasiadou 2016: 17–18). This view was voiced again in 2008 by Jerome Von Eisenberg in a series of articles and lectures that reached a large audience (Eisenberg 2008a, 2008b, 2009). In Von Eisenberg's opinion, it was Pernier, director of the excavations at Phaistos, who got a forger to make the disc, as he was jealous of the epigraphical discoveries then occurring in other archaeological sites, such as Knossos and Gortys (Eisenberg 2008a: 10). To make the disc, Pernier took his inspiration from an Etruscan object (Eisenberg 2008a: 10), the Magliano Disc found in 1882 (Milani 1893); like the Phaistos Disc, this is characterized by an inscription written following a spiral pattern. The weaknesses in Eisenberg's argument have already been discussed from different perspectives by various authors, proving conclusively the illogicality of considering the disc as a fake on the grounds he proposed (La Rosa 2008, 2009; Hnila 2009; Cucuzza 2015; Anastasiadou 2016). Moreover, the study of the Protopalatial clay artefacts of Phaistos, in particular of the pot-marks (Baldacci 2017a) and of the Impressed Fine Ware (Sanavia 2017), has led to the identification of some clues that point to the fact that the item is an authentic Minoan artefact, and that clarify its chronological context.

One of the forty-five signs of the Phaistos Disc—no. 21, the so-called comb sign (Godart 1994: 107) (see Figure 8.5)[12]—has been found as a pot-mark on one bowl (F 4718) found in the 1960s at the site of Phaistos (Levi 1976: 500, pl. 184 g–h; Levi and Carinci 1988: 27, pl. 14 k–l; Baldacci 2017a: 69–72) (Figures 8.6 and 8.7).[13] Relief pot-marks (Baldacci 2017a: 65–9) (Figure 8.8) are to be found on semi-coarse vessels, generally plain or simply painted with bands in dark-on-light, while they are usually absent on the well-known Kamares fine ware, painted in polychromy on a dark background. Vases with relief pot-marks come from the

[11] Della Seta (1909: 12–14) was the first showing the peculiarities that demonstrate that the disc was stamped from the exterior to the interior; see also Godart (1994: 46–60; 2009: 193–4).

[12] The definition of 'comb' for the sign must be taken as conventional, as, on the basis of the known archaeological record, it is not possible to ascertain whether the sign represents a comb or an actual object at all (see Baldacci 2017a: 72, with n. 49).

[13] The bowl is now at the Archeological Museum of Herakleion (inventory no. 126310).

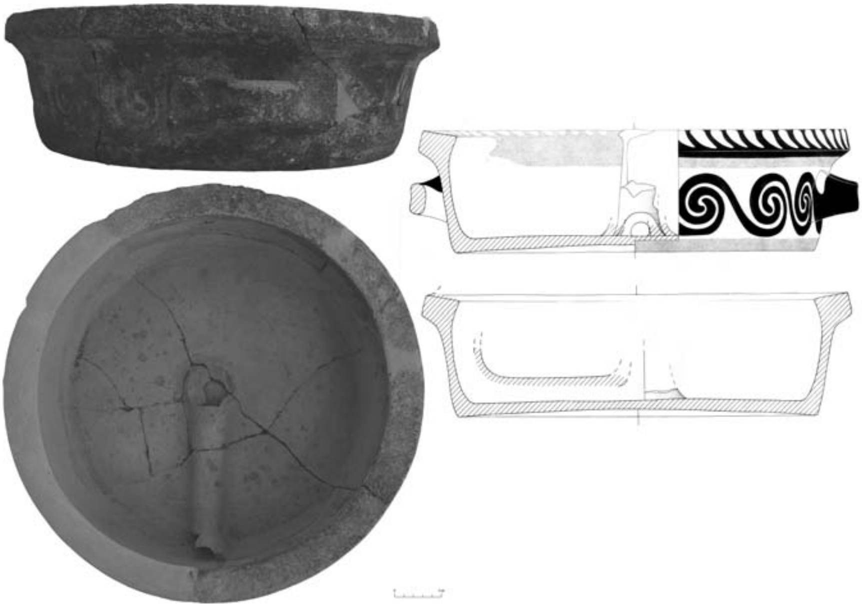

Figure 8.6 Bowl F 4718 from Casa a Sud della Rampa, Phaistos
Source: Photo by the author; drawing by G. Merlatti.

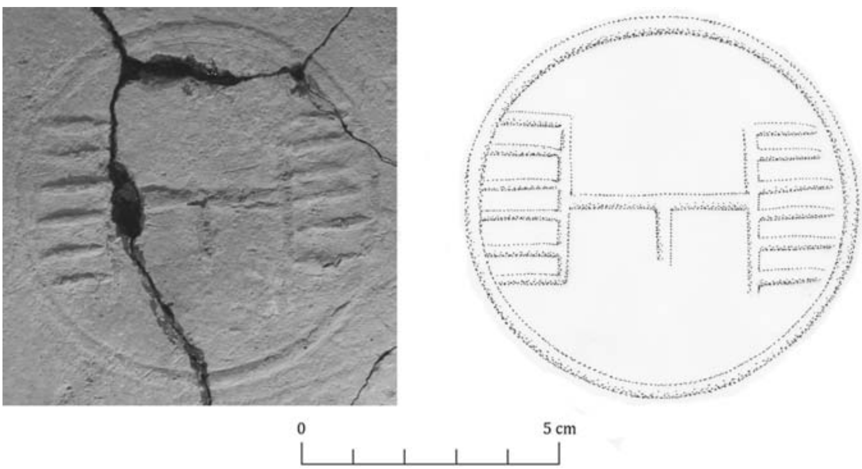

Figure 8.7 Detail of the mark with the 'comb' sign on the bottom of bowl F 4718
Source: Photo by the author; drawing by G. Merlatti.

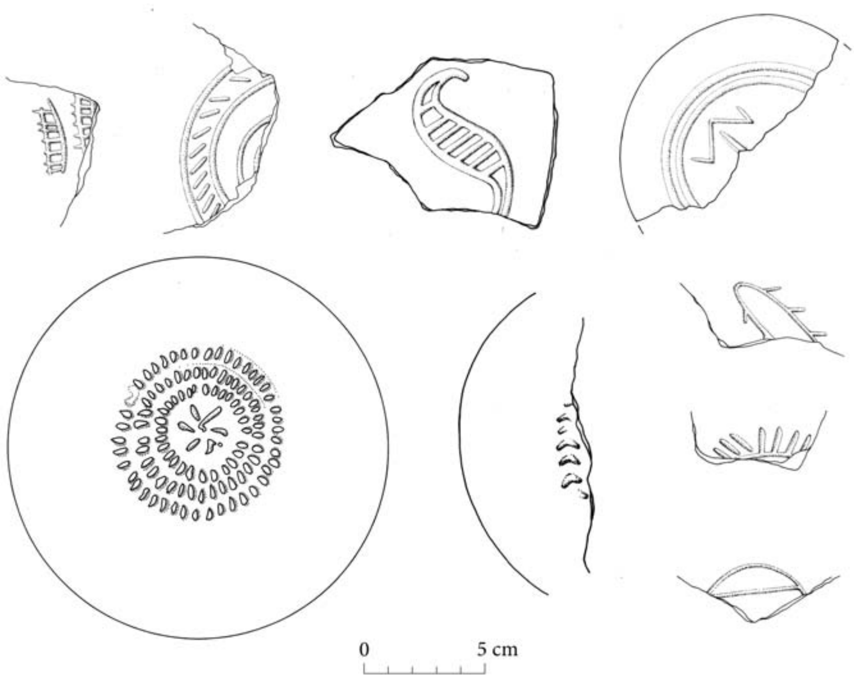

Figure 8.8 Examples of relief pot-marks from Hagia Triada
Source: Drawings by G. Merlatti.

three most important sites of the Western Mesara, which share the same ceramic tradition: Phaistos,[14] Hagia Triada (Baldacci 2013), located 3 km from the former, and Kommos (Van de Moortel 2006: 299–300, 308, 345–6, pls 3.17A and B, nos Ja/45, Ja/46, Ja/47, Je/30, Je/31), further off and a port overlooking the Libyan Sea (see Figure 8.2). Other examples are found in the palatial centre of Malia, on the north coast of the island (see Figure 8.2).[15] The appearance of such marks is basically restricted to the Protopalatial era, being attested in the Mesara area in all the ceramic phases of the period (Middle Minoan IB, Middle Minoan IIA, Middle Minoan IIB). Afterwards, the practice seems to disappear. The pot-marks are mostly badly preserved, owing to the partial preservation of the pots and to the flaking of their surface. They consist of quite elaborate motifs left in relief on the external base of the vases, formed from contact with the uppermost part of the wheel-head arrangement (the so-called bat), which bore the sign incised (in negative).[16]

[14] A *corpus* of the relief pot-marks from Phaistos is currently in preparation by the author.

[15] Quartier Mu: Poursat et al. (1978: 106–16, nos 58–81); Poursat (1996: 176–8, nos 332–7); Sanctuaire Middle Minoan II: Poursat (1966: 536); Maison des morts: van Effenterre and van Effenterre (1963: 95, pls XI, XXXV).

[16] For the functioning of this type of potter's wheel, see Evely (2000: 283, 274, fig. 111, type 2). For the use of the 'bat', as observed in the Cretan traditional potters' workshops, see Baldacci (2017a: 66, n. 7).

Relief pot-marks are considered as indicators of the craftsmen or workshop that produced the vases and occur equally on widespread and quite standardized shapes, and on specialized shapes, sometimes indeed on one unique shape within the whole corpus. Among the Phaistian vessels that are a *unicum* and bear a relief potter's mark is the aforementioned shallow, handled bowl F 4718 (see Figure 8.6 and Figure 8.7), found in 1965 in the *Casa a Sud della Rampa* (House to the South of the Ramp) (Levi 1976: 489–505; Carinci 2001; Girella 2010: 68–81, with pls 5–15). This building, excavated under the direction of Doro Levi, is located in the Quarter to the South of *Piazzale* I—that is, the Middle West Court of the Palace (see Figure 8.3). The pot is characterized by a peculiar feature: a semi-cylindrical pipe of clay on its inside, which starts at the rim and runs to the centre of the bottom, where it ends with its mouth facing upward. Unfortunately, both the ends of the pipe are broken, thus preventing one from understanding how the device worked. The bowl exterior is decorated in polychromy on a dark surface ('Kamares style') with a running spiral, while the mark is located on the external bottom, which is unpainted. The mark on the bowl from the *Casa a Sud della Rampa* comprises two elements: an external circular border of 7.5 cm diameter and a motif inside it. The motif is composed by a central 'T' element, with a short vertical bar, and at each end of the horizontal bar is placed vertically a 'comb' element.[17]

The bowl with the 'comb' pot-mark was found in Room LXXXVII of the *Casa a Sud della Rampa*, whose material is dated to Middle Minoan IIIA early—that is, the very beginning of the Neopalatial phase (Girella 2010: 68–70, deposit 6a, with pls 5–6, and 54, table 4). As far as the chronology of the vessel is concerned, we have two ways of considering it. We can assume that the bowl is dated to Middle Minoan IIIA early, like the pottery of the assemblage it belonged to, or that it was produced in Middle Minoan IIB, continued to be in service also during the very next ceramic phase, and was then discarded in the Middle Minoan IIIA early deposit in which it was found. The latter hypothesis is likely, as the manner of manufacture and decoration of the bowl fit better with Middle Minoan IIB (Baldacci 2017a: 72),[18] and because there are no other marked pots coming from safe Middle Minoan III contexts (Baldacci 2017a: 71–3). If the vessel is instead considered as actually being made in Middle Minoan IIIA early, it would then represent the last known product to carry a relief mark, as no specimens with this feature have been retrieved in contemporary or later deposits.

The 'comb' pot-mark on the shallow bowl from the *Casa a Sud della Rampa* is basically identical to the so-called comb sign on the Phaistos Disc, appearing

[17] This motif is called 'comb' conventionally because there is not a clear correspondence between this sign and the actual Minoan–Mycenaean combs that are known. See Baldacci (2017a: 74, n. 49).

[18] Some doubts about a Middle Minoan III chronology for the vessel have been expressed by Carinci (in Levi and Carinci 1988: 27).

twice on side A of the artefact (see Figure 8.1 and Figure 8.5). In both cases it is the last sign (with a right to left reading) of an identical sequence composed of seven symbols.[19] Moreover, a very similar sign is found as a seal impression on the sealing CMS II.5, no. 246 (Pini 1970) (Figure 8.9), also coming from Phaistos, from the so-called *archivio di cretule* (Fiandra 1975; Levi 1956: 261–7; 1957–8: 7–26; 1976: 385–92; Militello 2002: 55–62, app. I, 80–4). This is a deposit of administrative documents discovered in 1955, which consisted of a total of around six thousand pieces, including sealings and Linear A tablets, found in the Protopalatial levels beneath Room 25 of the Second Palace of Phaistos.[20]

As the same 'comb' motif, with its particular and complex shape, is found three times with only minor differences (as a script sign, as a seal impression, and as a pot-mark on the bowl) (Figure 8.10), it is possible to deduce that it was a meaningful and specific one.[21] What are the implications tied to the appearance of the same sign on three different artefacts? In the first place, the fact that the disc, the sealing, and the bowl bear the same sign helps prove that the disc is genuine. The disc was found in 1908, while the sealing and the bowl were recovered respectively in 1955 and 1965, during regular excavations. This means that it would have been impossible for a hypothetical forger of the disc, recovered in 1908, to have used the sealing or the bowl as a source,[22] as they were only found decades later.

The presence of the 'comb' sign on three different objects is not the only argument supporting the disc's origin from Phaistos. A study recently carried out by Alessandro Sanavia (2017) on the Phaistos Impressed Fine Ware showed that striking similarities exist between that class of Protopalatial pottery and the Phaistos Disc.

Impressed pots are largely represented by fine-ware vessels (Figure 8.11). Such vases, generally decorated in the Kamares style (polychrome decoration on a dark background), are characterized by an array of stamped decorations of a single element repeated in sequence (Sanavia 2017: 83), serving an ornamental function (Sanavia 2017: 87). The impressions, as on the Phaistos Disc, were made by a stamping device, whose nature is not completely clear, as none of the stamps employed to decorate these vessels has been found (Sanavia 2017: 94–6). Impressed Fine Ware does not appear to have been very widespread, with the majority of specimens coming from the Mesara (again: Phaistos, Hagia Triada, and

[19] Groups A XVII and A XXIX in Della Seta and Godart's numbering. See Godart (1994: 63–9, 107).

[20] On the archive's interpretation as a secondary deposit, see Fiandra (1975: 6) and Weingarten (1994: 278, 290); as a primary *in situ* deposit, see Levi (1976: 388), Kanta (discussion in Kanta and Tzigounaki 2000: 209–10), and Militello (2002: 55–62).

[21] While simple and identical signs (as, for example, lines or crosses) may be found in different times and contexts, or on different media, as a result of quite independent processes, yet with identical and complex signs, like the 'comb' sign, a more specific correlation is supposed to exist. See Sacconi (1987: 374).

[22] The opinion that the sealing with the 'comb' sign was used as a source by the disc's forger is stated by Eisenberg (2008a: 18). Arguments against this hypothesis are in Godart (2009: 203); Hnila (2009: especially 64–5); Anastasiadou (2016: 30–1).

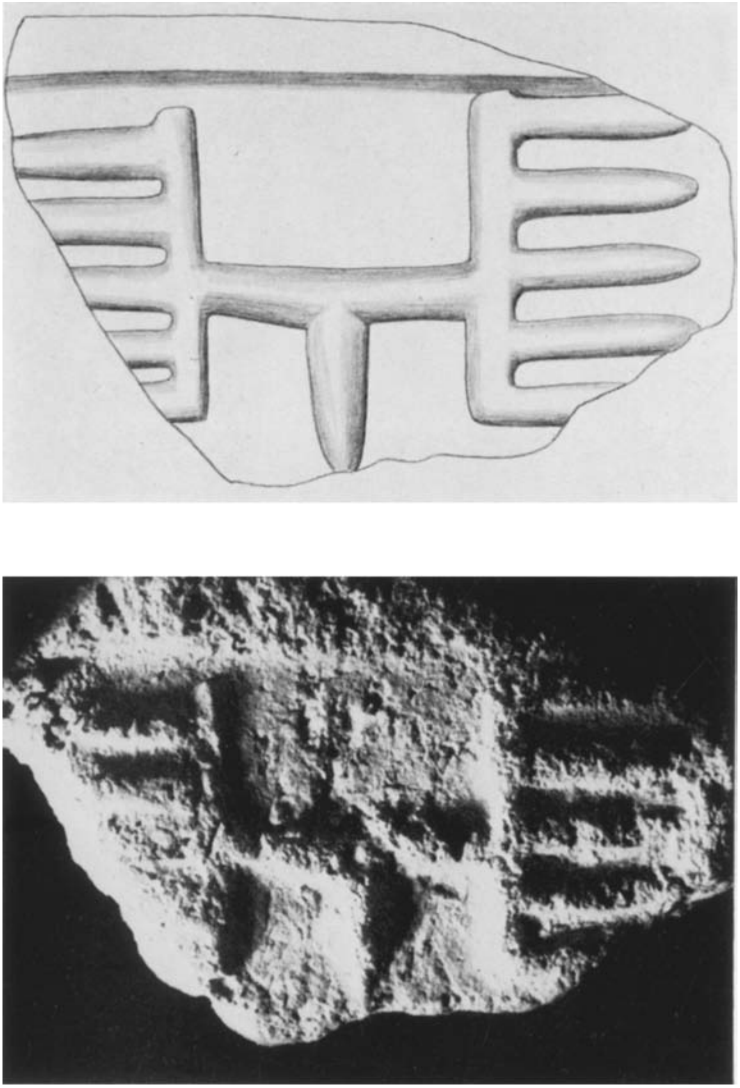

Figure 8.9 Sealing *CMS* II.5, no. 246, from Phaistos
Source: Courtesy of the CMS Heidelberg.

Kommos), and from the palatial site of Knossos (see Figure 8.2) (Sanavia 2017: 83). On the chronological side, this ware is characteristic of the Protopalatial period, with the first attestations appearing during Middle Minoan IIA and achieving a production on a wide scale in Middle Minoan IIB period (Sanavia 2017: 84–5).[23] Subsequently, for the beginning of the Neopalatial period (Middle Minoan IIIA),

[23] For the first Middle Minoan IIA specimens, see Baldacci (2017b: 169).

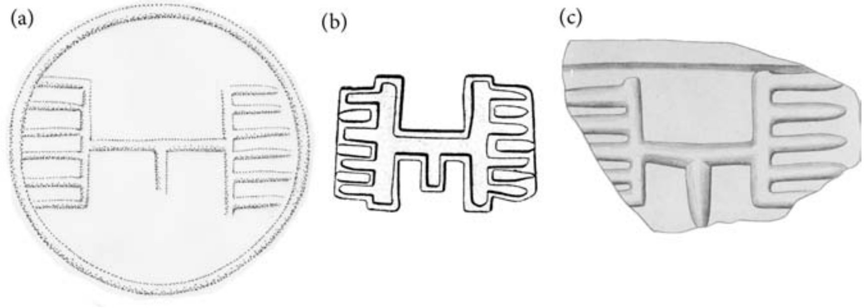

Figure 8.10 ‘Comb’ sign on bowl F 4718 (a), on the Phaistos Disc (b), and on sealing *CMS* II.5, no. 246 (c)

Sources: (a) drawing G. Merlatti; (b) Pernier (1908); (c) courtesy of the CMS Heidelberg) (not to scale).

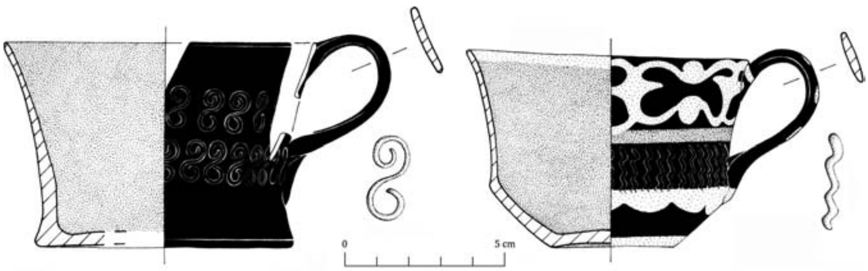

Figure 8.11 Impressed Fine Ware: two cups from Phaistos

Source: Drawings courtesy of Alessandro Sanavia.

only some poor examples have been identified. Vases and fragments recovered at Phaistos and Hagia Triada, gathered and studied by Sanavia, show some two hundred different signs, mainly of a geometric type; others come from the natural world (plants, rarely animals, and some types of seashell-like patterns); furthermore, it is possible to detect some representations of special objects, like double-axes (Sanavia 2017: 86).

The Impressed Fine Ware shows an interesting parallel with the Phaistos Disc, both in technical aspects—that is, the impressions made by a stamping device—and because of the presence of similar images. Sanavia found striking comparanda on Impressed Fine Ware for six Phaistos Disc signs (Figure 8.12): the ‘ram’, sign no. 30; the ‘cat head’, sign no. 29; the ‘fish’, sign no. 33; the ‘rosette’, sign no. 38; the so-called strainer, a triangle filled by dots, sign no. 43; the female figure, sign no. 6 (Sanavia 2017: 89–94). Moreover, a parallel exists between the so-called shield, a circle filled by dots, sign no. 12, and the impressions on a teapot from Knossos (Anastasiadou 2016: 31), which Sanavia (2017: 93–4) recognized as an import from Phaistos.

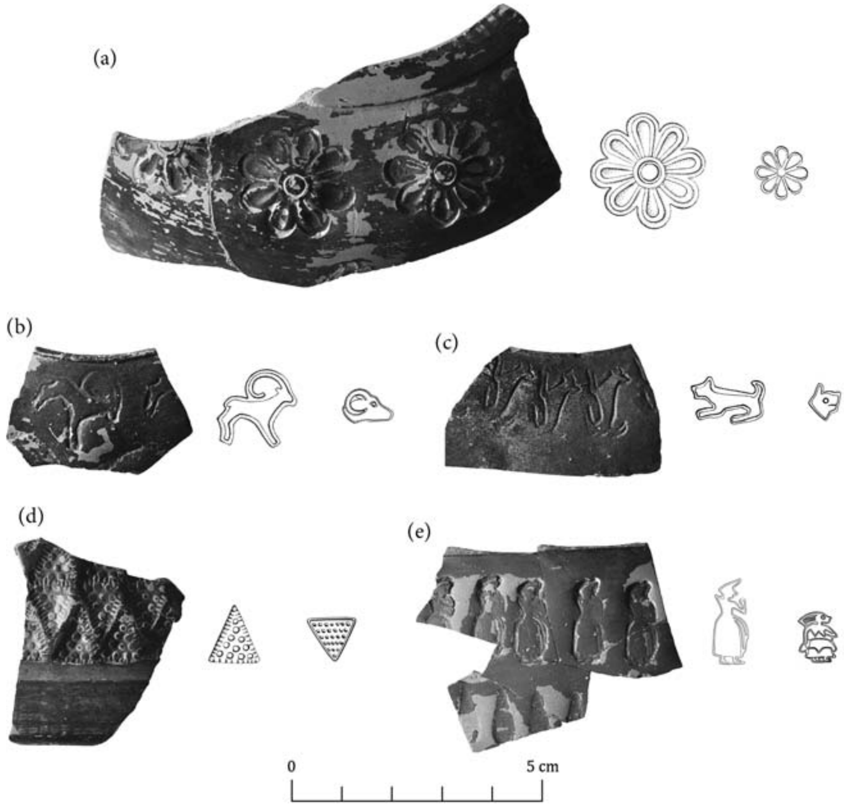

Figure 8.12 Parallels between the images of Impressed Fine Ware from Phaistos and the disc's signs: (a) the 'rosette', (b) the 'ram', (c) the 'cat head', (d) the triangle filled by dots, and € the female figure
Source: Courtesy of Alessandro Sanavia.

The striking similarity with Phaistos Middle Minoan II Impressed Ware—from the iconographic, stylistic, and technical points of view—is a further clue for the verification of the Phaistos Disc's authenticity, to be added to that of the 'comb' sign. It must be stressed that the greatest part of the Protopalatial impressed pottery was recovered during the years of Doro Levi's excavations (from 1950 to 1966), while during the earlier campaigns of excavations at Phaistos by Luigi Pernier only a few impressed fragments were discovered, which do not show any comparisons with the Phaistos Disc signs (Sanavia 2017: 92). This means, again, that in 1908 no one could have used the motifs of the impressed ware as a source to assist in a forgery.

This new evidence coming from the Phaistos potters' marks and Impressed Fine Ware strongly supports the genuineness of the disc, reinforcing some other parallels pointing to the disc's authenticity that have earlier been put forward

(Anastasiadou 2016: 30–3). Among the most relevant are those of the Mavrospilio ring and the Arkalochori axe. The gold ring from the Mavrospilio cave near Knossos (KN Zf13; CMS II.3, no. 38), found in 1926 by Arthur Evans, bears on its bezel an engraved Linear A inscription that follows a spiral layout comparable to that of the disc (Godart 1994: 60–2; Anastasiadou 2016: 19–20). The Arkalochori bronze axe, found in 1934 in a cave of central-eastern Crete by Spiridon Marinatos (Flouda 2015b), bears an inscription with fifteen signs in three columns; in particular, the plumed head that appears on the artefact has been compared to the disc's sign no. 2 (Duhoux 2000: 597, 599; Flouda 2015b: 50; Anastasiadou 2016: 31).

The evidence coming from the Phaistos pot-marks and Impressed Fine Ware, besides supporting the authenticity of the disc, also has an important chronological consequence, as it gives some important information for its dating, a matter that has been debated (Godart 1994: 145; 2009: 203–5). The attestation of the 'comb' on three objects, in all the cases as a stamped sign (impressed in relief from a potter's bat on the bowl; from a seal on the sealing; and from a stamp on the disc), seems to carry a particular chronological and spatial dimension, as the three artefacts come from the same site and their varied find-spots belong to a quite specific time span. The sealing is dated to the end of the Protopalatial period, probably to the very end—Middle Minoan IIB in ceramic terms.[24] As stressed before, the bowl's deposition in the *Casa a Sud della Rampa* is dated to Middle Minoan IIIA early, but, on stylistic basis, a Middle Minoan IIB date for the vessel seems very likely. The Phaistian Impressed Ware, which shares striking iconographic, stylistic, and technical similarities with the disc, is dated to Middle Minoan IIB in particular, with only a few examples found in Middle Minoan IIIA.

Summing up all the data at our disposal, what can we conclude about the disc's chronology? All the comparisons point to the end of the Protopalatial period, or at least the very beginning of the Neopalatial, Middle Minoan IIB–IIIA in ceramic terms, as the best fit. The chronology of a mature stage of Middle Minoan IIIA for the context of the disc, as verified by the recent fieldwork, must be taken as a clear *terminus ante quem*. Also, we cannot exclude the chance that the disc, made during the last phase of the Protopalatial period, Middle Minoan IIB, was preserved and continued to be in use during the next ceramic phase, thus becoming associated in the archaeological record with Middle Minoan IIIA material.

[24] The pottery of Room 25 associated with the administrative documents is dated to Middle Minoan IIB (Militello 2002: 61–2). In Militello's opinion, the room belongs to the very last phase of the First Palace—i.e. to the so-called *Fase dei Sacelli*, a partial revival of the First Palace after a first destruction caused by a seismic event and before its final destruction. On the *Fase dei Sacelli*, see Carinci and La Rosa (2007: 86).

Final Remarks

The concept of complete exceptionality that has been applied to the Phaistos Disc has at least to be reviewed. It is true that no similar objects have been found in Crete or anywhere in the Aegean, but it is also true that the disc is a special artefact, as its function is not utilitarian, nor is it an administrative document, intended to be preserved in an archive for a limited time spand as the Linear A and B tablets. Even if the purpose of the disc is not easy to detect, it seems reasonable that it has a cultic or magical character (Whittaker 2005: 33; Flouda 2015a: 80; Anastasiadou 2016: 43). If we bear in mind the special character of the disc and look at it from an archaeological perspective, it does not appear quite as isolated as it once did. While apparently the Phaistos pot-marks and the Impressed Fine Ware may look very distinct from the disc, as their symbols/designs are not script signs,[25] the comparison with such classes of materials showed that the disc seems to fit well enough into the cultural context of Phaistos, during the passage from the Protopalatial to the Neopalatial period. Not only does the disc find its place in a site, Phaistos, where the use of writing (Linear A) is well known (Militello 2002), but it also fits into the skilled artisanal context of the pottery-making (let us remember that the disc is first of all a clay artefact!) (Militello 2012: 257) and of the sphragistic practices of stamping designs at the site, whether they are seals (Levi 1957–8), decorative elements (Sanavia 2017), pot-marks (Baldacci 2017a), or script signs, as in the disc's case.

If we look at the disc from this archaeological perspective, we can hold out the hope that studies currently carried out on the various classes of material from Phaistos, even if apparently very far from the disc in their nature, may in the future bring new information that will allow an even better appreciation of this enigmatic artefact.

[25] The 'comb' sign on the bowl F 4718 from Phaistos is the only one in the *corpus* of the relief marks of the Mesara which presents a sign compatible with a known script; moreover, a phonetic value for the sign is unlikely (Baldacci 2017a, 76-77).

9

Design and Origins of Linear A Picture-Based Signs

Barbara Montecchi

Introduction

In the Aegean, three main scripts were used in the Bronze Age, during the second millennium BCE. Soon after their discovery at the beginning of the twentieth century, they were named ‘Cretan Hieroglyphic’, ‘Linear A’, and ‘Linear B’ by Sir Arthur Evans, the excavator of the Palace of Knossos on the island of Crete (Evans 1909: p. vi). The relationship between them and the origins of their graphic repertoires are at the centre of an ongoing debate (Salgarella 2020, 2021; Ferrara et al. 2022).

A short account of their chronology and the state of the art regarding this topic will be provided, before moving on to the shapes of Linear A signs and their assumed ‘linearity’ in contrast with the, generally speaking, more pictorial Cretan Hieroglyphic script. The core of the chapter follows up on a previous study, which aimed to show that a large part of the Linear A repertoire originated with Cretan Hieroglyphic (Ferrara et al. 2022), by analysing four image-based Linear A syllabograms that do not seem to have any Cretan Hieroglyphic ancestor, at least on the evidence available so far: AB 46 , AB 67 , AB 118 , and A 321 . Their origin will be investigated, and possible influences from Egypt will be assessed when the shapes look similar to Egyptian Hieroglyphic signs.

We will also try to understand how phonetic values were assigned to the four picture-based signs, at least apparently newly invented in Linear A. A strategy widely implied in the development of ancient invented scripts is called acrophony and consists in depicting an object, a human, or an animal (or parts thereof) whose name started with the same syllable or sounded similar to the syllable they

The research presented in this chapter stands within the framework of the ERC INSCRIBE research project. I would like to express my heartfelt gratitude to the Principal Investigator, Silvia Ferrara, for the opportunity to work within the multidisciplinary team she put together, and to the other members of the team for the valuable discussions that have enriched my work since the beginning of the project. A special mention goes to Miguel Valério, Andrea Santamaria, Roberta Ravanelli, and Lorenzo Lastilla, who digitally retraced a large number of the Cretan Hieroglyphic and Linear A signs used for the illustrations. Needless to say, any shortcomings remain the sole responsibility of the author.

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wanted to represent (Valério and Ferrara 2020). The hypothesis that acrophony and onomatopoeia were at play when new phonetic signs were designed in Linear A should, therefore, be checked. This will ultimately make it possible to distinguish iconic signs whose phonetic values stemmed from the relationship between their shapes and their physical referents.

The Origins of Linear A and Its Relationship with the Other Aegean Scripts

This section offers a short introduction to the Aegean scripts, starting with Linear B, in order to proceed from the best to the least known in reverse chronological order. Linear B is a syllabic system used in the second half of the second millennium BCE to record an early phase of ancient Greek (called Mycenaean Greek). Its graphic repertoire is largely derived from Linear A (recently Salgarella 2020). From the similarities in its use with Linear B, we can deduce that Linear A is also a syllabic system that mainly recorded open syllables of the type consonant + vowel, or simple vowels. We still do not know the encoded language, but we can exclude Greek (Duhoux 1998). Additionally, both Linear A and Linear B largely use logograms to record commodities, instead of spelling them out. Figure 9.1 shows a list of syllabograms where signs with a definite or arguable attestation in both Linear A and Linear B are marked by prefix 'AB', whereas those attested only in Linear A are marked by the prefix 'A'. We argue that a Linear A sign has a syllabic function when it is attested in sequences with other signs and/or when it corresponds to a syllabogram in Linear B.

It is a commonly accepted opinion that signs attested in both Linear A and Linear B encode the same or similar phonemes (Steele and Maißner 2017, with previous references). Some of these are also used as logograms in both scripts, as, for example, AB 30, which is used to indicate 'figs' and the syllable *ni*. Other signs are only attested as syllabograms or both as syllabograms and logograms in Linear A, whereas they passed to Linear B as logograms (e.g. AB 118, 123, and 164). Therefore, the phonetic use of a Linear A sign remains uncertain in three circumstances: (1) the shape corresponds to a logogram in Linear B, but, in Linear A, it is also attested in one or two syllabic sequences (AB 22^{f}, 122, 131a, 100/102 (Montecchi 2022)); (2) the shape corresponds to a syllabogram in Linear B, but is thus far not attested in any Linear A syllabic sequence (AB 87); (3) the sign has no Linear B counterpart, but, in Linear A, might be attested in one or two syllabic sequences (A 319 and 327).

A certain number of homomorphic signs can also be found in Cretan Hieroglyphic (e.g. CH 024/*155 = AB 30). The exact number, however, is still debated. According to the reference corpus of Cretan Hieroglyphic inscriptions (*CHIC* 19), this would apply to only twenty-seven of the signs listed in

AB 01		AB 44		AB 87		
AB 02		AB 45		AB 118		
AB 03		AB 46		AB 122		
AB 04		AB 47		AB 123		
AB 05		AB 48		AB 131a		
AB 06		AB 49		AB 164		
AB 07		AB 50		A 100/102		
AB 08		AB 51		A 188		
AB 09		AB 52?		A 304		
AB 10		AB 53		A 305		
AB 11		AB 54		A 306		
AB 12 ?		AB 55		A 310		
AB 13		AB 56		A 312		
AB 14 ?		AB 57		A 314		
AB 16		AB 58		A 315		
AB 17		AB 59		A 318		
AB 18		AB 60		A 319		
AB 20		AB 61		A 320		
AB 21(f)		AB 65		A 321		
AB 22(f)		AB 66		A 322		
AB 23		AB 67		A 323		= AB 39?
AB 24		AB 69		A 325		
AB 26		AB 70		A 327		
AB 27		AB 73		A 329		= B 15 ??
AB 28		AB 74		A 331		
AB 29		AB 75 ?		A 342		
AB 30		AB 76		A 345		
AB 31		AB 77		A 349		= AB 11 ?
AB 34		AB 78		A 350		= AB 22(f)?
AB 36 ?		AB 79		A 352		= A 318 ?
AB 37		AB 80		A 361		
AB 38		AB 81		A 362		
AB 39		AB 82		A 363		= AB 12?
AB 40		AB 85				
AB 41		AB 86				

Figure 9.1 Linear A syllabograms. Signs of uncertain syllabic use are grey in colour.

Source: Table adapted from Del Freo (2016: 125, tab. 1), with further suggestions marked with a question mark. In particular: AB 12? corresponds to the sign classified as A 324 in *GORILA* 5, possibly a variant of A 363; AB 14? corresponds to the sign classified as A 364 in *GORILA* 5 (Melena 2014: 85); AB 36? corresponds to the sign classified as A 301 in *GORILA* 5 (Pope and Raison 1978: 40); AB 52? corresponds to the sign classified as A 28b in *GORILA* 5 (Salgarella 2020: 337); AB 75? corresponds to the sign commonly transcribed as AB 5̣3̣ on KN Zb 5.

Figure 9.1, but a new reassessment of the palaeographical comparison between the Cretan Hieroglyphic and Linear A repertoires increases the number to sixty-one (Ferrara et al. 2022).[1] Our palaeographical analysis was based on a number of criteria, such as evidence that two compared signs share multiple traits in multiple instances. Moreover, we mapped tendencies in graphic development from Cretan Hieroglyphic to Linear A, to achieve as much coherence as possible in our analysis.

All this led to a confirmation of the hypothesis that a large part of the Linear A graphic repertoire was adapted from Cretan Hieroglyphic (Evans 1909: esp. 88–93; Davis 2010: 38–9), which had been called into question by several scholars in recent years (Schoep 1999: 266, 270–3; Olivier 2012: 19–20; Perna 2014: 254; Schoep 2020: 52). Indeed, Cretan Hieroglyphic and Linear A share a number of similar features that sometimes make it difficult to establish whether an inscription, especially one made up of few signs, belongs to one or the other script (*CHIC* 18; Petrakis 2017: 80–90). Unfortunately, this is also the case with the earliest attestations of writing in Crete. They are carved on seals primarily found in the cemetery of Archanes, in central Crete, which date back to the end of the third or the beginning of the second millennium BCE (for the uncertain chronology of these seals see Decorte 2018: 341, 363-4). Some scholars argue that these earliest attestations of writing belong to Linear A (Godart 1999; Anastasiadou 2016), others that they represent an earlier distinct script (Yule 1980: 170; Decorte 2018), from which both Cretan Hieroglyphic and Linear A might have derived (Olivier 2008: 171–2; Schoep 2020: 52). Nevertheless, these earliest attestations of writing are included in *CHIC* (#202, #251, #252, #313, #315), and, indeed, the majority of scholars believe they belong to Cretan Hieroglyphic, since the palaeographical analysis supports this view (Ferrara et al. 2021a).

The earliest attestation of Linear A dates back to the Middle Minoan IIA period, while it becomes more consistently attested in Middle Minoan IIB (Schoep 2002: 22). We can, therefore, say that Linear A was invented no later than Middle Minoan IIA—that is, by the end of the nineteenth century BCE according to high chronology (Manning 2010). Cretan Hieroglyphic and Linear A thus coexisted for at least a couple of centuries during the first half of the second millennium BCE (that is, in the Middle Minoan II and III periods), then Linear A became the predominant script in the Aegean in Late Minoan I period (that is, until the beginning of the fifteenth century BCE), so that few Cretan Hieroglyphic inscriptions dated to this period can be regarded as relicts.

[1] Linear A signs with palaeographical evidence for derivation from Cretan Hieroglyphic: 01, 02, 03, 04, 05, 06, 08, 09, 10, 11, 13, 16, 22, 23, 24, 26, 27, 28, 29, 30, 31, 36 (= 301), 37, 38, 39, 40, 44, 48, 50, 53, 54, 56, 57, 58, 59, 60, 61, 65, 69, 70, 73, 74, 76, 77, 78, 79, 80, 85, 86, 120, 122, 123, 131a, 305, 312, 314, 319, and possibly 12 (= 324/363) or 14 (= 364), 17, 56, 20 or 304.

Picture-Based versus Geometric Signs in Cretan Hieroglyphic and Linear A

We are now moving to the core of the chapter: the assessment of the assumed 'linearity' of the Linear A graphic repertoire. This implies a distinction between 'picture based' or 'pictorial' and more schematic or geometric ('linear' according to Evans's terminology) signs. By 'picture based' or 'pictorial' I refer to the graphic appearance of signs of writing, which formally stem from iconographic motives or directly from the depiction of living beings and objects, but do not necessarily represent them. Further on, I will use the term 'iconic' to refer to the relationship between the shape of the sign and what it represents—that is, the semiotic qualities of the sign (Givón 1985; Goldwasser 2016: 119–20; Vernus 2022: 338–40). Since both Cretan Hieroglyphic and Linear A are still undeciphered, this relationship is uncertain. In this chapter the graphic appearance of Linear A signs will be investigated with the aim of understanding why they have the shape they have and how phonetic values were assigned to those that were not adapted from Cretan Hieroglyphic, whether arbitrarily, as one could expect if they were purely abstract or geometric, or rather motivated.

The material source of inspiration for the shape of a picture-based sign can be termed 'physical referent'. In this respect, we can state that the Cretan Hieroglyphic graphic repertoire is more pictorial than the Linear ones, since the majority of the shapes have more or less clear referents in the contemporaneous figurative repertoire and material culture (Figure 9.2(a)). Nevertheless, Cretan Hieroglyphic is not entirely picture based, as shown by the examples in Figure 9.2(b), nor is Linear A entirely linear or geometric, as the name might suggest. A certain number of Linear A signs are indeed clearly picture based (Figure 9.3(a)), while others are more schematic but not describable as a simple geometric form (Figure 9.3(b)).

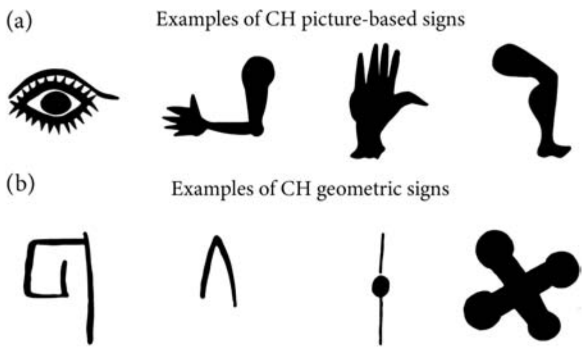

Figure 9.2 Sample of Cretan Hieroglyphic signs. From left to right: (a) CH 005 on #247.γ; CH 007 on 308.β; CH 008 on #297.β; CH 010 on #292.β; (b) CH 035 on #119.l.i; CH 060 on #115.b; CH 063 on 049.a; CH 070 on #222.b
Source: Drawings after *CHIC*.

Consequently, only a few turn out to be geometric shapes constituted by a few strokes (Figure 9.3(c)).

Nevertheless, the same Linear A sign might be attested under both pictorial and schematic variants. For example, syllabogram AB 80, shown in Figure 9.3(a) in a highly pictorial version recalling a cat face, is also designed as a triangle with two short traits at the top. It is important to stress that chronology does not play the main role here: pictorial and schematic variants often coexist at the same time in the same site. In Linear A, a more or less pictorial and detailed design relies mainly on technique (for example, painting versus incision), material (for example, stone versus clay), type of inscription (religious and ceremonial versus economic), and, of course, the accuracy of the hand that wrote the sign.

In the schematic signs the physical referents are not immediately recognizable, although their shapes, made up of many traits, still suggest they originally had a physical referent (Figure 9.3(b)). We can, therefore, suggest that in many cases it is because we do not have highly pictorial variants that the physical referent and the reconstruction of the graphic development are uncertain. However, even simple geometric shapes, constituted by few strokes, should not be discarded *a priori* as

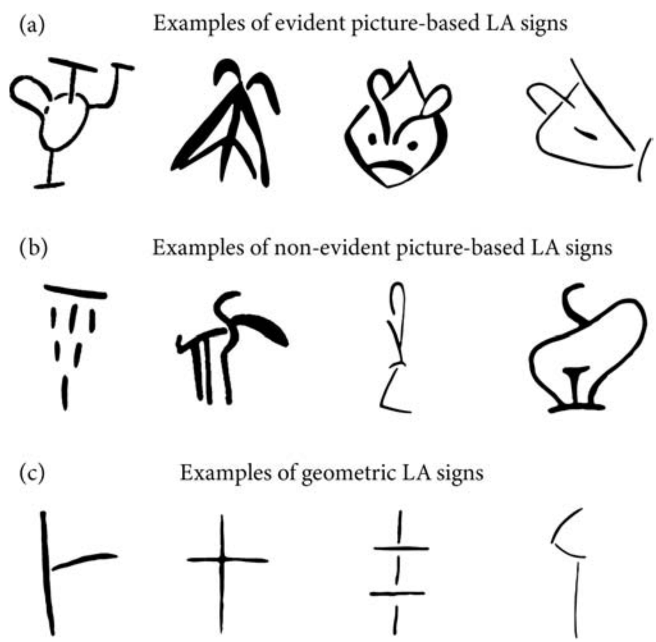

Figure 9.3 Sample of Linear A signs. From left to right: (a) AB 24 on PH 7a.3; AB 39 on KN Wc 26b; AB 80 on AR Zf 2; AB 85 on HT 118.1; (b) AB 07 on PH 7a.2; AB 51 on KN Zf 31; AB 53 PH 7a.2; AB 69 on IO Za 2b.1; (c) AB 01 on PH 7b.2; AB 02 on KO Zf 2; AB 03 on PH 1b.1; AB 11 on KO Zf 2

Source: Drawings after *GORILA*.

derivations from picture-based signs. For example, sign AB 11 (Figure 9.3(c)) might have originated with the snakelike sign CH 061 (Ferrara et al. 2022).

To sum up, the Linear A graphic repertoire comprises picture-based signs whose physical referent is easy to recognize, schematic signs whose physical referent is no longer evident, and geometric signs. The last two groups together—that is, everything that is not clearly picture based—account for the majority of the signs, and this explains the name 'linear' given to the script by Evans. Nevertheless, since we cannot understand at first glance whether a given shape is or is not the result of an adaptation process, we need to investigate Cretan Hieroglyphic and iconographic repertoires in order to reconstruct the origin and graphic development of any Linear A sign.

Acrophony and Onomatopoeia in Newly Invented Linear A Signs

If schematic or simple shapes may look similar by chance, making it often problematic to understand with certainty whether they originated with Cretan Hieroglyphic or were newly invented in Linear A, it is easier to assess whether a clear picture-based sign has or does not have a counterpart in Cretan Hieroglyphic. For example, both signs AB 08 and CH 042 are shaped like a double-axe, AB 24 and CH 052 like a spouted jug, AB 30 and CH 024 like the branch of a fig tree, and A 312 and CH 051 like a dagger. As a consequence, such comparisons between Linear A and Cretan Hieroglyphic are commonly accepted in the scholarship (*inter al. DOCS*[2] 33, fig. 6; *CHIC* 19; Perna 2016: 88, tab. 1). In the same way, we can detect four picture-based Linear A signs that clearly do not find any counterpart in any Cretan Hieroglyphic sign attested thus far. These are AB 46, AB 67, AB 118, and A 321.[2] These can, therefore, be considered innovations, at least until possible new Cretan Hieroglyphic documents featuring one or more of these signs come to light. AB 46 and 67 are attested in both Linear A and B as syllabograms, AB 118 is attested in both scripts but with a significant difference in its use, whereas A 321 is attested only in Linear A. These four signs provide us with the opportunity to explore the creation of an original phonetic Linear A sign starting from the depiction of a material referent and to verify whether the acrophonic and onomatopoeic principles may have played any role in this process.

Acrophony consists in depicting an object whose name starts with the same syllable one wants to represent, while onomatopoeia consists in depicting an object that produces a sound similar to the syllable one wants to represent. The onomatopoeic principle may, for example, explain why the head of a cat (AB 80) was chosen to represent the syllable *ma* and an ox (AB 23) to represent *mu*

[2] Suggestion that CH 067 could be a turned-around version of the plough-shaped sign CH 057 (Younger 2003: 310) must be rejected for evident palaeographical inconsistency.

(Petruševski 1965:226). Evidence for the acrophonic principle was recognized a long time ago in sign AB 30 (Neumann 1957: 157–8). This sign depicts the branch of a fig tree and is used in all three Aegean scripts as the logogram for 'figs' and as a syllabogram with value *ni*, at least in Linear A and B. Therefore, Neumann suggested that the syllabic value *ni* originated with the pre-Greek Cretan word for 'fig', which was taken as a loan by the Greek *νικῦλεον*.

Sign AB 67

With the above reflection in mind, the first sign I would like to analyse here is AB 67 . It is attested in both Linear A and B to represent a velar consonant + vowel *i*, and is conventionally transcribed as *ki* (e.g. ***ki**-da-ro*, ***ki**-ri-ta*, *su-**ki**-ri-ta* are sequences attested in both scripts). In Linear A, this sign appears under different palaeographical variants (Figure 9.4) and might be turned to face either the right or the left, as often happens with signs that are oriented on a vertical axis, such as AB 60 and A 301 (probably corresponding to B 36 : Pope and Raison 1978: 40). The earliest attestations of sign 67 are on accounting records from Phaistos dated to the Middle Minoan IIB period (Figure 9.4, top row). Earliest, however,

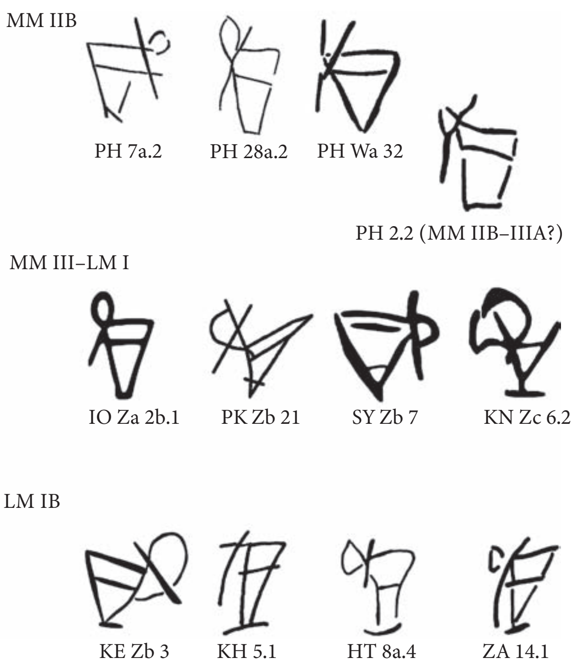

Figure 9.4 Selection of palaeographical variants of Linear A sign AB 67
Source: All drawings after *GORILA*, with the exception of PK Zb 21, which is after Davis (2008).

does not necessarily mean more pictorial, nor are later attestations necessarily more schematic or simplified (Figure 9.4, middle and bottom rows).

At a first glance, AB 67's shape may recall either a one-handled conical cup (Neumann 1957, 1999) or a ceremonial vessel called *rhyton* (Davis 2018: 393–4). Nevertheless, this latter hypothesis is ruled out for chronological reasons, since conical *rhyta* first appear in Middle Minoan IIB or even Middle Minoan III (Koehl 2006: 46)—that is, in the eighteenth-century BCE according to high chronology, whereas the creation of Linear A should be placed in Middle Minoan IIA. In contrast, clay one-handled conical cups are known from Middle Minoan IB onwards at Knossos (MacGillivray 1998: 69–70) and in Middle Minoan II contexts in other sites, such as Phaistos (Levi and Carinci 1988: 205–11, pl. 89).

Some eccentric features of the sign—namely, the horizontal stroke at the middle of the body, which may recall the rounded horizontal bulge at the middle of some one-handled cups (e.g. Levi and Carinci 1988: 212–14, fig. 48, pl. 83.f.g; MacGillivray 1998: 70, fig. 2.10.13, 72, type 13), the strongly tapering base, and the handle rising over the rim—seem to have been exaggerated. It is even possible that the sign originated with the depiction of a one-handled cup, but later scribes may have confused its shape with that of a *rython*. Significantly, a pictorial variant of sign AB 67 (Figure 9.4: KE Zb 3) is incised on a Late Minoan IB one-handled small-scale cup from Kea (Figure 9.5), made of local coarse ware (Caskey 1970: 110, no. 4, pl. I.4). The outline of the sign clearly matches the profile of the cup, while the vessel's base is emphasized by a short horizontal stroke. We thus have two possibilities: either the sign was a purely decorative element, or it was used on account of both its shape and its phonetic value. The second explanation would also work if

Figure 9.5 Late Minoan IB one-handled clay cup from Kea featuring inscription KE Zb 3
Source: GORILA 4.

the cup were used as the smallest standard unit to measure liquid and/or dry commodities and the sign would have referred to this (Neumann 1999: 415–16).

The oblique stroke on the handle, however, does not fit with any vessel shape that is archaeologically known. Moreover, this feature appears significantly different from one case to another: in many instances, the stroke is located at the base of the handle (e.g. HT 8a.4.5, PH 2.2, 7a.2, 28a.2, SY Zb 7, and ZA 14.1), in other instances it seems to represent the projecting lower part of a loop handle (e.g. IO Za 2b.1, ZA 4a.7, 5a.1). Finally, in a few instances, such as KE Zb 3 and PK Zb 21 (Davis 2008), it crosses the handle. In my opinion, the variants attested on PH 2 and 28 are the most helpful in order to explain what this stroke originally represented: here the trait is not yet as straight and schematized as in the other instances, and the overall design might recall a cup covered by a piece of cloth tied at the handle with a string. In this scenario, the horizontal stroke on the body would suggest the edge of the covering piece of cloth, and the stroke at the handle the string. In all the other instances, however, both the stroke at the handle and the one on the body must have been perceived as characteristic traits of the writing sign, not as references to the original inspiring image.

The palaeographic and archaeological analysis therefore confirms Neumann's suggestion that the phonetic value velar consonant + vowel *i* was assigned to sign AB 67 𐀑 by taking the first syllable of the non-Greek word that was adapted into the Greek *κισσύβιον* (Neumann 1957: 158; 1999: 416, followed by Notti 2014: 102, no. 65). This is the name of a rustic, non-precious cup in the Odyssey (9. 346; 14. 78; 16. 52; see also Theocritus 1, 27). *Κισσύβιον* cup is thus suitable for being the physical referent of sign AB 67.

Sign AB 46

The design of AB 46 𐀋 is more compressed than the complicated sign shape analysed above, but is still not just geometric, since it closely resembles two walking human legs (Figure 9.6). It is not attested in Cretan Hieroglyphic, and it is attested only twelve times in the whole corpus of Linear A inscriptions published thus far, including damaged instances.[3] Since it always occurs in syllabic sequences, we can take for granted that it is a syllabogram. In Linear B it represents the syllable *je*, and, if we count only attestations in different words, it is also a low frequency sign. Although it does not appear in identical sequences in both scripts, the similarity in its frequency favours the hypothesis that its phonetic value did not change from Linear A to B.

As stated above, the shape of this sign resembles two walking human legs, but it is unlikely that its physical referent was a straightforward pair of legs, because

[3] In addition to the nine instances recorded in *GORILA* 5: 213 I also counted ARKH Zc 8 (Sakellarakis and Sapouna-Sakellaraki 1997: 332, fig. 295), THE Zb 6 (Boulotis 2008: 70), and PE 6.2 (Hallager 2012: 268, fig. 3).

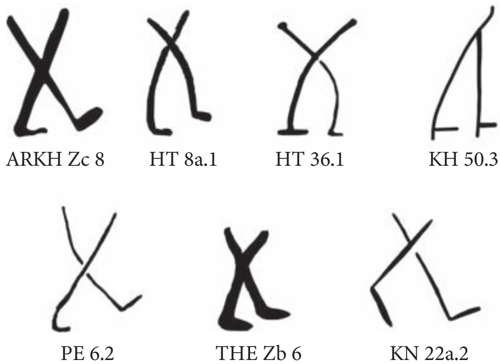

Figure 9.6 Best-preserved instances of AB 46 in Linear A

Source: Drawings after *GORILA*, apart from ARKH Zc 8 (after Sakellarakis and Sapouna-Sakellaraki 1997: fig. 295), PE 6.2 (after Hallager 2012: fig. 3), and THE Zb 6 (after Boulotis 2008: fig. 8b).

we have another human leglike sign: CH 010 corresponding to AB 53 𐀪 *ri* (Ferrara et al. 2022). Moreover, it should be noticed that the two legs cross, a very odd feature that does not reflect a naturalistic anatomy nor an otherwise known Middle Minoan motif. In my opinion, the crossing feature derives from an abbreviation/compression of the upper body, and the referent is abstract: the two legs would hint at a verb of movement such as 'walk', 'go', or 'come'. We do not know how these verbs were pronounced in the language of Linear A, but, if one of these started with the syllable *je*, this would explain why a pair of 'walking' (or 'going' or 'coming', and so on) legs were chosen to represent it.

In the Egyptian Hieroglyphic and Hieratic writing systems, two walking legs, sign D 54 𓂻, are used as both the determinative for verbs indicating motion and the logogram for the verb 'come', which spells *ii* or *iw* in Egyptian scripts, where only consonants are spelled out. In group 𓂻𓅱 *iw*, 𓂻 is traditionally considered a logogram (Gardiner 1957: 457; Hoch 1997: 69), but has more recently been considered a phonogram—namely, the biconsonantal *iw* (Allen 2014: 30, 171, 474), while 𓅱 is a phonetic complement, used to spell out the second consonant (*w*). We do not know what the exact pronunciation was, but there was probably a vowel between the two consonants *i* and *w*.

In comparing the shapes of AB 46 𐀋 and D 54 𓂻, we should not take the orientation of the feet into consideration, because Egyptian can be written either from left to right or from right to left, so the feet can point either to the right or to the left depending on the reading direction of the inscription. Nevertheless, we do notice that the legs of Egyptian Hieroglyph D 54 do not cross, and the feet are typically flat on the ground. In this regard, the shape of another Egyptian sign is far more similar to AB 46: the Old and Middle Kingdom Cursive Hieroglyphic and Hieratic versions of G17 𓅓. This is originally shaped like an owl, but cursive scripts include variants where the head of the bird is omitted, the upper body

Figure 9.7 Hieratic versions of sign G17 : (a) from the sixth Dynasty; (b) from the tenth and eleventh Dynasties; (c) from the twelfth Dynasty
Sources: (a–b) Möller (1909: pl. 18); (c) downloaded from *AKU-PAL*; not to scale.

strongly reduced, and the legs emphasized, so that some of them look very similar to our Linear A sign (Figure 9.7).

Although the shapes shown in Figures 9.6 and 9.7 are very similar, the two sounds they represent are not, since G17 stands for the consonant *m*. Moreover, we do not have any evidence to argue that the Cretans of the early second millennium BCE were trained in Egyptian writing. What we can suggest, on the grounds of the evidence for trades and cultural contacts (Warren 2000; Colburn 2008; Phillips 2008; Wiener 2013), is that they were exposed to Egyptian inscriptions. It is thus tempting to imagine that the designer of Linear A sign 46, possibly not present in Cretan Hieroglyphic, misinterpreted cursive variants of phonogram G17 as two walking legs and got the inspiration from them to design , giving it the phonetic value *je* by acrophony from a Cretan verb of motion.

Sign AB 118

The shape of sign AB 118 is easily comparable to a pair of balancing scales (Figure 9.8). A similar sign is also present in the Egyptian Hieroglyphic repertoire: U 38 , the logogram or determinative for 'scales' (Gardiner 1957: 521; Hoch 1997: 59). However, the two shapes are not similar enough to hypothesize a borrowing from Egyptian Hieroglyphic. This statement might change if an intermediate shape between U 38 and AB 118 came to light in Cretan Hieroglyphic, as this would not be the only logogram borrowed from Egypt and attested in all three Aegean scripts, this also being the case with the logogram for wine (Ferrara et al. 2021b: 7–9).

As far as the use of AB 118 is concerned, it is well attested in Linear A syllabic sequences, but its phonetic value is unknown, since in Linear B it is used only as the logogram for the highest unit of weight.[4] On three Late Minoan IB Linear A tablets (HT 12.4, 24b.1–2, 38.3), AB 118 is also placed between the indication of certain commodities (e.g. wool on HT 12.4) and a numerical indication—that is, a suitable position for a unit of measurement. On such records, therefore, AB 118 has a logographic value recording the result of the weighing of certain goods.

[4] As shown by Judson (2017: 116–17), AB 118 and the syllabogram *dwo*, so far only attested in Linear B, are two clearly distinct signs.

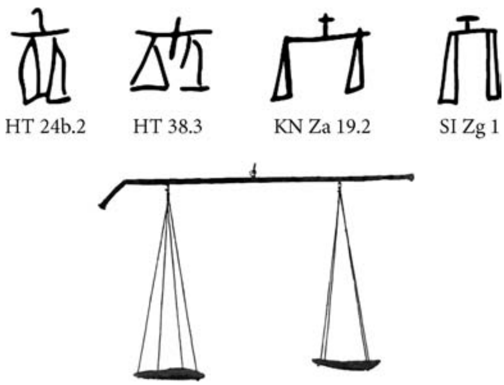

Figure 9.8 Above: selection of palaeographical variants of AB 118 in Linear A; below: a pair of metal scales from Mycenaean Pylos
Sources: GORILA; photograph by the author, courtesy of the Archaeological Museum of Chora; not to scale.

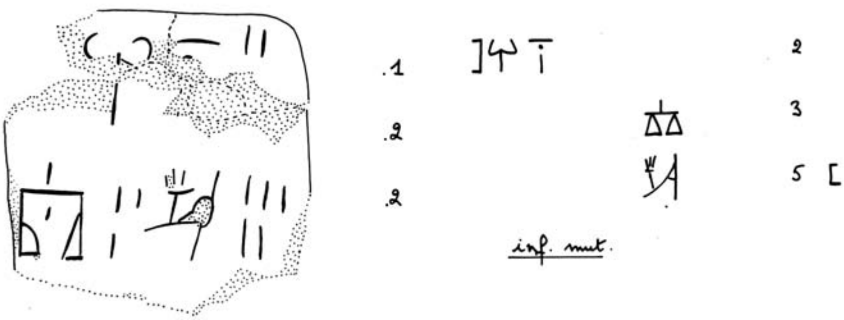

Figure 9.9 Clay tablet KN 2: drawing (left) and transcription (right)
Source: GORILA 1. 258–9.

The sign must also have a logographic value on its earliest attestation on tablet KN 2.2, dating back to Middle Minoan III. This is a record of three different entries followed by whole numbers (Figure 9.9). The first is expressed by a syllabic sequence, the second by sign 118, and the last by a monogram (that is, a combination of two syllabograms). Since AB 118 is not located between a commodity and a number, as we would expect in the case of a unit of measurement, it might even indicate the recorded items—namely, scales or weights—unless the commodity was implicit (Montecchi 2017: 13–14).

Significantly, AB 118 is also incised on a stone weight found at Agia Photia, near Siteia, in Eastern Crete. This is an ovoid stone featuring the drawing of a fish and a Linear A inscription above it (SI Zg 1). Figure 9.10 shows two images from the 3D

Figure 9.10 Stone weight from Agia Photia showing inscription SI Zg 1 above the image of a fish; left: Digital photograph; right: radiance scaling of the inscription
Sources: Digital photograph by Lorenzo Lastilla and Roberta Ravanelli (courtesy of the Heraklion Archaeological Museum—Hellenic Ministry of Culture—Hellenic Organization of Cultural Resources Development (HOCRED)); radiance scaling of the inscription by Lorenzo Lastilla and Roberta Ravanelli, cleaned up with Photoshop by the author.

model available in the INSCRIBE 3D Model Viewer (https://www.inscribercproject.com/Linear_A.php):[5] the whole stone weight (left) and the Linear A inscription SI Zg 1 (right). Unfortunately, the archaeological context and chronology of this stone are uncertain.

The inscription is very shallow, and it is at times difficult to distinguish proper signs from accidental scratches. In *GORILA* 4: 168, it is transcribed as a unique syllabic sequence (*a*-[·]-*da*-**118*), but AB 118 may well stand for 'weight', as a logogram, rather than representing a syllabogram. The stone has been weighed using two electronic scales, giving two different results: 3,511 and 3,450 gr. (Alberti 1998: 11 and 17, n. 47). However, both roughly correspond to 1/9 of the absolute value of the highest unit of weight suggested on the grounds of known sets of balance weights—that is, around 31,200 gr. (Parise 1994). To the left of AB 118 there is a shallow incision whose shape fits with the Linear A sign for fraction D (Alberti 1998: 13), but the autopsy of the object leads me to consider it an accidental scratch resembling the shape of fraction D by chance, rather than a script sign. Indeed, this scratch is not transcribed in *GORILA* either. Moreover, two further observations reinforce the idea the scratch is not to be identified with fraction D: (1) it is placed next to the base of sign 118, whereas a single number (either whole or fractional) is normally placed next to the top or in line with the preceding sign; (2) none of the values suggested in the scholarship for fraction D, on the grounds of Linear A preserved accountings and computational analysis, corresponds to 1/9 (Corazza et al. 2021, with previous references).

It is also worth noting that the sign next to AB 118 is transcribed as syllabogram AB 01 ⊦ (*da* in Linear B) in *GORILA* 4, but it may actually be made up of two distinct traits, linked by an accidental shallower scratch (Figure 9.10, to the right). If the reading direction were from right to left, the horizontal top stroke could be

[5] Accessed 03 May 2024.

considered to be one ten, while the vertical stroke could be one unit, to be read together as number 11. In this case, since it is unlikely that a weight of 3,450–3,511 gr. could correspond to 11 high AB 118 units, the inscription might refer to a group of weights, as it also seems to be the case with two inscribed jars bearing numerical indications that exceed the capacity of the single vessels—namely, KN Zb 27 and 35 (Christakis 2011: 52).

However, regardless of the interpretation of the sign placed next to it, either as a syllabogram (AB 01) or as a number (11), the notion that AB 118 is here used as a logogram for 'weight' is also strongly suggested by the fact, first pointed out by Michailidou (2000: 19; 2001: 63, 80), that the inscribed stone from Agia Photia (SI Zg 1) is comparable to some Egyptian stone weights whose inscriptions inform us that they were used for fish (Bruyère 1934: 90; 1939: 219–21; Doll 1982). In Figure 9.11, two of the most representative examples are reproduced.

The inscription incised on the weight reproduced in Figure 9.11(a) is to be read from right to left.[6] The seated man with a vessel on his head is the determinative usually placed next to load-related words. In this context it is to be understood as an abbreviated form for the word 'weight'—that is, in this context it has a logographic function to indicate what the stone is. Next we read , the monoconsonantal hieroglyph *n*, used here for the 'genitival adjective' with the meaning 'of, belonging to'. We then see a fish, which should be understood as an image (exactly as the fish on SI Zg 1) rather than a logogram, since it is significantly bigger than the other hieroglyphs in the same inscription, and its shape does not

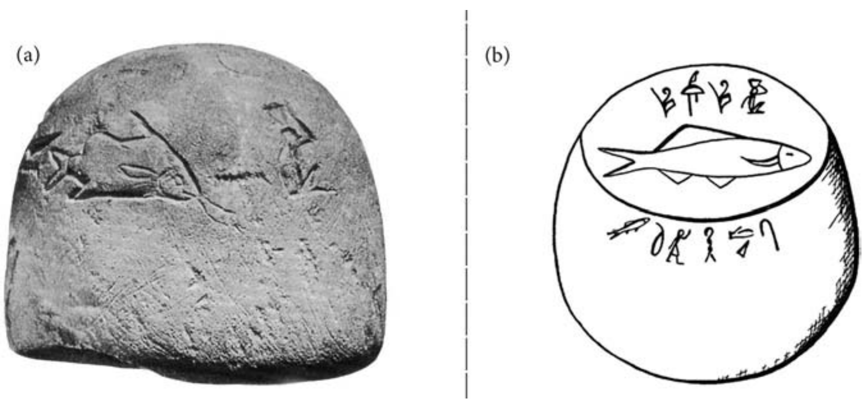

Figure 9.11 (a) Egyptian stone weight housed in the *Musées Royaux d'Art et d'Histoire* at Brussels, cat. no. E.7041; (b) Egyptian stone weight from Deir El Médineh

Sources: (a) Michailidou (2000: 137, fig. 19); (b) drawing adapted from Bruyère (1934: 90, fig. 60); not to scale.

[6] I am gratefully indebted to Dr Lutz Popko (Sächsische Akademie der Wissenschaften zu Leipzig) for generously sharing with me comments on the Egyptian inscriptions analysed in this paragraph.

match any fish of the hieroglyphic repertoire, but rather portrays a *Synodontis* (Doll 1982). The inscription continues adding other details on the side that is not reproduced in Figure 9.9(a).

Likewise, on the weight reproduced in Figure 9.11(b) we can easily recognize the sign for 'weight' and the image of a fish. Moreover, the mass of this last weight is also similar to the Siteia stone (3,250 gr. according to Bruyère 1934: 90; 1939: 220). Although these Egyptian weights date back to the nineteenth or twentieth Dynasty (Doll 1982)—that is, roughly to the thirteenth or twelfth century BCE, and are thus certainly later than SI Zg 1, their mass, material, and inscriptions constitute a close parallel for the inscribed stone SI Zg 1, so that the latter can be confidently interpreted as a weight for fish and sign AB 118 incised on it as a logogram for 'weight'.

To sum up, it can be suggested that in Linear A the depiction of a pair of scales (i.e. AB 118) was used to point out both the logogram for 'weight', by metonymy, and a phonogram. By analogy with signs AB 30 and 67 (see above), we can argue that the phonetic value was also assigned to AB 118 by acrophony, although we cannot exclude homophony—that is, the phonetic value corresponded to the entire word for 'weight'. We can imagine that this syllabogram, whatever it was, was not retained in Linear B because it was not perceived as useful for the notation of any Greek phoneme.

Sign A 321

Sign A 321 is so far attested only in Linear A, and only at the end of syllabic sequences (TY 3a.1, IO Za 7, HT 6a.3, 102.4̣, ZA 18a.1). It is clearly shaped like a hoop-like *sistrum* (Figure 9.12), which is a percussion instrument consisting of a handle and an upside-down U-shaped frame with sticks and discs. The Latin word *sistrum* derives from the name the Greeks gave to this musical instrument (*σεῖστρον*, literally 'that which is being shaken', from the verb *σείειν*), but the instrument itself is generally considered of Egyptian origin (Mikrakis 2000: 163, with previous references).

In Egypt two types of *sistra* were used: the *naos*-shaped variety, which was represented by hieroglyph Y8 and called *sššt* (conventionally phonetized as 'sesheshet'), and the hooplike *sistrum*, which was called *sḫm* (conventionally phonetized as 'sekhem'). However, hooplike *sistra* are archaeologically well known on Crete from Middle Minoan IA onwards (Sakellarakis and Sapouna-Sakellaraki 1991: 184–7, figs 15–18; 1997: 351–6; Soles 2011, 2022; Brogan 2012: 15–16, fig. 3.1). Although the inspiration probably came from Egypt, all the examples so far from Bronze Age Crete appear to have been manufactured on the island (Brogan 2012: 21). It is, therefore, likely that sign A 321 was created within Linear A, starting with the depiction of this kind of object.

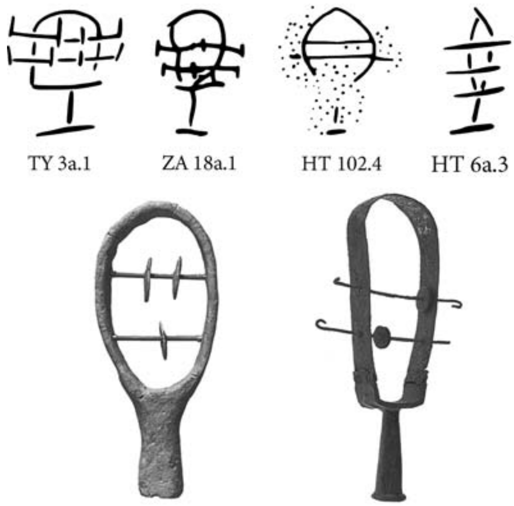

Figure 9.12 Above: selection of palaeographical variants of sign A 321; below left: Middle Minoan IA clay *sistrum* from Archanes Phourni HM P 27695; below right: Late Minoan I bronze *sistrum* from Mochlos HMN 14398

Sources: above: *GORILA*; below left: photograph by the author, courtesy of the Heraklion Archaeological Museum—Hellenic Ministry of Culture—Hellenic Organization of Cultural Resources Development (HOCRED); below right: Soles (2022: 253–4, fig. 109, pl. 73); not to scale.

The choice to give a phonogram the shape of a musical instrument may be explained by the onomatopoeic principle, by representing the sound played by the instrument. When shaken, the small thin metal rings on its movable crossbars produce a soft clank or a loud jangling, so that one of the two Egyptian names for the *sistrum*—namely, *sššt*—can be considered onomatopoeic.

Concluding Remarks

In concluding this chapter, a question arises: to what extent are Linear A signs 'linear'? On the whole it seems safe to say that they appear linear, both because the majority stand in vertical lines, and because the physical referent is evident in only a small number of instances. Moreover, the majority of Linear A phonetic signs have been proved to have originated with Cretan Hieroglyphic as compressed variants of original picture-based signs (Ferrara et al. 2022).

On the grounds of the evidence currently at our disposal, among the innovations we can confidently detect image-based (AB 46, AB 67, AB 118, and A 321) and schematic signs with variants that are sufficiently complicated to suggest they were also originally image based, although their physical referent is not evident (e.g. AB 07, 41, 45, 51, and 81). The higher degree of simplification of the latter warrants the search for their sources of inspiration among the Middle Minoan iconographic repertoire, rather than a direct comparison to an actual physical referent. For example, AB 41 has been suggested to originate with the scorpion motif (Ferrara et al. 2022: 88, 109) and AB 81 with the flying bird motif (recently Salgarella 2021: 75–6; Ferrara et al. 2022: 88, 109).

In this chapter, it has been shown how highly iconic signs seem instead to derive from the depiction of selected objects (AB 67 from a cup, AB 118 from a pair of scales, and A 321 from a musical instrument) whose names, in the language of Linear A, started with or whose sound (in the case of the musical instrument) was similar to the phonetic value they represent. A fourth iconic syllabogram, AB 46 *je*, although less pictorial than the previous ones, might either be an adaptation from an as yet unattested Cretan Hieroglyphic sign or an original Linear A creation inspired by Egyptian signs representing, or just resembling in their more cursive variants, two legs walking (respectively signs classified as D52 and G17 in Gardiner 1957). In both cases, the hypothesis is put forward that the phonetic value *je* derived via acrophony from a verb indicating motion.

In theory, another method of creating new phonograms would also be possible: derivation from the shape of a pre-existing sign whose phonetic value was similar to the one to be encoded. This is the case, for example, with Linear B 90 *dwo* created by duplicating the shape of Linear B 42 *wo* (*inter al.* Judson 2017: 117). However, no phonetic series (e.g. *da*, *de*, *di*, *do*, *du*; *ka*, *ke*, *ki*, *ko*, *ku*; and so on) is made up of signs that seem to have been mechanically derived from a core shape.

To sum up, the creative mechanisms we can currently recognize within the Linear A repertoire are fourfold: (1) derivation from Cretan Hieroglyphic, (2) adaptation of iconographic motifs, (3) drawing of physical referents, and (4) possible influence of Egyptian cursive scripts if the absence of evidence for AB 46 in Cretan Hieroglyphic were due to the actual absence of the sign in this script. Phonetic values would have been assigned to iconic signs through acrophony, homophony, or onomatopoeia in Cretan Hieroglyphic, if belonging to group 1, or in Linear A, if belonging to groups 2, 3, or 4.

10

The Rongorongo 'Lunar Calendar' of Rapa Nui (Easter Island) and the Type of Script

Miguel Valério

A Key Case of Invented Writing?

The Rongorongo script of Rapa Nui (Easter Island) is attested on twenty-seven inscribed objects, labelled A–Z and #A (Horley 2021: 42–3). It may represent one of the few cases of independent writing in the world (Diamond 1997: 224, 230–1), alongside some of the scripts treated in this volume. In the narrowest sense, writing is a graphic encoding of language that uses not just semantic signs but also phonetic ones. This gives the code the *potential* to notate every word, even those not easily depicted by a picture (especially grammatical words). Rongorongo shows some signs that it may be a phonetic notation of language: it uses a large number of glyphs (see below) in linear sequences and in very long strings of texts. Paragraph or sentence dividers are used in the longest inscription, the Santiago Staff, which is over 1,600 glyphs long. Of course, none of this certifies that we are dealing with a fully-fledged writing system: the Dongba 'pictographic' script of the Naxi has similar features, and yet it has limited phoneticism and underrepresents large portions of the ritual texts it conveys (Ramsey 1989: 266–70). For this reason, Dongba is not usually classed as writing proper.

Rongorongo is hard to situate as a code because it remains undeciphered. Very recently, Horley (2021) has produced a corpus with proper editions of all known inscriptions. It overcomes many of the difficulties posed by earlier catalogues (Barthel 1958; Fischer 1997) and will facilitate future research on the script. Still, how many signs (graphemes) Rongorongo had remains an open question. Barthel (1958) produced a catalogue of 632 sign shapes, whose numbers are still

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a conventional way to transcribe the glyphs. Unfortunately, he amalgamated free-standing glyphs, some ligatured glyphs (not all and not systematically), and some glyphs that are clearly variants (allographs) (Pozdniakov 1996, 2011; Pozdniakov and Pozdniakov 2007). Alternative sign-lists have been proposed in this century, each following different criteria and offering different results (Horley 2005; 2021: 441–3; Pozdniakov and Pozdniakov 2007). Building on previous progress in discerning allographs, Horley (2021) now proposes that Rongorongo had 130 basic (that is, 'independent' or self-standing) glyph shapes. This is close to Barthel's estimation (1958: 166) of 120 basic components. It seems like a reliable estimation, but it still does not tell us how many graphemes the script had: the ligatures may be in the hundreds, and we are yet to understand how any kind of glyph—and indeed Rongorongo as a whole—really worked.

On the positive side, we know that the language represented in the inscriptions—if any—must be Rapanui, the East Polynesian tongue of the islanders, spoken in isolation for centuries. Rapanui was significantly recorded only after the late 1860s, which is precisely when it was deeply affected by a crisis in the number of speakers and contact with languages such as Tahitian and Spanish (even the name *roŋoroŋo* 'recitation' seems recent). Still, its close East Polynesian relatives (Mangarevan, Marquesan, Hawaiian, Tahitian, Tuamotuan, Maori, and so on) are well documented, so that it is viable to discern borrowings and reconstruct older Rapanui in some measure (cf., e.g., Davletshin 2016; Kieviet 2017).[1]

Furthermore: Rongorongo Tablet C (also known as *Mamari*) bears a sequence of text that most scholars agree can be interpreted to some extent. It most probably contains a 'calendar' with the list of 'the nights of the moon' that made up the Polynesian month, and whose Rapanui variety is known from oral tradition. If this identification is correct, then this 'list of nights' is crucial for decipherment, as it provides us with a sort of 'artificial bilingual' (cf. Davletshin 2012a: 243). In this chapter, I propose that a new look at Tablet C can help us understand what type of notation Rongorongo is.

What Type Is Rongorongo?

The question I have just posed ramifies into several enquiries. First: does Rongorongo constitute writing in the narrow sense (logo-phonetic or phonetic

[1] I use as main references for Rapanui the works of Roussel (1908), Fuentes (1960), Englert (1978), and Kieviet (2017), though other sources will be cited. Roussel's posthumous vocabulary is promising for early Rapanui, because it contains material from the late 1860s. It has been claimed that it is heavily contaminated by Mangarevan and Tahitian (Fischer 1992; Weber *apud* Sagredo Baeza 2013: 231), but this claim has not yet been backed by systematic philological analysis. As will be patent throughout this chapter, Roussel's vocabulary contains some material that has no match in Mangarevan or in Tahitian and is also not what we expect of inherited Rapanui words (based on regular sound laws and semantic proximity to East Polynesian cognates).

notation of a language) or a semasiography (a code whose signs do not map into a specific language and is used in a limited domain)? Second: if it is proper writing, what units (phonemes, syllables, morphemes) do its signs represent and what rules govern their use? This second question, in turn, involves several issues: what kind of phonetic signs (segmental, syllabic, morphemic) or other types (logograms, semantic determinatives) are used? And which orthographic principles guide the juxtaposition, ligaturing, or separation of basic glyphs to spell words? The problem goes back to the first report of 'hieroglyphic' writing on Rapa Nui (by Eyraud in 1864), and the literature is extensive. On this occasion, I cannot dwell on the various past and current proposals (for summaries, see Fischer 1997; Horley and Pozdniakov 2018; Horley et al. 2018; Horley 2021: 30–3), so I will only summarize them as a necessary starting point for this chapter's argument.

Barthel (1958, 1963) proposed that Rongorongo is 'embryo-writing' that omits grammatical words and registers only the key parts of speech (agent/subject, verb, object), as condensed, telegram-like representations of fuller oral traditions. He assumed the glyphs are mainly logograms that were also used phonetically through rebus (for example, glyph 25 was allegedly *pure* 'shell' but might also denote *pure* 'pray(er)'), but his readings did not yield a viable decipherment. There have been other proposals that Rongorongo is a logographic notation, even with a degree of phoneticism (e.g. Fedorova 1995; Fischer 1995; 1997: 259–60), but Pozdniakov (1996) and Guy (1998) showed that these are difficult to falsify.

Most scholars nowadays think Rongorongo is syllabic, possibly with some logograms (Macri 1996; Horley 2005; 2021: 33, 435; Pozdniakov and Pozdniakov 2007), or clearly logosyllabic (Davletshin 2012a; 2012b: 96; 2016; 2019; 2022). These views seem to build mainly (though not exclusively) on three assumptions: (1) that Rongorongo has around 50 basic signs, which is a close match for the 54–5 syllables of the Rapanui language (Macri 1996; Horley 2005; Pozdniakov and Pozdniakov 2007); (2) that a syllabic script can match the distribution of glyphs with the grammatical structures of the Rapanui language, especially reduplication (e.g. Davletshin 2019: 408); or (3) that statistical analysis of the distribution of glyphs is comparable to the distribution of syllables in the Rapanui spoken language (Horley 2005; Pozdniakov and Pozdniakov 2007). Assumptions (1) and (3) are hindered by the fact that the definitive number of Rongorongo glyphs is not established (cf. now Pozdniakov 2011; Davletshin 2012a; Horley and Pozdniakov 2018: 82; Horley 2021): using a non-definitive sign-list will introduce a bias in any statistical analysis that predicts Rongorongo's adherence to the distribution of Rapanui syllables. Meanwhile, a definitive repertoire is not viable until we make progress on how the script functioned and what the logic of the ligatures was (Davletshin 2012a: 243). Moreover, if Horley (2021) is correct, the number of basic glyphs may (more than) double the number of Rapanui syllables. Finally, assumption (2) is challenged by the fact that most Polynesian morphemes (especially lexical words) have a disyllabic (C)V(C)V structure (POLLEX), not a monosyllabic (C)V one. We will see that this is also true of Rapanui, and I will provide examples of how a different script typology can also fit the glyphs' distribution. None of the points I have just raised ensures that Rongorongo cannot be a logosyllabic script; but they do show that this is far from being the only or even the most likely option.

Evidence for a Lunar Calendar in Tablet C

Scholars agree that lines Ca6–8 of Rongorongo Tablet C, and perhaps Ca5 and Ca9 as well (Figure 10.1), contain a 'lunar calendar' (Barthel 1958: 242–7; Krupa 1971; Guy 1990, 2001, 2006; Pozdniakov 2011; Horley 2011; Horley and Pozdniakov 2018, 88–9; Horley *et al.* 2018: 351–2, 380, 389–92). This refers to a list of the names of the nights (or days) of the moon, which made up the lunar month in the Rapanui and East Polynesian methods of time reckoning.[2]

The external source in this case is the list of nights of the moon in the Rapanui oral tradition, as reported in three 'ethnographic' works (Thomson 1891: 546; Métraux 1940: 51; Englert 1974: 243–4). The three records deviate very little from one another (Table 10.1) and compare well with similar lists from other Pacific islands where East Polynesian languages are spoken.[3]

Figure 10.1 Drawing of lines Ca5–9 of Tablet C (*Mamari*), containing the so-called list of the nights of the moon or lunar calendar
Source: Drawing by the author, courtesy of INSCRIBE.

[2] For comparable Polynesian lists of nights of the moon, see Fornander (1878: 126), Tregear (1899: 46), Best (1922), Stimson (1928, 1964), Williams (1928), Audran (1929), Hiroa (1932: 218–22), and Métraux (1940: 50–1). These are the main comparative sources used throughout this chapter.

[3] A manuscript dated to 1936 and attributed to the native Esteban Atan contains a fourth list of nights (see Kondratov 1965: 409, 416; Horley 2011: 19–20). However, it diverges a great deal from the other three Rapanui sources and Polynesian lists in general. It is likely to be a late, 'eroded' version of the calendar, and so it is problematic for our study of what the earlier list of nights recorded in Rongorongo looked like.

Table 10.1 Rapanui nights of the moon as reported by Thomson (1891: 546), Métraux (1940: 51), and Englert (1974 [1948]: 243–4)

	Thomson (1886)	**Métraux (1930s)**	**Englert (1930s?)**
1	*Oari* (New Moon)	*Tireo*	(*Oari*?) *Ohiro* (New Moon)
2	*Kokore tahi*	*Hiro*	
3	*Kokore rua*	*Ata* (*Oata*)	*Kokore tahi*
4	*Kokore toru*	*Ari* (*Oari*)	*Kokore rua*
5	*Kokore hâ*	*Kokore tahi*	*Kokore toru*
6	*Kokore rima*	*Kokore rua*	*Kokore ha*
7	*Kokore ono*	*Kokore toru*	*Kokore rima*
8	*Maharu*	*Kokore ha*	*Kokore ono*
9	*Ohua*	*Kokore rima*	*Maharu*
10	*Otua*	*Kokore ono*	*Ohua*
11	*Ohotu*	*Maharu*	*Otua*
12	*Maure*	*Hua*	*Maúre*
13	*Ina-ira*	*Atua*	*Ina-Ira*
14	*Ra Kau*	*Hotu*	*Rakau*
15	*Omotohi* (Full Moon)	*Maure*	*Omotohi* (Full Moon)
16	*Kokore tahi*	*Ina-ira*	*Kokore tahi*
17	*Kokore rua*	*Rakau*	*Kokore rua*
18	*Kokore toru*	*Motohi*	*Kokore toru*
19	*Kokore hâ*	*Kokore tahi*	*Kokore ha*
20	*Kokore rima*	*Kokore rua*	*Kokore rima*
21	*Tapume*	*Kokore toru*	*Tapume*
22	*Matua*	*Kokore ha*	*Matua*
23	*Orongo*	*Kokore rima*	*Orongo*
24	*Orongo taane*	*Tapume*	*Orongo Taane*
25	*Mauri nui*	*Matua*	*Maúri-nui*
26	*Marui Kero* [sic]	*Rongo*	*Maúri kero*
27	*Omutu*	*Rongo Tane*	*Omutu*
28	*Tueo* [sic, = *Tireo*)	*Mauri-nui*	*Tireo*
29	*Oata*	*Mauri-kero*	*Oata*
30		*Mutu*	

Source: Thomson (1891: 546); Métraux (1940: 51); Englert (1974 [1948]: 243–4)

The lists have only small differences. The most obvious is the optional use of the preposition *o* 'of', which is not actually part of the names of the nights: thus e.g. *O Hotu* means literally '(night) of Hotu'. Other divergences are due to typos, defective or alternative spellings, use of different sources, and perhaps even recent language change. Nevertheless, the original form of a night's name can be reconstructed by comparison with its cognates in other East Polynesian languages, based on known sound laws. For instance, *Atua* (or *ʔAtua*?), not *Otua*, must be the original Rapanui name of the 10th or 11th night: cf. Hawaiian *Akua*, Mangarevan (*O*)*etua*, Marquesan, Maori and Tahitian *Atua*, etc., all from proto-East Polynesian *(*ʔ*)*Atua*.

The structure of Ca6–8 (Figure 10.1) recalls the oral lists, supporting its interpretation as a calendrical text. First, it has twenty-seven instances of the right-facing crescent glyph 40 (once the variant 40b),[4] either in isolation or as part of ligatures. This is close to the number of days in the synodic month or lunation, about twenty-nine and a half (Horley 2011), and the typical number of thirty nights in most East Polynesian lists (however, we will see that two of these crescents are probably not part of the month).

The second hint is given by eight repetitions, with only slight variations, of the sequence 390.41 – 378 (or 315) – 41 – 671 – 8.78.711. Its final glyph, a fish hanging from a line (711), comes in two versions, one facing up, the other facing down. Just about halfway through Ca6–8, glyph 152, a sitting human figure on top of three bulging features and inside an oval contour, divides the text in two parts. The first part contains four out of eight instances of the repeating sequence, and the three that can be clearly 'read' have the fish of sign 711 orientated upwards.[5] By contrast, the fish faces downwards in the four instances of 711 that occur in the second half of the text, after 152 (Guy 1990: 140–1). Barthel (1958: 245) inferred that glyph 152 must be a depiction of the Full Moon. In favour, he cited an ancient Rapanui tradition that there was an old woman in the moon, sitting by a stone oven called *umu*, which has counterparts elsewhere in Polynesia.[6]

Accordingly: before 152, the delimiting sequence with the upward fish glyph (711) should somehow indicate the moon's progressive increase in size (waxing); after 152, the second part with 711 facing down must indicate the waning phase of the moon, until the last night of the month. Barthel (1958: 242–7) and others deduced that the first half of Ca6–8 contains the first division of the lunar month, spanning from the night of the New Moon (whose name in the oral traditions

[4] Glyph 40 has two graphic variants (one with an extra 'protuberance' that might depict the waxing lunar phase), just like the Egyptian hieroglyph for 'moon' (N10 and N11) (Gardiner 1957: 486).

[5] One of these four instances is found at the edge of the tablet (Horley 2021: 116; Valério et al. 2022: 342, 347). However, the text is very faint, and it is not obvious that the glyphs are really a fourth instance of 8.78.711, with the fish glyph upwards (oddly, the fish may be facing down in this instance). Given the little space available at the edge, it is possible that some abbreviation was attempted.

[6] Englert (1974 [1948]: 133–4, *apud* Barthel 1958: 245, n. 4): The old folk used to say that 'no es una montaña lo que se ve en la luna, sino una mujer anciana que está sentada al lado de un gran curanto *umu pae* (de piedras en circulo)'. He linked this tradition to a legendary character called *Ko te Nuahine káumu a rangi kote kote*, 'the old woman who lights the *umu*-oven (curanto) in the *kotekote* sky' (*kotekote* is obscure). This echoes the trope of several Polynesian mythologies (Gill 1876: 45–6; Craig 1989: 64), according to which the goddess Hina resided in the moon. Hina literally means 'white, pale' and is related to *mahina* 'moon', which in Rapanui and other languages is distinct from *marama* 'moon(light), month'.

varies) to the night of the Full Moon (*Motohi*). Moreover: 390.41 – 378 – 41 – 671–8.78.711 seems to *divide* the list into seven sections, each with a subset of the lunar nights. This recalls some Polynesian calendars, which mark certain groups of nights as favourable or unfavourable for fishing or planting (Best 1922; 1929: 94; Stimson 1928; Pozdniakov 2011). Perhaps the subsections of the Rongorongo list reflect the same practice.

The final piece of evidence is the presence of a series of six consecutive crescents in the first part of the passage, and another series of five crescents in the second half. These groups match exactly the two series of *Kokore* nights in the oral calendar (Table 10.1). *Kokore tahi*, *Kokore rua*, and so on literally mean 'Kokore one', 'Kokore two', and so forth, and *Kokore* is a generic name derived from the partial reduplication of East Polynesian *kore* 'without; lack(ing)'. This possibly alluded (at least originally) to nights when fishing could not be done, and further supports the idea that the subsections of the calendar make such distinctions (Pozdniakov 2011: 46).

The two crescents in the group 40 – 40 – 520 – 70, at the beginning of line Ca9, have been treated as part of the 'calendar' (cf. Horley 2011: 22, fig. 3), but combinatorial evidence suggests they are not (Wieczorek 2016: 187–8). First, a similar group occurs in the verso of Tablet C (Cb14), as well as in Tablet B (Bv2) (Figure 10.2), where calendrical contents might be present, but are not obvious. Second, the crescents of Ca9 are found *after* the sequence 280 – 385y – 385. The latter occurs in Ca5 and again at the end of Ca8 (see Figure 10.1), and it appears to mark the beginning and end of a wider calendrical text that encompassed more than just the list of nights (Pozdniakov 2011: 46–7). Crucially, the passage of… 40 – 40 – 520 – 70… is outside this 'frame'. That 280 – 385y – 385 is a delimiter is supported by Horley's comparison (2011: 24–5, fig. 5) of Ca5–9 with a panel of petroglyphs from Ahu Ra'ai, on Rapa Nui (Figure 10.3). This rock carving depicts three turtles and a series of about twenty-nine crescent-shaped lines, as many as the nights of the month, suggesting a lunar cycle. Before and after the crescents,

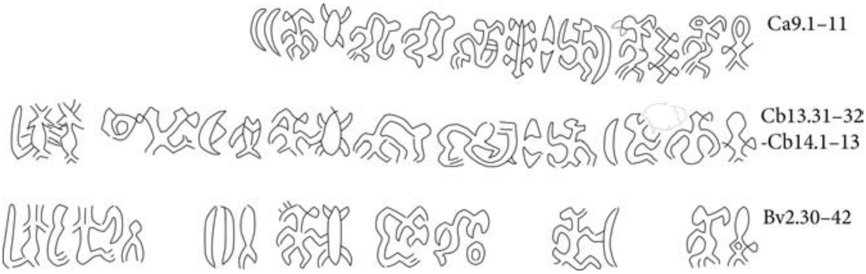


Figure 10.2 Three parallel versions of a passage (Ca9, Cb13–14, Bv2) that appears after the 'lunar calendar' of Tablet C and includes the sequence 40 – 40 – 520 – 70
Source: Drawing by the author, courtesy of INSCRIBE.

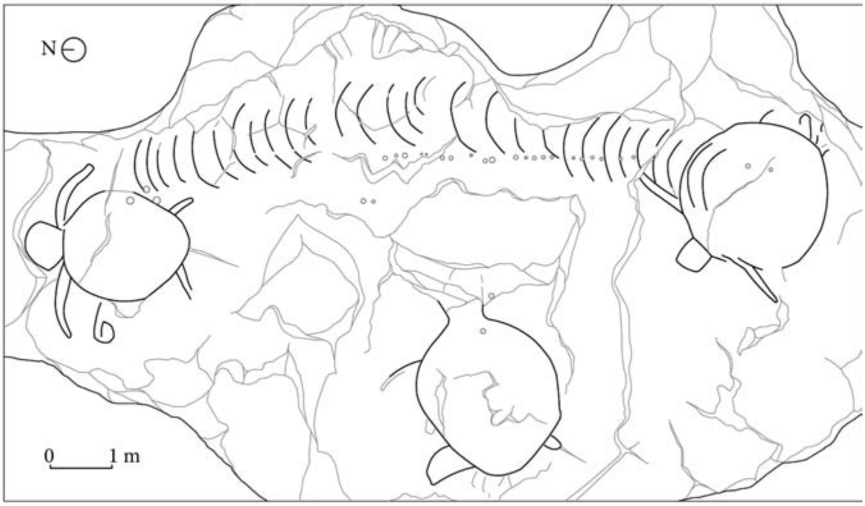


Figure 10.3 Petroglyph panel at site 31-44, near Ahu Ra’ai (Rapa Nui), showing a lunar cycle

Source: Drawing based on photogrammetric model documented by Paul Horley thanks to the kind permission and help of Ninoska Huki (CONAF Rapa Nui), Sonia Haoa, and Lílian González (Mata ki te Rangi Foundation).

two left-facing turtles appear, echoing the way in which the Rongorongo group 280 – 385y – 385 ‘frames’ the text of Ca5–8.

In conclusion: Ca6–8 is structurally similar to the Rapanui oral list of lunar nights, making the match plausible. There is, however, disagreement on the particulars of reading the glyphs, including their type (semasiographic, or logographic, phonetic, and determinative?), leading to very different views on the mechanics of Rongorongo. Nevertheless, the proponents of Rongorongo as a syllabic script have not yet produced a decipherment of Ca6–8 with plausible syllabic spellings of the names of the nights, even though the analysis above hints at the position of known names of nights. Davletshin (2012a: 250; 2022: 193) even maintains that the crescents functioned as numerical signs.[7] In what follows, I argue that some glyphs in the Ca6–8 text can spell the names of the nights if we assume they represent morphemes rather than syllables, even when they are phonetic.

[7] Davletshin (2012a) argues that the two types of crescents are ‘basic numerals’, and that a single crescent can also be a word-sign for Rapanui *tahi* ‘one’. He doubts the interpretation of Tablet C as a calendar along the lines of previous works because ‘there are no writing systems where signs function in such a “pictographic” manner: that is where a crescent is used for writing “one moon night”, three crescents for writing “three moon nights” and five crescents for writing “five moon nights” ’ (Davletshin 2012a: 250). Yet, in Ca6–8 nights could simply have been *listed* one after the other, sometimes by their own name, but often just generically, with glyph 40 functioning as a logograph (‘night – night – night – night – night’).

Towards a Semanto-Phonetic Paradigm

Metoro's Descriptions of the Glyphs

Étienne Jaussen, bishop of Tahiti and the first researcher of Rongorongo (*c.*1869–73), asked a native man from Rapa Nui to read four tablets (A, B, C, E). This man, Metoro Tau'a Ure, was said to have been instructed in Rongorongo before resettling in Tahiti (Fischer 1997: 47–57). As transcribed by Jaussen (1893; see also Barthel 1958: 173–99, 202–6), Metoro's readings—which he actually recited or sang—proved to be just descriptions of what the glyphs depict, even if often given in narrative style. See, for example, his reading of the ligature 381.8 from Tablet A (line Ab7):

ko te tagata — kua ui ki te hetuu
'the man/person—has looked at the star'

It became clear that these 'readings' or descriptions, as I will refer to them (cf. Table 10.2), do not yield coherent texts and a proper decipherment. Recent works make little use of this material or ignore it altogether (cf., e.g., Davletshin 2022: 215, n. 8), as they became associated with unsuccessful attempts to interpret the glyphs as logograms (cf. Horley et al. 2018: 362). Yet, they may contain clues to the values of Rongorongo glyphs.

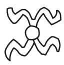
According to Neumann (1992), signs of image-based writing systems follow three modes of representation. These modes describe the relation between *what a sign depicts figuratively* and *its value as a script sign*:

Table 10.2 'Readings' of Metoro for the main glyphs discussed in this text and their translation

Glyph(s)	Shape	Metoro's main descriptions	Gloss
3		*maro*	'feather garland' (or *'strip'?)
8		*ra*[ʔ]*a* *hetu*[ʔ]*u* also *ahi*	'sun' 'star' 'fire'
9		*ragi*	'sky' (or 'chief, commander'?)

Continued

Table 10.2 *Continued*

Glyph(s)	Shape	Metoro's main descriptions	Gloss
10		*huki* *hoko huki* *tu ~ tuu* i.e. *tu*[ʔ]*u*	'pierce' *'pointed/piercing implement'? 'stand; (be) upright'
30		*kihikihi*	'lichen' (*or 'weed/creeping plant'?)
38		*hakapekaga*	'crossing'
40(a), 41		*marama*	'moon(light)'
44, 77, 78		*kava haati*	*'breaking/snapped off *kava* plant'?
59		*ha*[ʔ]*u ~ haha*[ʔ]*u* *ha*[ʔ]*u*	'bind, lash' 'headgear, hat'
74		*hua* *huaga*	'fruit(s), testicle(s)' 'fruit(s)' (*lit. 'fructification'?)
77, 78, 79		*viri*	'wind, coil, roll up'
81		*ahi* *ura*	'fire' 'flame'
280		*honu*	'turtle'
315, 378		*tagata marama*	'man/person of the moon'
381y – 381		*tagata moe*	'person lying down'
290, 390		[ʔ]*ariki* *tagata nui* *tagata honui*	'ruler' 'big man/person' 'man/person of authority'
600		*manu, manu rere*	'bird, creature', 'flying bird'
711		*rave* (*i te*) *ika* *tui* (*i te*) *ika*	'catch fish' 'string fish together'

Note: I provide only the salient lexical parts (e.g. *manu* 'bird' rather than *te manu* 'the bird' and *haha*[ʔ]*u* 'bind, lash', not *kua hahau* 'has bound'). The asterisk marks an additional meaning of a Rapanui word not contemplated by Jaussen nor Barthel. Unwritten glottal stops are given in angular brackets; *g* is the velar nasal /ŋ/ (*ng* or *ŋ* in other spelling conventions).

Sources: Jaussen (1893); Barthel (1958, 1963).

- *Connexio iconica* (i.e. iconicity): *a sign signifies what it depicts*, so that, for example, the picture of an eye stands for 'eye' (as a logogram).
- *Connexio tropica* (i.e. metonym): *a sign signifies something associated with what it depicts*, so that an eye stands for 'see', 'look', 'sight', 'watch', 'supervision', and so on (as a logogram or semantic determinative).
- *Connexio homophonica* (i.e. homophony): the iconic or metonymic value of a sign is used to spell a word or part of a word that sounds the same, so that the picture of an eye can be used in phonetic spellings like EYE-*tem* ('item') and SEE-*cret* ('secret').

Neumann developed this classification for the Anatolian Hieroglyphic script, but it applies just the same to other picture-based invented scripts—namely, Egyptian hieroglyphic, Mesopotamian cuneiform Bronze Age Chinese, the earliest Mesoamerican scripts…and Rongorongo, if it is also writing. Because we know the language of the Rapanui, we can know the name of the thing depicted by a glyph, the names for notions associated with that thing, and which words sound the same (homophones). This is where Metoro's readings come in: they can give us clues to what the glyphs represent.

Hua and Hiro

In fact, the only cogent 'reading' of a lunar night's name in Tablet C ever proposed draws on Metoro's descriptions. Six positions before the probable full-moon glyph (152), the position expected for the night called *Hua*, we find 74f.40. This ligature combines the right-facing crescent (40) with two hanging round shapes (74) with protruding strokes (f), like the hanging fruits (drupes) of a coconut tree:

Barthel (1958: 245) noticed that Metoro described 74f as *hua* 'fruit, testicle(s)',[8] a word that sounds just like the night *Hua*. Following this trail, Guy (1990, 2001, 2006) suggested that 74f was a logogram ('ideogram' in his terminology) for ***hua*** **'fruit'**. He also proposed that 40 was a logogram and a 'semantic classifier' for **'night'**, regardless of whether it also had a phonetic value (the Rapanui word for 'night' is *poo*). Thus, Guy treated 74f.40 as a *semanto-phonetic spelling*: 74f would mark the phonetic reading of the word, *hua*, while 40 would indicate semantically that it is the name of a night (74f.40 = ***hua*.night**).

[8] Also *huaga*, lit. 'fructification' (see Table 10.2).

Guy did not extend this view to other cases, nor did he formulate it exactly like this. Yet, he did hint at it by comparing the Chinese character 銅 *tóng* 'copper' (Guy 1990: 144). This character combines two graphs: 金 *jīn* 'metal' for its semantics, and 同 *tóng* 'same; together' for its sound (metal+*tóng*). This combination of semantic and phonetic elements is just one of the types used in the Chinese script from its beginnings. Chinese signs developed as either single or combined graphs that stand for one morpheme in three basic ways: (1) *phonetically* (as phonograms, via rebus), (2) *semantically* (as logograms) or (3) *as combinations of semantic and phonetic graphs*, as in the example of 銅 *tóng* 'copper'. This is only a rough sketch of a more complex, multilayered picture (Boltz 1994, 2000). Thus, a Chinese logogram can also contain two semantic components (e.g. 'capture' contains 'hand' + 'bird') (Bottéro 2004: 252), a strategy seen also in other scripts (e.g. Sumerian cuneiform 'head' + 'bowl' > 'eat'). In addition, the elements of a combined Chinese graph can themselves be compounds: e.g., in 銅 *tóng* 'copper', the phonetic 同 *tóng* 'together' can be further analysed as semantic 凡 'all' + semantic 口 'mouth'. The Chinese graphs that cannot be further decomposed (like the 120–30 or so basic glyphs of Rongorongo) are called 'radicals'.[9]

We find clues in the calendar that Rongorongo had the same three basic functional types as Chinese signs. Thus, if read correctly, 74f.40 ?***hua*.night** is a *semanto-phonetic* compound and 40 ?***poo* 'night'** is a *logogram*. The third type follows from Guy's observation (2001; 2006: 12) that the shape of glyph 30, the third item in the list of lunar nights in Ca6–8, is reminiscent of the Rapanui word *hiro* 'twine/twist fibres (to make rope)':

The glyph depicts a looping thread of something that could be fibres, making the match compelling. Metoro consistently called this glyph *kihikihi*. This is Rapanui for 'lichen', but East Polynesian cognates are also the name for weeds or creeping plants (POLLEX), which could have been its original sense. Thus, Metoro may have had vegetal fibres in mind.[10] To sum up: if 30 was a logogram ***hiro* 'twist fibres'**, then in the calendar it spelt the night *Hiro* through rebus, as a *phonogram*.

[9] Chinese is not strictly speaking a logosyllabic script (even though its phonetic signs are all monosyllabic), because it does not contain a distinct, self-contained 'grid' of graphemes devoted to the representation of syllables more than anything else. This undermines any analogical reasoning that implicitly assumes Rongorongo must be logosyllabic because 'all known hieroglyphic scripts are' (Davletshin 2012a: 244; cf. also Davletshin 2022: 188).

[10] In fact: Metoro read 306.3 (human with open hand + cord?) as *tagata haga i te kihikihi* 'man/person who makes the *k*.', which implies that he perceived both glyphs 3 and 30 as *kihikihi* and something that could be worked.

Polysyllabic Signs?

That some Rongorongo glyphs might function a lot like Chinese writing is hardly surprising. Chinese is mainly an isolating language, and most of its words contain only one morpheme. Also, most Chinese morphemes have just one syllable and many are homophonous or near homophonous (Boltz 1994: 18). These features determined the typology of the Chinese script: there was vast potential for rebus, which favoured the development of one-syllable logograms that might also be used as phonograms or semantic indicators. Similarly, East Polynesian tongues are highly isolating (Kieviet 2017: 12), so that Rapanui has a great deal of correspondence between morpheme and word. However, Rapanui morphemes are mainly polysyllabic, and the majority has *two syllables*. Hence, the language is also rich in homophones, but they are disyllabic, not monosyllabic, as in early Chinese. Their typical structure is (C)V(C)V: e.g. *here* ‘knife, rasp (of obsidian)’ vs *here* ‘bind, fasten’.

Crucially, even Rapanui words transcribed as (C)V̄ derive from dissyllabic (C)VV forms. This is the case of *pō* ‘night’ (< proto-East Polynesian **poo*), for instance. (C)V̄ words were probably perceived as disyllabic in the past, as suggested by developments like Rapanui *toa* ‘sugarcane’ from earlier **too* (Maori, Tahitian, etc. have *tō* ‘id.’). Similarly: (C)VV Rapanui words with non-identical vowels clearly contain two syllables, not diphthongs: for example, the reduplicated plural of *kai* ‘eat’ is *kakai*, not **kaikai* (Kieviet 2017: 37). Davletshin (2019: 418) lists only twenty-two lexical words of modern Rapanui as monosyllables, and they all belong to the (C)V̄ < (C)VV type.[11] Conversely, the only true (C)V words are all grammatical words: e.g. *ʔa* (possessive preposition), *he* (nominal predicate marker), *ʔi* ‘in, at’, *ki* ‘to’, *te* (article), etc. (Kieviet 2017). Thus, Rapanui has very few true monosyllables, and they do not name things that could easily be translated into pictures and become, later, phonetic glyphs.

This point is crucial: scholars who see Rongorongo as a (logo-)syllabary must argue that its hypothetical syllabic signs became phonetic not through rebus, but through acrophony (that is, by drawing on the first syllable of the word they depict).[12] If, on the contrary, Rongorongo glyphs mainly stood for polysyllabic

[11] These words are: *ā* ‘drive (cattle)’; *ʔi* ‘be full’; *hā* ‘four; to breathe’; *hē* ‘where’; *hī* ‘to fish (with a line); headache; have diarrhoea’; *hū* ‘kindle fire’; *kā* ‘burn’; *kē* ‘different (postnominal)’; *kī* ‘say, speak’; *ŋē* ‘to sound (squealing or screeching sound)’; *ŋū* ‘cuttlefish; avaricious, stingy; to recite by singing’; *ō* ‘distribute, give a feast; to answer a call by *ō*’; *pā* ‘surround, encircle’; *pē* ‘go, disappear (of money)’; *pī* ‘to water, sprinkle water on’; *pō* ‘night’; *pū* ‘hole; go to meet somebody’; *rē* ‘win a race’; *tā* ‘tattoo, mark (on cloth); weave a net; become infected’; *tī* ‘plant sp. (*Cordyline fruticosa*)’; *tū* ‘crush, grind’; *ū* ‘breast (of woman), nipple’; milk; roar (about sea)’. Some of these words postdate or could potentially be later than the creation of the Rongorongo script: Davletshin glosses *ā* as ‘post-Contact’ (i.e. post- 1722); *ʔi*, *pī*, *rē*, and *tū* are given as late Tahitian or potentially Tahitian borrowings; and *ū* is glossed as ‘“Mangarevan?’.

[12] E.g. Davletshin (2012b: 106; 2022: 201) speculates that phallus-like glyph 76 was a syllabogram *ko*, whose value ‘may be of acrophonic origin’ from Rapanui *kohe*, the name of a plant.

morphemes, then Barthel's idea that grammatical words were largely omitted makes sense: all grammatical words (particles) that have only one syllable could not be written phonetically with polysyllabic signs.

Up to now, it has been impossible to expand on Barthel's and Guy's above-mentioned insights and infer principles by which Rongorongo might have spelt not just *Hua* and *Hiro* but also other nights and phrases. Next, however, I argue that, if we combine (1) these insights, (2) Metoro's descriptions of what the glyphs depict, (3) the distribution of the glyphs in the 'lunar calendar', and (4) the assumption that the glyphs mainly represent polysyllabic lexical morphemes, new light can be shed on Rongorongo.

Expanding the Paradigm

Glyphs for 'Night' and 'Moon'

For Metoro, both crescent glyphs, 40 and 41, were *marama* 'moon(light), month', and their distribution in the Rongorongo corpus shows that they are sometimes interchangeable. However, Guy (1990: 144) noticed that, while the right-facing crescent glyph 40 seems to represent the *nights* of the moon in Ca6–8, the same is not true of the left-facing crescent 41. Rather, 41 is restricted to the delimiting sequence 390.41 – 378 – 41 – 671 – 8.78.711, which Guy interpreted as marking 'the appearance of the moon'. This distribution supports his interpretation of 40 as the logogram **'night'** (Rapanui ***poo***) and 41 as **'moon'** (Rapanui *mahina* 'moon' or *marama* 'moon(light); month'?). The Chinese script provides an exact typological parallel for the specialized use of two lunar signs: the early graph  became both **ngwjat* 'moon(light); month' and **rjak* 'night' (> modern 月 *yüeh* and 夕 *xì*) (Boltz 1994: 66, 85).

In a few instances glyphs 40 and 41 (as well as their respective 'horizontal' variants, glyphs 42 and 43) do alternate in parallel texts (Davletshin 2012a: 252–3, fig. 2), as if they were mere allographs. This is a potential obstacle to Guy's view. However, 40 and 41 might interchange only in certain *semantic* uses: for instance, the 'moon' and 'night' glyphs could be determinatives for the same word—if that word were, for example, related to the moon, night-time, or some other astronomical or time-reckoning notion. This is the hypothesis I follow here.[13]

[13] Davletshin (2022: 215, n. 6) additionally thinks that glyph 41 cannot be trisyllabic (which would exclude *mahina* and *marama* 'moon' as values): the glyph is used in pairs (41 – 41), and in Rapanui grammatical duplication yields the structure prefix + (C)V(C)V + (C)V(C)V (hence *ma-rama-rama* 'light, brightness') when it operates on trisyllabic forms (which etymologically reflect prefix + (C)V(C)V). Therefore, he expects a (C)V(C)V value. However, I see no reason why glyph 41 should not be polyvalent and have two readings, one trisyllabic (?***mahina*** or ?***marama***), the other disyllabic (e.g., ?***hina*** **'grey/white/pale'** or ?***rama*** **'light, torch'**). Moreover, at this stage, we might even wonder if Rongorongo 41 – 41 spelt *maramarama* as ?***marama-[ma]rama***.

Ligature 40.10

If we accept the identifications of 30 = *Hiro,* 74f.40 = *Hua*, 152 = Full Moon / *Motohi*, and the two *Kokore* series of nights, then we can deduce which nights are indicated by glyphs or ligatures other than just 40 (Figure 10.4).[14]

Thus, we expect 40.10 – 40 – 30 to contain at least *Oata* and *Hiro*. Most East Polynesian lists have cognates of these nights, so they must have been part of the old calendar. Métraux (1940: 51) reported that, even though it is missing from Thomson's account, *Hiro* was given to him as the name of 'a new full moon'. Conversely, the recording of *Ari* at the start of the list is odd: except for the Hawaiian list, all cognate calendars contain a cognate of *Ari*, but it occurs in positions 7th through 12th. Thus, at Rapa Nui *Ari* may have moved to the beginning of the month only after Tablet C was inscribed.

Like 74f.40 ?***hua*.night**, the ligature 40.10 could be semanto-phonetic, in this case with the potential phonetic element (glyph 10) attached on the right. Guy suggested that 10 was a logogram for Rapanui [*ʔ*]*ata* 'shadow, reflection', perhaps because he (like Métraux) analysed *Oata* as **O Ata* '(the night) of Ata'. Yet, *Oata*

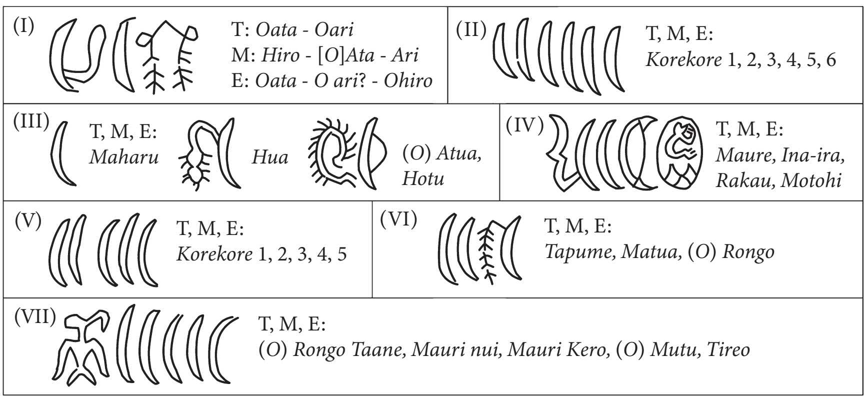


Figure 10.4 Initial matching of glyphs from the seven subsections of the Rongorongo text in Ca6–8 with the positions of lunar nights in the Rapanui oral lists (T = Thomson, M = Métraux, E = Englert); the two probable series of *Kokore* nights, and glyphs 152 (full moon?), 30 (**?*hiro***), and 74f.40 (**?*hua*.night**) are used as reference points

[14] The fifteenth night is marked only by glyph 40. In the oral lists, it is called *Ina-ira*, a name not found in any other Polynesian list. Horley (2011) and Horley et al. (2018: 391) note that Rapanui *ina i-ra* means 'not there' and suggest it is the result of an error by, or a misunderstanding of, Thomson's informant. Métraux and Englert followed Thomson and did not obtain any different information. Thus, *Ina-ira* may be a recent addition. All other Polynesian lists have a reflex of **Turu* in this position (Mangarevan, Maori, and Tahitian *Turu*, Hawaiian *Kulu*, Marquesan *Tuʔu*, etc.). Perhaps the Rapanui calendar also used **Turu* at the time Tablet C was carved.

reflects Rapanui **ʔOhata*, from **Soʔata* 'bright; cast light' (through **Hoʔata*, with metathesis; see POLLEX and Davletshin 2016: 359). Thus, Rapanui **ʔOhata* is related to *ʔata* 'reflection' only etymologically. Another fact makes Guy's idea problematic: 10 is one of the most common Rongorongo glyphs (>300 attestations),[15] but it is hard to think of a reason why a logogram for ***ʔata* 'shadow, reflection'** should be so frequent.

Glyph 10 appears to depict some *erect* object whose tip is rounded or flat—for example, a limb, a phallus, or a stake (it may be an abbreviation of anthropomorphic glyphs with a *raised* limb, especially 205 and 305). Suitably, Metoro's readings for 10 often contain *tu*(*u*), which reflects Rapanui *tuʔu* 'stand up; upright' (also 'mast, pole') and its reduplicate form *tutu*, i.e., *tutuʔu* 'stand up (pl.)'.[16] It is beneficial to hypothesize that glyph 10 is a logogram ***tu*(*ʔ*)*u* '(be) upright'**. First, this is a frequent Rapanui word and homophonous with an equally frequent verb, *tuʔu* 'arrive', which accounts well for the glyph's distribution. Second, this interpretation means that 40.10 can represent a starting night called **Tu*(*ʔ*)*u*. This night was not recorded by any ethnographer on Rapa Nui, but it has counterparts in several Polynesian lists:

- Mangareva: *Tu*(*u*)*-nui* 'Great Tuu' is the 30th and last night of the month, after *Ohoata* (Tregear 1899: 46; Janeau 1908: 115).
- South-eastern Marquesas: *Tu* or *Tu-nui* is the 1st day of the month, followed by *Tu-hava* (2nd) and *Tu-hakaoata* or *Hoata* (3rd) (Handy 1923: 348; Audran 1929; Dordillon 1931: 409).
- North-eastern Marquesas: the *Tu-nui* of the south-eastern Marquesas changes positions with *Tu-hava* (Audran 1929).
- Hawaii: the nights in positions 3–6 are called *Kū kahi*, *Kū lua*, *Kū kolu*, and *Kū paau*, literally 'first', 'second', 'third', and 'final *Kū* (< **Tuu*)'. They are preceded by *Hilo* and *Hoaka* (< **Hiro*, **Hoʔata*) (Fornander 1878: 126).
- Island of Aana (Tuamotu): one list begins with *Tu*, followed by *Fakaata* (cf. south-eastern Marquesan *Tu-hakaoata*) and *Hiro-Hiti* (a form of *Hiro*) (Stimson 1964: 72, 145, 558).[17]

If we read 40.10 – 40 – 30 as **night.*tu*(*ʔ*)*u* – night – *hiro***, i.e. '*Tuu* – a night (*ʔOhata*) – *Hiro*', this is not just a perfect match for the beginning of the list from

[15] According to Pozdniakov (2011: 42, tab. 2), the glyph represents 6.6% of the corpus.

[16] In Aa6, Ab4, Br7, Br8, Bv8, Bv11, Ev3, Ev6, Ev7. Metoro also used phrases with *huki* 'pierce' or 'digging stick' (cf. Englert) and *hoko huki* (the name of a sharp implement) (see Table 10.2 and Barthel 1958: 204), but these are his descriptions of glyph 4 and they suit it better, as it depicts a pointed object with a sharp tip. Therefore, the use of *huki* for glyph 10 (also pointed but more rounded) may be the result of confusion by Metoro.

[17] The calendars of Rakahanga and Manihiki might also preserve hints of a possible *Tuu* series (Hiroa 1932: 218, 221, tabs 16–7). Both begin with a night called *Te Atu* or *Atua* followed by *Tu(a)tahi* 'First Tu(a)'. Afterwards, Rakahanga has *Tu-roto* ('Inner Tu'), whereas Manahiki features *Tuatahi-rua* 'Second Tuatahi' and *Tuatahi-toru* 'Third Tuatahi'. However, this deserves further investigation.

Aana; it also compares well with the nights at (or around) the start of the month in Mangareva, the Marquesas, and Hawaii.

We should still stress one potential problem. Outside Rapa Nui, **Tireo* and **Tuu* are mutually exclusive: lists with a reflex of **Tuu* have no form of **Tireo*, and the opposite also holds. This distribution could imply that the presence of *Tireo* in the Rapanui lists is a late introduction, perhaps by Thomson.[18] Unfortunately, even this argument faces an obstacle: the last section of the Rongorongo calendar contains five crescents that should correspond to *Rongo Tane*, *Mauri Nui*, *Mauri Kero*, *Mutu*, and a fifth night, which (by elimination) ought to be *Tireo*. Yet, it seems improbable that Rapa Nui had both *Tireo* and *Tuu*. I cannot suggest a definitive solution, but the agreement between Metoro's perception of glyph 10 as *tu*[*ʔ*]*u* and its use as the name of initial nights in other Polynesian calendars is too strong a hint to ignore. In fact: because the last nights of the calendar in Tablet C are marked only by the 'generic' glyph 40, the presence of *Tireo* is not assured.

Ligature 3.40

Ligature 3.40 is in the position of *Rongo*. If 74f.40 is ?***hua*.night**, then glyph 3 could also be a phonetic indicator attached to a semantic 40 (?**night**). Interestingly, Guy (2006: 65) remarked that glyph 30 ?***hiro* 'twist (fibres)'** looks like a duplication of glyph 3. The latter depicts something that hangs (rope, fibres, or feathers?) and resembles the shape of glyph 30 (twisting fibres/rope?). Metoro called glyph 3 *maro*, the Rapanui name of a 'kind of banner or pennant, made with small feathers of birds, *tied* in the fashion of garlands *to a strip* or rod' (Englert 1978: 192; emphasis and translation are mine). The cognates of *maro* in other East Polynesian tongues signify vestments worn around the waist or loins ('loin-cloth, girdle, belt'; see POLLEX), suggesting it was originally something meant to be tied or bound, perhaps generically a *'band' or *'strap'. This is what Metoro may have had in mind. Thus, we expect gyph 3 to represent a word that has to do with ropes or binding *and* sounds like *Rongo* [roŋo].

There is a set of Polynesian cognates that fit this expectation to an extent. Reflexes of a proto-form **ʔoloŋaa* (POLLEX) occur in most East Polynesian languages (Hawaiian *olonaa*, Manihiki-Rakahanga *ʔo*(*o*)*rogaa*, Mangareva *oroga*, Marquesan *oʔoka* ~ (*ʔ*)*oʔona*, Rarotongan *ʔorongaa*, Tahitian *rooʔaa*, Tuamotuan *rongaa*) and various Outlier Polynesian languages (for example, Takuu and Nuguria *aronaa*, Luangiua *longaa*, and so on). The word usually names a kind of nettle (*Pipturus argenteus*), whose bark was used for obtaining fibres and making cordage, nets, or fishing lines. In some tongues (for example, Mangaia,

[18] The guide and interpreter of Thomson on Rapa Nui, Alexander Salmon, was related to the Tahitian royal family (Thomson 1891: 476; Routledge 1919: 208).

Mangareva, and Manihiki-Rakahanga) it also names the fibres themselves or the items made from it. Because the reflexes of **ʔoloŋaa* are so widespread, earlier Rapanui probably had one as well. Based on regular sound laws, we can reconstruct it as **ʔoroŋaa*, but **roʔoŋaa* '(cord of) *roʔongā* fibre'[19] is also possible (metathesis is frequent in polysyllabic Rapanui words; Davletshin 2016: 359). If Rapanui had this cognate and glyph 3 was a logogram for it, then the latter might indicate *Roŋo* phonetically. However: while the omission of vowel length and the glottal stop from writing is common worldwide, ?****ro(ʔ)oŋaa*** for *Roŋo* also implies differences in the vocalism at the end of the word.

There is an alternative account that may avoid this problem. Elsewhere in the Rongorongo corpus, the ligature 3.40 also occurs in a parallel sequence repeated in tablets A, C, H, P, and Q (Figure 10.5). Each element in this sequence features glyph 3 attached to another basic glyph or ligature. This creates a very repetitive pattern that makes it difficult to interpret glyph 3 as syllabic or even phonetic in this context. The structure is more suggestive of a list than a fluid sentence. If, on the contrary, 3 is used semantically, then it can be a determinative that spells various words related to fibres, cords, or their use. This works whether the glyph's reading was ?***ro(ʔ)oŋaa*** **'bark fibres; cord'** or something else—for example, ***taura*** **'rope'**, ***maro*** ***'band, strip'**, and so on (and we cannot exclude polyvalency).

Interestingly, 3.40 occurs twice (in Ab5 and Cb10), but most other instances of the 'cordage sequence' feature either 40.3 or 40:6.3. Because the hand glyph 6 is optional, it is likely that it has a semantic role too, perhaps to indicate an action of the hands. This means that, if there is any phonetic component in the ligature, it should be the crescent. If we interpret 40(:6).3 as **?*poo*(.hand).cord**, then we should look for a Rapanui a word that (1) denotes an action of the hands; (2) sounds like *poo* 'night'; and (3) has something to do with tying or binding. There is one that fits this description to an extent: Rapanui *poa* 'to hit, touch, moor',[20] which is likely to derive from proto-East Polynesian **poo* 'cover, catch, strike (with a cupped hand)' (it might reflect the same sound change seen in Rapanui *toa* < **too* 'sugarcane'). While this suggestion is not free of problems either, perhaps it is more economic to assume that 3.40 = 40.3 = 40.6.3 could function as a phonetic spelling of both Rapanui ****poo*** **'catch, moor'** (or similar) and ***poo*** **'night'**. Perhaps in the calendar 3.40 spells *poo* '(a) night' rather than the name *Roŋo*?

[19] Notice that, like Tahitian *rooʔaa* and Tuamotuan *rongaa* (< **roʔoŋaa*?), some Outlier Polynesian cognates lack initial *ʔo*-: cf. Ifira-Mele *rogaa* 'Pipturus argenteus', Luangiua *loŋa* 'id.', and Vaeakau–Taumako *longaa* 'a big tree'.

[20] Roussel (1908: 185, 188, 206, 208; cf. also Churchill 1912: 241) has *poa* 'choc, contagion; heurter, maculer'; Englert (1978: 228) has *poá* 'touch something (with feet or hands); moor a boat; bring close (to land or something else)'; Fuentes (1960: 295) gives *poá* 'touch, hit' and *háka poá* 'bring something close to; dock; make touch'.

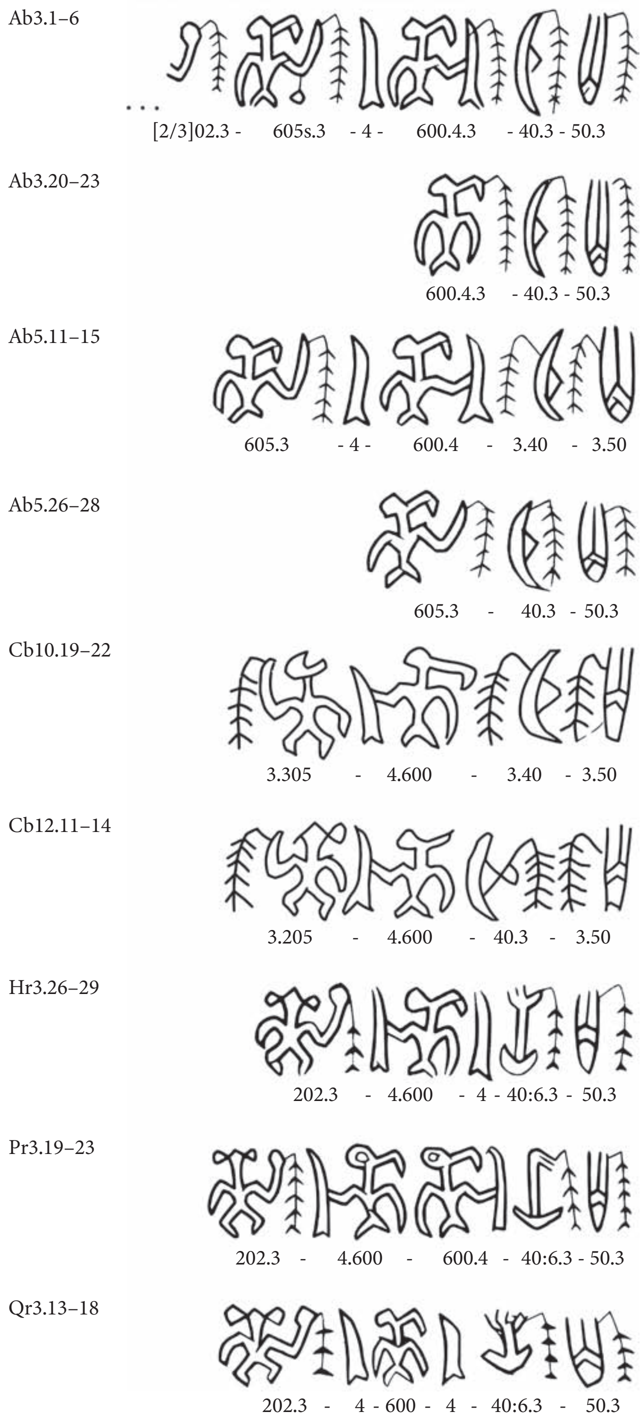


Figure 10.5 Parallel passages containing the initial part of series of combinations with glyph 3

Sources: Lines Cb10 and Cb12 after Valério et al. (2022) and courtesy of INSCRIBE; the remaining drawings are from Horley (2021) and are reproduced here with permission.

Glyph 59

Glyph 59 occurs where we expect *Atua* to be. Since *Atua* is (near-)homophonous with Rapanui *ʔatua* 'deity', Guy (1990: 144; 2006) speculated that 59 was 'a feather cloak, worn by chiefs and heavenly beings' and therefore a 'symbol' of deities. Yet, nothing in the distribution of 59 in the rest of the corpus supports this notion, and Metoro did not relate the glyph with the supernatural in any way. Rather, he used two words, *hau* and *hahau*, to refer to this glyph. Metoro's *hau* is both a noun and a verb, whereas *hahau* is strictly a verb.[21] The noun, glossed by Jaussen as 'chapeaux en corde d'hibiscus' (Barthel 1958: 202), is Rapanui *haʔu* 'hat, headgear' (< **faʔu*).[22] The verbs must be Rapanui *hahaʔu* 'tie, lash, fasten' and the non-reduplicated form **haʔu* (< **faʔu*), which is attested only in Metoro. Their etymological link with *haʔu* 'headgear' is illustrated by Tuamotuan *fau* ~ *hau* 'tie, bind on (as a head-dress, band, fillet)' and 'adorn with wreaths' (Stimson 1964: 84, 123).

Following this clue, we can consider an alternative account. Tablet C may not record *Hua – Atua – Hotu* in this order as in the lists of Thomson and Métraux, but rather **Hua – Hotu – Atua*. In this scenario, glyph 59 would denote the night *Hotu*. While *Hua – Atua – Hotu* is the most widespread order for these three lunar nights in Polynesia, it is not always respected. The Ngati-Awa (northern New Zealand) and Kahungunu (eastern New Zealand) versions of the Maori calendar show the arrangement *Ohua – Hotu – Atua* (Williams 1928: 28, nos 15, 21). Renaming or reversing the order of certain nights is seen in various calendars of Polynesia and is precisely what explains the divergences across islands. Different versions of the list could even coexist in the same society. This is important to note, because Thomson and Métraux recorded the 'standard' order *Hua – Atua – Hotu* (Englert has *Ohua* and *Otua* but lacks *Hotu*) for Rapa Nui, which therefore must still have existed as the inherited sequence for these nights from the first settlement of the island. If a variation arose, it had to coexist with the original order. This may not look like the most 'economic' suggestion, but there are two more indications that glyph 59 is consistent with it.

First, 59 occurs in two main 'palaeographic' variants, one a winding shape, another a full loop:

[21] Metoro's uses of *hau* as a noun are clear in phrases such as *te hau* 'the *h.*' or *toona hau* 'her/his/its *h.*'. The verb occurs typically in the phrase *kua hau* 'has *h.*-ed'. Finally, the partially reduplicated form was usually part of phrases such as *ku hahaú* 'has *h.*-ed' and *ka hahau* '(must) *h.*'.

[22] This is also clear from his reading of glyphs 522f (Cb13) and 526 (Er4) as *te ariki puo haú* 'the high-chief who wears a headdress' (cf. Rapanui *puʔo* ~ *puʔa* 'put on') (Barthel 1958: 193). It is worthwhile noting that the head-part of glyphs in the series 520 (including 522f), which Metoro recognized as a headdress, resembles glyph 59.

Second, 59 alternates or is used alongside glyph 30 ?***hiro*** **'twist (fibres)'** in two sets of parallel texts, here called Group 1 and Group 2.

In Group 1 (Figure 10.6), a hand glyph (shapes 6 or 55b/132) is followed by glyphs 30, 59, 56, or sequences involving them (30 – 4 or 59 – 4 – V30). Very likely, these are variant spellings of the same words or stand for similar sentences. This distribution makes sense if glyph 30 signified ***hiro*** **'twist, twine'**(?), and, as implied by Metoro, the equally twisting 59 had something to do with binding or the use of cords.

Group 2 (Figure 10.7) is comprised of three parallel passages from Tablets C, H, and P (Guy 2006: 66; Horley 2010: 54, fig. 10). Each passage has three ligatures involving 59, and Hr4 and Pr3 even employ Barthel's shapes 451f, 455f, or 456f, which describe combinations of 59 with an anthropomorph with a head shown

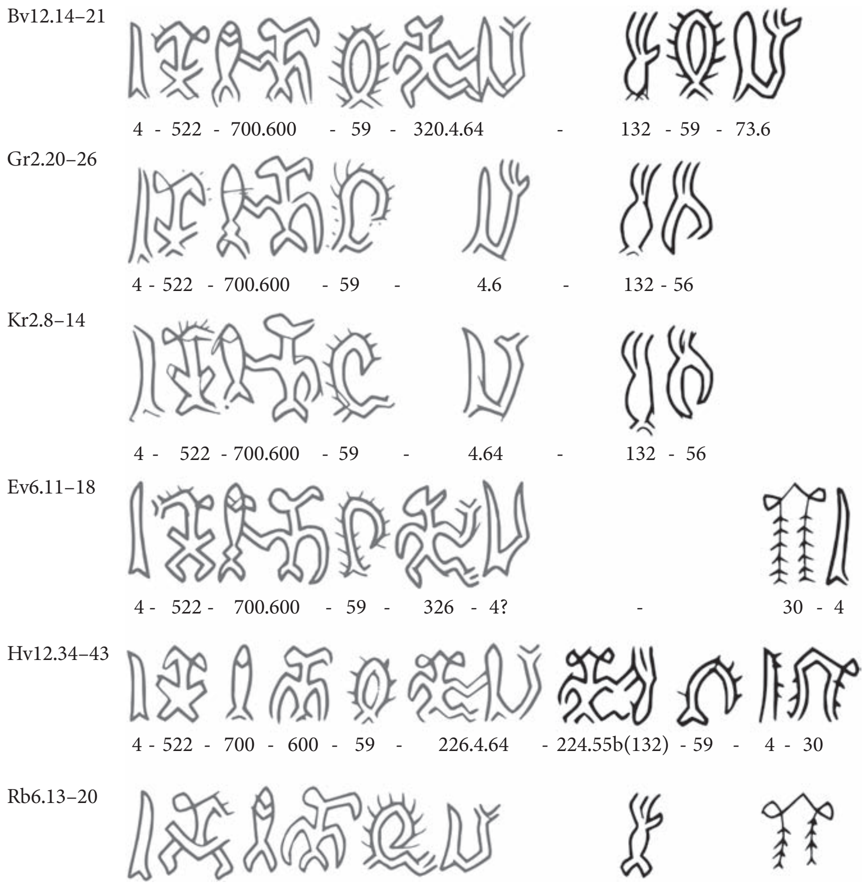


Figure 10.6 Parallel sequence from tablets B, E, G, H, and K or Group 1
Source: Drawings adapted from Horley (2021) with permission.

Figure 10.7 Parallel sequences from tablets C, H, and P or Group 2
Sources: Line Cb10 after Valério et al. (2022) and courtesy of INSCRIBE; Hr4 and Pr3 adapted from Horley (2021) with permission.

in profile. Although their shape varies in each passage, these three ligatures must be the same. The third one is the most interesting for our purposes: in Cb10 and Hr4 it contains a version of 3 facing upwards (a growing plant or fibres?), whereas in Pr3 it uses an upside-down form of 30 ?***hiro*** **'twist fibres (into rope)'**. Again, this strongly implies that the values of glyphs 3, 30, and 59 are somehow related.

All in all, we expect glyph 59: (1) to refer to the *manipulation of fibres/cordage*; (2) to include a sense of *twisting*; and (3) to *sound roughly like* the name of either the night *Atua* or, as I have argued, *Hotu*. The only morpheme that fits all these requirements survives in modern Rapanui ***hatu*** **'weave a hat or mat; fold'**, and the reduplicated forms *hahatu* 'hem, fold back (and sew the edge of a garment)' and *hatuhatu* 'fold repeatedly' (Fuentes 1960: 200; Englert 1978: 121, 125).[23] This morpheme is a nice fit for the use of 59 in the calendar: as there is no Rapanui morpheme *[ʔ]*atua* or **hotu* whose meaning could be depicted figuratively by a twisting and spiky shape like 59,[24] we can hypothesize that ***hatu*** was a rough spelling of *Hotu*.

[23] Rapanui *hatu* derives from **fatu* 'weave' and has cognates in all East Polynesian languages (POLLEX).

[24] The name of the mythical hero settler of Rapa Nui, Hotu Matua, obviously contains *hotu*, but it seems that it is not native. Fischer (1994) shows that the character of Hotu Matua matches the *ʔAtu Motua* 'Lord Father' of Mangareva. The latter name has Mangarevan *ʔatu* 'lord', which is cognate with Rapanui *hatu* 'master' (both from **fatu* through regular sound changes). Thus, Hotu Matua may have entered the Rapanui lore during the late-nineteenth-century diaspora of the Rapa Nui people. Indeed, the name ('Fruitful Father'?) also seems to be influenced by Tahitian *hotu* 'bear fruit' (< **fotu* 'appear'), which has no known cognate in Rapanui. Finally: Marquesan *hotuhotu* 'small black vermin that eats wood and corpses' (Dordillon 1931: 173) could be interesting, given the worm-like shape of 59. Yet this is reduplicated from *hotu* 'hole, perforate(d)' (POLLEX), which also has no known cognate in Rapanui.

Group 2 provides additional support for this interpretation and the general idea that Rongorongo glyphs spelt polysyllabic morphemes. It looks like a short list of three items (words?) related to weaving or the manipulation of fibres. The second ligature combines our 59 ?***hatu*** **'weave; fold'** with glyph 81, which is Metoro's *ahi* 'fire' or *ura* 'flame'.[25] If we take Metoro literally and assume 81 means **'fire/flame'**, then we can also expect 59.81 (and variants) to notate a weaving term that sounds like something related with combustion. Again, there is a ready pair of Rapanui homophones that fits the evidence: ***raraŋa*** **'weave/plait (mats or baskets, using plant fibres)'** vs ***raraŋa*** **'the scorched part of something'**. These words contain different etyma: the former is a partial reduplication of **raŋa* 'plait (mats/baskets)'; the latter is formed from *rara* 'scorch, char, heat' with the addition of the nominalizing morpheme -*ŋa*. Yet, because they sound the same, they provide a rationale for uniting a weaving glyph with a fire glyph. Of course, in Group 2 the expected sense is *raraŋa* 'plait'.

It will be immediately clear that 59.81 = ?**weave.fire** > ?***raraŋa*** is not a semanto-phonetic spelling of the same type discussed so far. Neither the sound of *hatu* 'weave' nor of *ahi* 'fire' nor of *ura* 'flame' is involved, and yet the ligature's value (?***raraŋa***) seems not exclusively semantic either. Rather, Rongorongo appears to have developed a peculiar type of sign: two graphs whose *semantics* combine to evoke a new and shared *phonetic* value. If this is correct, it might enlighten more glyphs.

Ligature 44.40

The first such case is ligature 44.40, which occurs in the position of night *Maure*, but has as yet received no explanation that is coherent with how other, better understood glyphs behave.[26] As a starting point: Metoro described glyph 44 and other bending or twisting shapes (54, 77, and 78) as *kava haati* 'broken (by snapping) *kava* plant', *kua haati te kava* 'the *kava* plant has broken', and *hatu huri*

[25] Glyph 8 (star/sun) seems possible in Hr4 and Pr3, but the long stem of the corresponding shape in Cb10 is consistent with 81.

[26] Guy (1990: 144) suggested a 'visual pun', in which the twisting glyph depicted the male sexual organ and evoked the Rapanui phrase *ma ure* 'with (*ma*) a penis (*ure*)' (for Rapanui *ure* 'penis', see Churchill 1912: 266; Fuentes 1960: 353). The proposal was problematic and Guy (2006: 11, fig. 13) no longer maintained it. To be sure, Metoro's old speech still attests to *ma* 'with' (modern Rapanui uses *hai* 'id.'), but the article *te* is always placed before the noun (e.g. *ma te ika* 'with the fish'). Second, I know of no writing system in which one phonetic sign (be it a segment, a syllable, or a morpheme) draws its value from an entire phrase. Guy (1990) further suggested that the glyph depicted 'a wick or a flame' and expressed 'the notion of brightness', because *Maure* is the third night before the full moon and already 'quite bright'. Horley (2011: 30–1, fig. 9.12) proposed that the glyph is a picture of the Mare Frigoris, a lunar mare observable on the surface of the moon. Both proposals imply atypical semantic signs, which, moreover, can hardly account for the other occurrences of glyph 44 in non-calendrical Rongorongo texts.

(cf. *hatu* 'fold' and *huri* 'overturn'). He also used the word *viri* 'coil, wind, roll up' for glyphs 77, 78 (sometimes), and 79 (consistently). There is ambiguity in his reading of these various shapes in similar ways, but we can see that for Metoro glyph 44 had something to do with twisting, turning, bending, or breaking, which agrees well with its shape.

We can explore the idea that 44.40 combines the semantics of '**break/twist'(?)** and '**night'** to evoke both ***maure*** **'a night of the moon'** and a homophone. No such homophone is attested, though, again, it may have existed before the 1860s. East Polynesian languages have a prefix **maa-*, which carries a sense of attenuation (like English *-ish* in *soonish*).[27] This prefix is not productive in Rapanui, but it appears fossilized in some pairs: e.g., *ʔau* (< **ʔahu*) 'smoke' vs *ma*(*ʔ*)*ahu* 'steam', *hina* 'pale' vs *mahina* 'moon', *rama* 'light, torch' vs *marama* 'moonlight', *roa* 'long, tall' vs *maroa* 'stand, (be) straight', and *ruhiruhi* 'weakness; delicate' vs *maruhi* 'crippled, paralytic; weak'. We can wonder if there was also a trisyllabic Rapanui word **maure* with this construction. A morpheme **ure* 'whirl, wave' could be inferred from *ureure* '(in) spiral' (Roussel 1908: 243) and *ure tahiri* 'gush, spurt, flow' (Englert 1978: 279) < **taafiri* 'wave, whirl' (POLLEX), but these may be foreignisms in Rapanui.[28] More promising is the evidence from Hawaiian *ma*(*ʔ*)*ule* '(be) faint; dispirited' (Pukui and Elbert 1986: 242), Tahitian *maureure* 'shame(ful); dismay; discouraged; clumsy' (Davies 1851: 141; Jaussen 1861: 30)[29] and perhaps Mangarevan *mouri* 'fear; dread (of some shameful event)' (Tregear 1899: 56) and Marquesan *mouʔi* 'id.' (Dordillon 1931: 272). It implies (not without irregular sound changes) the existence of a proto-East Polynesian word **maure*, perhaps with a less figurative sense (such as 'stirred', 'shaken', or 'broken') and a virtual Rapanui reflex **maure*. This would fit the combination of a 'broken' glyph with the crescent in the position of *Maure*. As this suggestion cannot be proved, I offer it only very tentatively.

Glyph 600

This glyph is Metoro's *manu* 'bird, creature'. In the list, it appears right before the crescent glyph that should indicate *Rongo Taane*, but whether 600 – 40 should be read together is unclear (they need not to). Thus, I forgo any speculation for the time being.

[27] See, for example, Tuamotuan *mā-* 'id' (Stimson 1964: 268) and Tahitian *mā-* 'prefix forming verbs or adjectives' (*Fare Vānaʻa*).

[28] Fuentes (1960: 354) renders *ure tahiri* as 'lightning', but this is later than Englert's translation (1978: 279). Still, 'gush, spurt, flow' recalls Rapanui *ure tiatia moana* 'whirlwind, eddy', which in turn is borrowed from Tahitian *ureure tiʔa moana* 'watersprout' (see *Fare Vānaʻa*)—contrast native Rapanui *ohi*[*ʔ*]*ohi*[*ʔ*]*o* (Roussel 1908: 247) ~ *ohirohiro* (Englert 1978: 212) 'whirlwind'. This also suggests that Roussel's *ureure* '(in) spiral' may be a Tahitianism.

[29] Cf. also Tahitian *maure* 'bare (said of trees)' and *ureure* 'poor, destitute' (Davies 1851; *Fare Vānaʻa*).

The Delimiting Sequence

We have seen that 390.40 – 378 – 41 – 670 – 8.78.711 subdivides the list of nights and probably marks the progressive waxing and waning of the moon (by means of the up- and down-facing fish glyph 711). In addition, Guy (1990: 140, 143–4) plausibly interpreted the crescent glyph 41, placed after an anthropomorph with his or her arms raised, as marking 'the appearance of the moon'.[30] Guy's observation provides a clue worth following.

The lists of nights of the moon are so similar throughout Polynesia because they were transmitted *orally* for centuries before being recorded in paper. For example, Stimson (1928) documented in full one oral list reported by a former Tahitian queen who learned it from her ancestors. Her recitation of the list of nights, it turns out, was interwoven with mentions of the *daily reappearance of the moon* in the sky (Table 10.3).

Some of these phrases are rather formulaic. The verb changes, but the structure is the same: *ʔua* (perfect marker) + verb + *te* (article) + *marama*, i.e. 'The moon has X-ed'. Notice that *ʔua* is cognate with modern Rapanui's particle *ku* and its variant *ko* (Metoro used the earlier forms *kua* and *ku*), and that Rapanui has comparable idioms: cf. *ku tea* (*ʔ*)*ā te hetuʔu ahiahi* 'the evening star has risen' (Englert 1978: 261).[31]

Though with less detail, similar recitations were recorded by Fenton (1885: 131–2) among the Maori, in New Zealand. Again, the formula *kua* + verb + *te marama* 'the moon has X-ed' was used.[32]

		'The good days and the bad days for planting and fishing, according to the words of the wise men who have come from the seat of learning.'
1.	*He whiro.* […] *ka kohiti te marama.*	'Whiro. […] The moon reappears.'
3.	*He hoata.* […] *kua kitea nui tia.*	'Hoata. […] It has become so large it can be seen plainly'
16.	*He Rakaunui. Kua raununui te marama. Kua whero.*	'Rakaunui. The moon has become full. It has turned red.'
17.	*He Rakaumatohi. Kua riwha te marama.*	'Rakaumatohi. The moon has become partly invisible.'

[30] Guy hypothesized that the entire sequence was a 'pictogram' indicating the need to measure the diameter of the moon and determine whether an extra night had to be added to a current month. This usage is typologically odd and leads to incoherence: for example, he suggested that 390.41 represented a man holding a 'measuring rod', so that glyph 41 would not depict a lunar crescent anymore.

[31] Cf. also Marquesan *ʔua eke te meʔama* 'la lune monte' and *ʔua tu te meʔama* 'la lune paraît' (Dordillon 1931: 127, 406).

[32] I provide my own translation, which is more literal than Fenton's original. Best (1922: 28–30) has a less detailed presentation of the same calendrical recitation.

Table 10.3 Relevant fragments of the Tahitian list of the nights of the moon

Excerpts of the Tahitian recitation (as transcribed by Stimson 1928)	**Translation**	**Night**
'E parau teie na te feiā tāi'a 'ei fa'a'ite ra'a i te mau pō horo ra'a te i'a…'e, í te mahana é au ai no te tanu ra'a mā'ā.	This is a record for fishermen, recounting the nights when the fish run,…and the days which are favourable for planting food-plants.	(Introduction)
'ua pâta te mārama, *'e mārama ápî 'a, é 'ua noho te mārama í ni'a í te pätu.*	**The radiations of the moon have become visible**, it (is) a new moon, and the moon rests upon the horizon.	Tireo (1)
'ua hiti te mārama, *'ua fa'a'ite í tō'na huru.*	**The moon has risen**, she has revealed her form.	Hiro-hiti (2)
'ua 'āta te mārama, *te 'itèä '"è ra, é, hôra 'tura í tō'nä 'ta.*	**The moon has appeared**, thereafter she is visible, and she has shed her light.	Hoata (3)
'ua tūrămărămă te mārama	**The moon has begun to shine brightly.**	Tamatea-muri (9)
'ua hotu te mārama *é* ***'ua tupu;*** *áita eā te rā í tŏpă 'ua tĭ'ä 'e te mārama.*	**The moon has increased** and **reached her full development**; before the sun has set the moon has risen.	Hotu (15)
'ua tā'ăhi te măhana í te ***mārama, 'ua ta'oto te mārama*** *…'ō Mutu te pō, 'Māuri-matě te ao, 'ō Tireo te ăhiăhi;*	Daylight has trodden upon the moon, **the moon has set**; (...) Mutu is the night, Mauri-mate is the day, Tireo is the evening (following).	Māuri-matě / Mutu / Motu (30)
'ua mutu 'atoà ia te pärau mai te hiti ra'a mai te mārama ápī é tae noä 'atu í te pohe ra'a.	Concluded is also (this) account, from the rising of the new moon until the setting.	(Conclusion)

Source: Stimson (1928).

Similar oral 'glosses' on the list of nights must once have been widespread, so that the Rongorongo calendar may conceal a comparable formula. Also crucially: except for the shift in the fish glyph at the end, we should expect the delimiting sequence to evoke no changes in the moon. Because it recurs unchanged throughout the whole list of night, it probably refers to the continuous reappearance of the moon throughout the month in generic ways—again, compare the Tahitian oral list.

If glyph 41 stands for ***marama*** **'moon'** in opposition to 40 ***poo*** **'night'**, then 390.40 – 378 – 41 in the delimiting sequence is a good candidate to contain a formula akin to 'The moon has risen/appeared' (as anticipated by Guy):

And if Rongorongo omitted particles, as hypothesized by Barthel, we should expect to find only the verb and noun represented: i.e. [*kua* / *ku* +] verb + [*te*] *marama*. Metoro described glyph 390 in various ways. One of them, *tagata nui* 'big person/man', fits the glyph's depiction of a human with a prominent belly. Thus, I suggest that the combination 390.41 **?big.moon(light)** evokes the following homophonous Rapanui words: *tea* 'white, bright; whiten, shine', *tea* 'rise (celestial bodies)' (see above), and *tea* 'pride; proud; boast'.[33] Of course, the meaning 'rise' is the one that befits the group. Additional evidence comes from the alternation of 290 – 47 (Cb14) with 630 – 47 (Bv2, Ca9) in the parallel sequence that comes right after the 'calendar' in Tablet C (see Figure 10.2). The idea that glyph 290/390 (human with prominent belly) could imply *ascent* seems less odd because it also substitutes for 630 (rising bird).

We also need to account for glyph 378/315 between 390.41 ?***tea*** and 41 ?***marama***. One possibility is that it is a redundant determinative that specifies that 390.41 ?***tea*** is meant as 'rise', not '(be) proud' nor 'brighten', white'. However, it seems more likely that it indicates another verb, one with a related meaning—for example, *tikeʔa* 'be visible' (< **kiteʔa*). Suitably, 378/315 depicts a human with one raised limb (which resembles glyph 10 ?***tu(ʔ)u*** **'stand, be up'**) as if to mean 'appear' or 'stand out', and a hand pointing to him or herself, as if to suggest an intransitive action. The similar group 315 – 41 in the sequence of Ca9 (see Figure 10.2) is a further hint that 378/315 is linked to 41 ?***marama***.

I propose 390.40 – 378 – 41 reads as **(big.moonlight)*tea* – *tike(ʔ)a* – *marama* →** Rapanui [*kua*] *tea*, [*ku*] *tikeʔa* [*te*] *marama* 'the moon has risen and become visible'.[34] The second phrase has good parallels. Two of Metoro's recitations for glyph 40 (in Ab3 and Er2) prove its existence in older Rapanui: *ku tikea te marama* 'the moon has become visible'; and *ko te marama ku tikea* 'the moon, it

[33] To the best of my knowledge, only Roussel (1908) records *tea* 'boast; pride; proud, etc.', *teatea* 'boast; boasting; vain, arrogant', as well as the phrases *mata tea* 'look at one's clothes out of vanity', *taetea* 'humble (pride-less)', and *tagata tea* 'vain (person)'. The fact that no other East Polynesian tongue has this sense for *tea* and the variety of expressions that use this morpheme imply that this is proper Rapanui.

[34] For older Rapanui I reconstruct *ku* rather than *kua* as the preferred form of the perfect particle before verbal morphemes with more than two syllables, like *huero*. Though this distribution is no longer observable nowadays, it is seen in Metoro's speech. Mangarevan (Janeau 1908: 61) and Marquesan (Dordillon 1931: 32) also drop the final -*a* of their perfect markers in the same environment.

has become visible' (see Barthel 1958: 182, 196).[35] Moreover, it resembles both the Tahitian and Maori recitations for the night *Hoata*, which use reflexes of **kiteʔa*:

- Tahitian *ʔua ata te marama, te ʔitea aʔe ra* 'the moon has appeared, thereafter she is visible' (see Stimson above).
- Maori *kua kitea nui tia* 'It has become so large it can be seen plainly' (see Fenton above). Best (1929: 249) also recorded: *ka kitea te marama* 'the moon is visible'.

The whole reading also echoes the Tahitian statement for the second night (*Hiro-Hiti*): 'The moon has risen (and) she has shown her shape.' Notice that 'to show' is expressed by the causative *faʔa-ʔite* ('make visible'), which contains the same etymon as **kite-ʔa* (*ʔite* < **kite*). The fossilization of the same notions (rise and visibility of the moon), grammatical constructions, and etyma (**kite*, **kite-ʔa*) in different parts of Polynesia shows just how ancient these formulae are. Thus, while the reading ***tea – tike(ʔ)a – marama*** is as hypothetical as other readings offered here, I stress that it fits both what we expect from the structure of Ca6–8 and Polynesian oral traditions.

Next: 8.78.711 should indicate the waxing and the waning of the moon, based on the change of orientation in the fish glyph 711 before and after the full-moon glyph. Moreover: glyph 8 is Metoro's 'star' or 'sun', so we can also suspect it denotes something related to 'light' or 'brightness' in connection with a celestial body. As there are parallel passages in which a sequence A – B (two juxtaposed glyphs) alternates with A.B (ligatured glyphs) (Guy 2006: 56), it is possible that an A.B.C spelling like 8.78.11 is the same as A.B – C and indicates two morphemes. Thus, 711 could represent words that mean 'more' and 'less', while 8.78 could signify the size or glow of the moon. To explore this hypothesis, we need to investigate glyph 78.

Glyph 78 always 'hangs' attached to other glyphs like glyph 3 (**?'fibres/cord'**). This implies that it can also depict some kind of thread or filament, despite the ambiguity of Metoro's descriptions (who seemed to confuse it with glyphs 44 'snap?' and 79 'roll, coil?'; see Table 10.2). Another clue as to its value is afforded by the parallel Rongorongo passages shown in Figure 10.8. We see some symmetry in it: most of the glyphs in text Ev8 repeat in duplicated form in Bv11. One of these is the combination of 275 or its variant 376 (sitting person *with a load on the back*) with the 'thread' glyph 78, and it is apparent that the two components can change positions without altering the ligature's value. This parallel sequence features the variation between single and double forms of glyphs, which recalls a

[35] Roussel (1908) has Rapanui (*haka*)*kite* 'show (make visible)' and *tikea* 'see, know, perceive' (also *tikea a mai* 'visible, seen'). The latter is from the passive **kite-ʔa*. In recent Rapanui, *tikea* ~ *tikeʔa* is documented alongside innovative *tikera* (Davletshin 2016: 363).

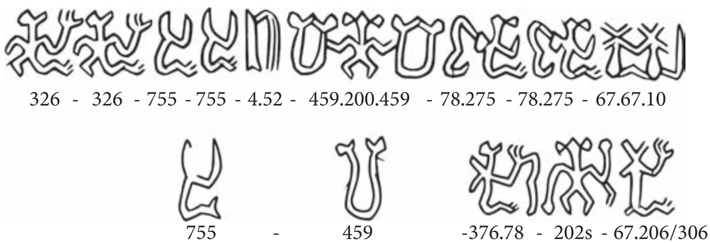


Figure 10.8 Parallel sequences ('gathering sequence') in tablets B (Bv11.26–34) and E (Ev8.24–28)

Source: Drawings according to Horley (2021), reproduced with permission.

well-known grammatical feature of Rapanui and Polynesian languages: a (C)V(C)V morpheme can reduplicate to take on a frequentative, iterative, or intensive value: e.g. *hono* 'patch' > *honohono* 'put various patches', *piro* 'rotten' > *piropiro* 'completely rotten', etc. (Kieviet 2017: 69–71). This agrees with the notion that Rongorongo glyphs represent morphemes, not (C)V syllables, as only the former undergo reduplication. The ligature 376.78 = 78.275 **?load.?thread** can then be matched with a set of East Polynesian homophones—namely, *kave* as 'threads' or fringelike things and *kave* as 'carry (on back)':

- Rapanui *kave* 'fibres, thread' (cf. also *kavei* 'short handle; peduncle; loop of rope').
- Hawaiian *ʔawe* 'carry on the back; knapsack carried so' and 'tentacle' > *ʔaweʔawe* 'knapsack; straps for a bundle'; cf. also *awe* 'strand; thread' (Pukui and Elbert 1986: 35).
- Maori *kawe* 'carry, convey; the straps by which a bundle is carried on the back; etc.' > *kawekawe* 'tentacles of a cuttlefish' (Tregear 1891: 140–1).
- Tuamotu *kave* 'carry, bring to; hang; the thread of a fringe, etc.' > *kavekave* 'anything fringelike; ends, strands, threads, fibres' (Stimson 1964: 211). Also notice the use of a reduplicative form with a frequentative sense: *kave* 'carry' > *kavekave* 'deliver'.

Certainly, Rapanui **kave* 'carry' is not directly recorded, but cognates are so common among the East Polynesian tongues that it probably existed before the linguistic changes of the late 1800s. Notice that this pair of homophones does not just square well with the shapes of 78 and 275/376. While the sequence in Ev8 and Bv11 is undeciphered, its glyphs are very suggestive of a short list of terms for transportation or gathering: alongside our 78.275 = 376.78 ?***kave*** **'carry'**, the joining heads' glyph (459) might mean 'join, gather, assemble' or similar, and the 'person with closed fist' glyph (206) was frequently read by Metoro as *ma*[*ʔ*]*u* 'grab; bring'.

If we assume that 78 stands for **?*kave 'thread'**, then 8.78 can be interpreted as other ligatures above: we expect it to evoke a word or set of homophones related both to celestial light (glyph 8) and to things that hang like a filament (glyph 78). The older Rapanui word *huero* fits these requisites: it means 'ray of light' and 'radiate, shine' (Roussel 1908: 234),[36] but etymologically it also refers to projecting body parts: cf. the old Rapanui expression *hetu*[*ʔ*]*u huero* 'comet', literally 'tailed star' (Métraux 1940: 52), as well as cognates like Hawaiian *huelo* 'tail (of animal)' (Pukui and Elbert 1986: 85) and Mangarevan *vero* 'tail' > *verovero* 'rays, tentacles' (Tregear 1899: 120).[37] That ?****kave* 'thread'** might point to **'tail'** or **'ray of light'** is not strange, as sunbeams and comet tails were perceived as threads in the Polynesian imaginary: cf. Hawaiian *awe* 'strand, thread' vs *aweawe* 'rays of sun' (Pukui and Elbert 1986: 35),[38] Niue *kavekave* 'rays of setting sun', Pukapuka *kave* 'tail of a comet', Samoan *ʔave* 'sunbeam', and Tokelau *kave* 'beam/ray (of light)' (POLLEX). Therefore, I suggest that 8.78 conceals ***huero*** → [*ku*] *huero* '[the moon] has shed her light' in the context of Tablet C.[39] Again, this reading yields a phrase very similar to the recitation about the night *Hoata* in the Tahitian oral list (see above).

Metoro gave various descriptions of 711 as a fish hanging from a line, but one of the most frequent was *rave* (*i te*) *ika*, literally 'catch fish'. Roussel (1908) records for Rapanui the related forms *rava* 'have, capture, obtain, etc.' and *rava ika* 'fish(ing); fisherman'.[40] Both have been largely replaced by *ravaʔa* 'take, get, pillage' (Englert 1978: 242), probably a Tahitian borrowing. If 711 evoked fishing (*rava ika*) visually and was a logogram for older Rapanui ***rava* 'take, seize'**, then it might have been used as a rebus in the calendar. Maori, Moriori, and Rarotongan have a particle *rawa* 'very, extremely' that is placed *after* verbs: cf. Maori *he*

[36] Roussel (1908: 186) also gave Rapanui *uero* (*sic*) 'comet'. In recent Rapanui, *huero* has shifted to *hiero* 'the first glares of the sun before it rises' (Englert 1978: 131) and 'halo' (Fuentes 1960: 205). Englert's gloss is probably more exact than Métraux's *huero* 'dawn' (1940: 52).

[37] Roussel (1908: 234) recorded the reduplicated form *hueroero* 'ray', which reveals the structure prefix + (C)VCV-(C)VCV. This suggests that Hawaiian *huelo*, Rarotongan *u*(*v*)*ero* 'burst forth (rays through the clouds)', Tuamotuan *huero* 'burst asunder (sky)', etc., all derive from **su*(*u*)-*welo* (cf. **suelo* in POLLEX). That **su*(*u*)-*welo* was built on **welo*, but had a similar sense, accounts for doublets such as Mangarevan *vero* 'tail' and 'to dart, throw', Tuamotuan *vero* '(to) spear' and 'tail, ray of light', Tahitian *verovero* 'to twinkle (stars)', etc. Thus **welo* meant basically 'to cast, project' in reference to projectiles, hanging body parts, and rays of light alike. Notice also that Métraux's *hetu*[*ʔ*]*u huero* 'tailed star' is the same as Mangarevan *etuvero* (**ʔetū vero*) 'comet' (Tregear 1899: 15).

[38] Hawaiian *awe* and Tahitian *ave* 'comet tail' have no initial glottal, just as Mangarevan *ave* 'a string; tail of a comet' lacks the initial *k*. By regular sound laws, this means they derive from a doublet **awe*, without *k*. Tahitian *ave* may have been borrowed into Rapanui, which in recent times also attests to the phrase *hetuʔu ave* 'comet' (Englert 1978).

[39] Not many Rapanui idioms with the verb *huero* are attested, but we know that its relatives were used in reference to the moon: cf., e.g., Rarotongan *te verovero marama* 'the moonbeams' and Pukapuka *Na velo loa te yila o te māina lā loto o nā kāpuāo* 'the moon's light shone right down through the clouds' (*Te Pukamuna*).

[40] These forms are doublets: cf. Mangarevan *rave* 'take' and *raveika* 'to fish; fisherman'; Maori *rawe* 'snatch' (< **rawe*) vs, e.g., Tuamotu *rava* and *ravaika*, Hawaian *lawaiʔa*, Marquesan *ʔavaika* (POLLEX).

ātaahua *rawa* *atu* 'it is extremely beautiful'. More distant Polynesian languages (Pukapuka, Samoan, Tokelau) have a cognate, *lawa*, showing that this particle is an archaism and goes back to proto-East Polynesian (POLLEX). The closest attested counterpart in Rapanui is the particle *rava* 'very, much', which is used *before* verbs (e.g., *rava kai* 'glutton', lit. 'much-eating', or *rava keukeu* 'hard-working'). However, in earlier times Rapanui may also have preserved the postverbal intensifier **rava*, before the recent Tahitian loanword *hopeʔa* (Kieviet 2017: 119) took on a similar role. My suggested full reading of 8.78.711 is therefore ***?huero.?rava*** → [*ku*] *huero rava* 'she (the moon) has shone brightly'.

By logic, we should expect the down-facing version of 711 to express the opposite sense of **rava*, i.e., 'little, less'. Crucially: 711 occurs over fifty times in various Rongorongo texts, but its down-facing version is restricted to Ca6–8. Was it an ad hoc device? For now, I forgo further speculation and stress only that the scenario presented here accounts for several facts and fits the expected calendrical contents of the text.

Turtle on the Horizon?

While Metoro was adamant that glyph 280 is a turtle (*honu*), his readings of the two instances of 385y – 385 in Ca5 and Ca8 are ambivalent: in the first instance he described people lying down (*tagata moe*), but in the second he saw two mice (*erua kiore*)—which, strangely, was often his view of the series of glyphs of sitting anthropomorphs with head shown in profile. Although Barthel treated the back-to-back anthropomorphs depicted by 385y – 385 as independent glyphs, it is possible that they are just one, and that their position is what conveys meaning. I suggest that 385y – 385 evokes Rapanui *taha* 'flank, side' (< **tafa* 'side, beside'), which also means 'edge, horizon' and is homophonous with *taha* 'go down, decline (said of the sun)'. This yields the hypothetical reading ?***honu*** – ?***taha***, which can be translated as 'turtle of the horizon', or even 'sunset turtle'. In this scenario, 280 ?***honu*** **(turtle)** would be a logogram and 385y – 385 ***?taha*** **(side)** probably a phonogram (depending on the exact sense of the phrase). While other possibilities cannot be excluded, I stress that this one makes some sense of the use of 280 – 385y – 385 as the start and end of the calendrical text and its link to the lunar petroglyphs at Ahu Ra'ai (see Figure 10.3). The precise symbolic link between turtles and the observation of the lunar cycle remains uncertain.

A Guiding Star?

Next comes glyph 38, which is very rare (Horley 2021: 455) and was described in three or four different ways by Metoro. Two of them may be informative:

hakapekaga (**haka-peka-ŋa*), roughly '(the) crossing (of something)', and *peka-peka* 'starfish'.[41] Both derive from ***peka* '(to) cross'**,[42] a good candidate for the logographic value of the glyph, which appears to depict a crosswise lashing. Interestingly, **peka* forms several East Polynesian words with astronomical and time-reckoning connotations:

1. Tuamotuan *kōpeka* ~ *nāpeka*, alternative names of the Southern Cross, 'a constellation in the form of a cross of four stars' (Stimson 1964: 377–8); Hawaiian *kapeʔa* < **tapeka* 'id.' (Pukui and Elbert 1986: 132); and Marquesan *napeʔa* / *tapeʔa* (northern dialect) ~ *napeka* (southern dialect), which name the same constellation, as well a month roughly equivalent to April (POLLEX).
2. Maori *kaupeka* 'branch', which also means 'a division (of time)', including the lunar month (Best 1922: 15).
3. Tuamotuan *peka*: a 'guiding star which rises later but on the same line of sight as a previous guiding star, taking the place of the latter in determining the course' (Stimson 1964: 377–8).

These three comparanda yield interesting prospects for Ca5, if one of them had an unattested cognate in Rapanui. Given the position of 38 ?***peka*** at the start of the wider calendrical text and after the hypothetical 'horizon/sunset turtle', one possibility is that it denotes a 'guiding star', perhaps generically (like Tuamotuan *peka*), as a reference for astronomical observation. Indeed, Polynesian time-reckoning often focused on stars whose first appearance or setting marked the beginning of a certain month: for instance, among the Maori, the star *Whiti-kaupeka* (Spica in Virgo) appeared at the start of Whiringa-ā-nuku (October) (Makemson 1941: 271). Another possibility is that older Rapanui used a derivative of *peka* to name months as a 'a division of time' (as in Maori). After 38 ?***peka*** come glyphs 7 (canoe) and 600 (bird), but their role here remains obscure.[43]

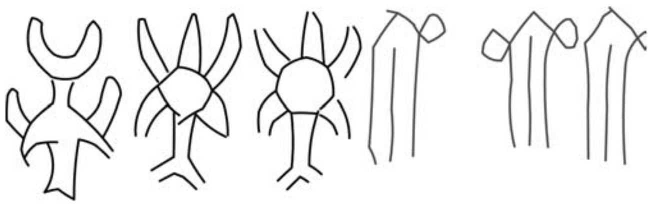
[41] Metoro's recitations (Barthel 1958) contain three descriptions: *te pito motu* 'cut off navel' (Ab8), *hakapekaga* 'crossing' or similar (Ca5), and the obscure *rapue* (Br9). The fourth description, *te pekapeka* 'crustacé en forme de croix', is actually Jaussen's label (1894: 25) for glyph 38 in his repertoire of 'signes ideográphiques', which was illustrated with readings based on his interviews with Metoro.

[42] Only *pekapeka* 'starfish' and *kopeka* 'vengeance' are well attested in recent Rapanui (Englert 1978: 179, 224), but Roussel's earlier vocabulary (1908) gives *peka* 'cross', *hakapeka* 'cross (legs)', and *hakapekapeka* 'intertwine; trellis'. These data are unsurprising, as all East Polynesian languages have reflexes of **peka* with a similar semantic coverage.

[43] Perhaps glyph 7 stood for ***vaka* 'canoe'** and modified 38 **?*peka***: cf. Hawaiian *pe'a* (< **peka*) 'sail of canoe' (Pukui and Elbert 1986: 322) and Maori *kaupeka* 'sprit and boon? yard and boon of latin sail?' (Best 1925: 297). However, for now this speculation does not lead to a superior interpretation of the text.

Evening Sky?

In lines Ca5–6, between 38 – 7 – 600 and the list of nights, there is a series of five sequences delimited by glyphs 1 – 214 and ligature 1.6 (see Figure 10.1). Four of these sections each contain a group of three instances of the same glyph (reflecting four divisions of time?), but for now this observation has not led to further insight. Nevertheless, it is worth examining the group 9:<u>42</u> – 81 – 81 – 5 – 5 – 5, which is part of the second of these sections:



Glyph 9 is Metoro's *rangi*. Jaussen and Barthel assumed this was *raŋi* 'sky', but East Polynesian languages have a homophonous word *raŋi* 'chief, commander'. The latter is a better suit, as the glyph seems to depict a head with headgear (or a decorated staff or sceptre?). Moreover: if the glyph on top of 9 ?***raŋi*** **'chief'** is 42—that is, the horizontal variant of 40 ?***poo*** **'night'**,[44] then it could be a semantic marker of astronomical concepts. In other words, 9:42 (***raŋi*****:night**) could be a semanto-phonetic spelling of *raŋi* 'sky', with glyph 9 indicating the sound and 42 the semantics. Next come two instances of glyph 81, which Metoro read as *ahi* 'fire' or *ura* 'flame' (Table 10.2). If we assume this was the glyph's exact value, then attractive prospects open.

We can interpret 9:42 – 81 – 81 in three ways. The first is as ***raŋi*** – ***ahi*** – ***ahi***, which yields a phonetic spelling of Rapanui *raŋi ahiahi* 'evening sky'. In the second scenario, 9:42 – 81 – 81 becomes ***raŋi*** – ***ura*** – ***ura***, which we might read as *raŋi uraura* 'bright-red sky'. The expression *rangi uraura* 'reddened sky' is attested in Maori,[45] and Métraux (1940: 52) reported the following for Rapanui: 'According to my informant, the old term [for "dawn"] was *uraura*, which also applies to the color of the sky at sunset.' Finally: the combination of the glyphs for 'commander' (9) and 'night' (42) might rather point to the Rapanui homophones *ʔao* 'command, power' and *ʔao* 'dusk, nightfall'. Thus, **[*ʔ*]*ao*** – ***ura*** – ***ura*** 'crimson twilight' is yet another plausible interpretation. Whichever reading we prefer for

[44] This reading is preferable to glyph 27 (cf. Valério et al. 2022: 346–7). The similar ligature 42:9 is also attested in Tablet D (Db6).

[45] Consulted at https://maoridictionary.co.nz/word/8903 (accessed 11 May 2024). I thank A. Davletshin for pointing out to me the existence of this Maori parallel.

9:42 – 81 – 81, the result is a description of the sky around the time the sun sets, which is very much at home in our calendrical text.[46]

Concluding Remarks

Our set of hypothetical readings (Figures 10.9–10.10) has implications. The first is the identification of spellings of names of nights beyond *Hua* (Barthel, Guy) and *Hiro* (Guy): *Hotu* (written as ***hatu***), and potentially **Tu(ʔ)u* and *Maure*. And though **Tu(ʔ)u* is not part of the oral accounts collected from the late 1800s onwards, its presence at the beginning of an earlier Rapanui list of lunar nights is consistent with other Polynesian lists. Second: the 'delimiting' sequence emerges as a formula about the daily (re)appearance of the moon, which echoes similar oral glosses to the Tahitian and Maori lists of nights of the moon.

Then we have the ramifications for the nature of the script: so far, the only way to identify spellings of known Polynesian names of lunar nights in Rongorongo Tablet C has been to recognize the glyphs as representations of polysyllabic Rapanui morphemes with typical (C)V(C)V and (C)V(C)V(C)V structures (Figures 10.9–10.10). Guy's intuition (1999) that some glyphs were logograms—some could be phonetic (through rebus) and some others appear to be semanto-phonetic spellings—can be expanded as an incipient set of principles. These principles meet two expectations: (1) that the signs of image-based scripts have values that relate to what they depict, be it through iconicity, metonym, or homophony (phoneticism); (2) when phoneticism is applied to scripts that notate languages rich in homophony, rebus—not acrophony—is the preferred strategy. Moreover, a new and unusual type of sign has been suggested that poses a challenge for classification: it combines the *semantics* of two glyphs to evoke pairs of homophones or nuanced words and produce a distinct *phonetic value*. Proposed examples include 'weave' + 'fire' for ***raraŋa*** 'plait' and 'a scorch', and 'star' + 'thread' for ***huero*** 'ray of light; tail (of comet); radiate' (Figure 10.10).

The hypothetical readings proposed here are viable only if it is assumed that particles (grammatical words) were largely omitted. Or, what is the same, they imply that Rongorongo glyphs mainly represented words that functioned as nouns, verbs, and adjectives, as the most salient parts of speech. We should assume that the rest (grammatical words) were reconstructed from context or because the text was known from memory. This is in line with Barthel's view of Rongorongo as 'embryo-' or stenographical writing. Still, the possibility that 711

[46] One of the various Maori names for the Evening Star (Venus) was *Rangi-tū-ahiahi*, roughly 'Evening Sky' (Best 1955 [1922]: 40). Yet it is unlikely that 9:42 – 81 – 81 refers to Venus. We have already seen that its attested name at Rapa Nui is *hetuʔu ahiahi*, literally 'Evening Star' (Englert 1978: 130), which is also the most widespread (and hence ancient) name in Polynesia, including Hawaii and the Marquesas (POLLEX).

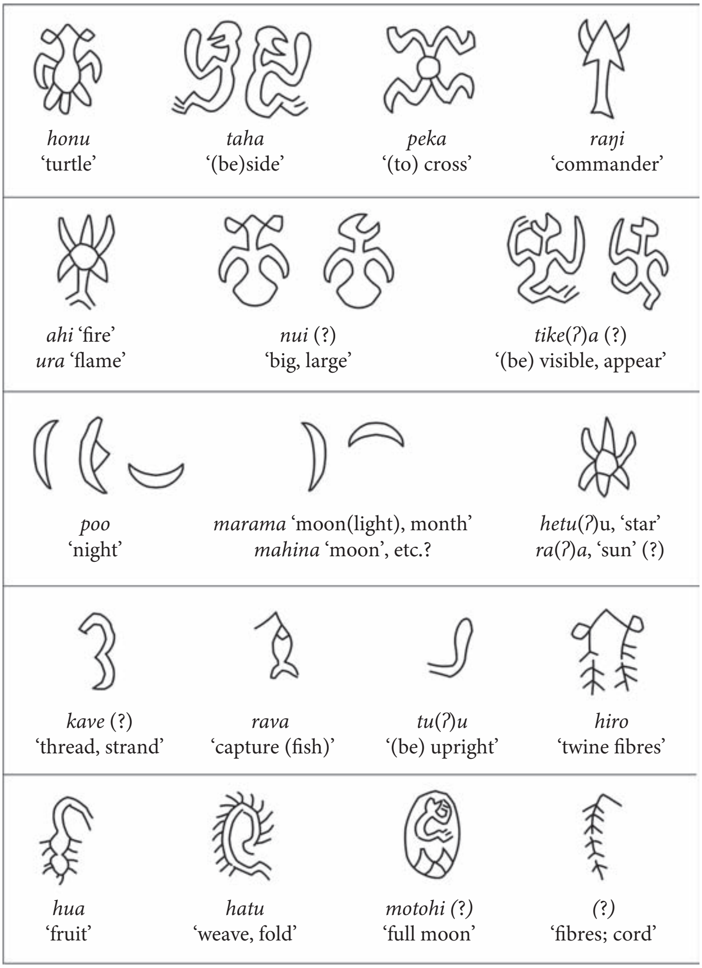


Figure 10.9 Hypothetical values assigned to basic glyphs

?*rava* 'catch fish' stands for a reconstructed postverbal intensifier **rava* needs to be considered; it may be that some disyllabic particles were also represented. Finally, signs like **?*raraŋa* 'plait' / 'a scorch'** may have afforded a way to spell CV structures resulting from reduplication (here, *ra-* from *raŋa*) or represented by particles (in this case, nominalizing *-ŋa*).

The issue of falsifiability (cf. Guy 1995; Pozdniakov 1996) should be mentioned, however shortly. The set of hypotheses or 'model' proposed here must be tested against the rest of the Rongorongo corpus, as the main glyph values and principles of writing should hold for other texts ('cross-readings') with as much regularity as possible. Of course, the success of this task does not depend only on the correct identification of glyphs and the structural analysis of their distribution; it

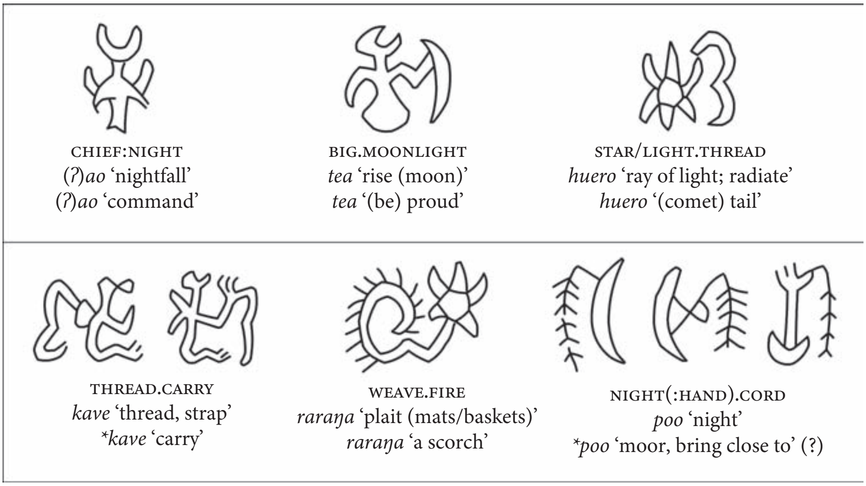


Figure 10.10 Hypothetical values assigned to Rongorongo ligatures

also needs at least some textual contents to be attested in external sources (namely, Polynesian oral traditions and phraseology documented in writing) that can aid verification. Here, this exploration has been very limited (cf. the examples of 59f.81 ?***raraŋa*** and 75.275 ***?kave*** outside the calendar) because the list of lunar nights has been the focus of this chapter, but it will be the subject of forthcoming investigations.

Finally: it has been argued that it is ‘impossible’ (Horley et al. 2018: 367) or ‘unlikely’ (Horley 2021: 31) that Rongorongo texts omit particles, because they would be impossible to understand and translate. It is true that such omissions would make texts ambiguous to us: for example, hypothetical ?***honu*** – ?***taha*** might translate as **te honu taha* ‘the turtle of/at the edge/horizon’, **ko te honu, kua taha* ‘The Turtle, it has gone down (the horizon)’, and so forth. But notations such as Dongba or the earliest Sumerian cuneiform—which represent many elements of spoken language logographically and some phonetically, but thoroughly underrepresent others—show clearly that there is a difference between *what is or was understandable for the producers and users of a text*, and what is retrievable (decipherable) for non-users like us. Such cases and Rongorongo might fit within what Déléage (2013: 8–13, 165) classed as *écritures sélectives* and *attachées*—that is, ‘bound’ and ‘selective’ scripts that transmit only specific kinds of discourse, and only partially, and are therefore inseparable from them. Most of his examples are scripts ‘attached’ to rituals whose usage involves some kind of oral recitation and retrieval of texts by memory—exactly what we expect if the oral Polynesian calendar was carved in Rongorongo glyphs. Be it as it may, the ongoing investigation of Rongorongo will pose interesting challenges both for decipherment and for the debate on what constitutes writing proper.

PART III

CURRENT APPROACHES TO EARLY WRITING AND READING

11

IDIOM: A Digital Research Environment for the Documentation and Study of Maya Hieroglyphic Texts and Language

Christian M. Prager, Katja Diederichs, Antje Grothe, Nikolai Grube, Guido Krempel, Mallory Matsumoto, Tobias Mercer, Cristina Vertan, and Elisabeth Wagner

Among graphic notation systems indigenous to the Americas, the Maya hieroglyphic script is unique in being a robust writing system that is widely understood. Classic Maya civilization flourished in present-day south-eastern Mexico, Guatemala, Belize, and western Honduras. From the third century BCE to the early sixteenth century CE, Maya writing encompassed a vast array of word and syllabic signs, and significant progress has been made on its decipherment in recent decades (Houston 2000; Houston and Martin 2016). However, despite these advancements, the script remains only partially deciphered, with an estimated 40 per cent of the approximately one thousand known signs still eluding full interpretation (Figure 11.1). A key challenge to complete decipherment is not only the rarity of many undeciphered signs but also our incomplete understanding of the Classic Mayan language, which needs to be reconstructed through comparative analysis of the more than thirty Mayan languages that have been documented since the sixteenth century. Unfortunately, a substantial portion of Classic Mayan vocabulary was lost through the decline of hieroglyphic culture in the tenth century CE and its final abandonment under European colonialism. Consequently, although it is possible phonetically to read a significant portion of hieroglyphic texts, the meanings of numerous words, phrases, and even entire texts remain unconfirmed and must be deduced based on co-texts and contextual information (Grube and Prager 2016). One example is the enigmatic term *tut* that is mentioned in several texts but whose exact meaning remains elusive to this day, as no cognate has been identified in colonial-period or modern Maya languages that could provide clues to a meaning (Grube et al. 2022).

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DOI: 10.1093/oso/9780198908746.003.0012

Figure 11.1 A selection of signs from the Maya script; the ancient Maya designed the characters on the basis of their natural and cultural environment
Source: Drawings by Christian Prager.

Similar to Egyptian hieroglyphs and Mesopotamian cuneiform, the Classic Maya script combined logographic and syllabic elements that are attested in over ten thousand surviving texts (Houston and Martin 2016) (Figure 11.2). The texts predominantly contain biographical details about elites and serve as written evidence of political interactions among the various ruling dynasties (Martin 2020). Focusing primarily on religious and political events that shaped the lives of the ruling class, these inscriptions played a crucial role in establishing political authority in the Classic Maya public sphere (Stuart 1998). By inscribing their words and imagery on stone monuments, wood, ceramics, bone, shell, jade, and fig-bark paper, among other media, the Classic Maya not only preserved cultural memory in their time but also provided a vital foundation for scholars reconstructing the history and culture of their elites today. Additionally, the precise calendar dates included in most texts offer invaluable historical insights and unique chronological data on the evolution of Maya writing and language (Wichmann 2006).

Shedding light on Classic Maya writing and language is the goal of the ongoing 'Text Database and Dictionary of Classic Mayan' project,[1] which is being conducted

[1] Textdatenbank und Wörterbuch des Klassischen Maya (TWKM), https://classicmayan.org. The project has been running since 2014. It is supported by the North-Rhine Westphalian Academy of the Sciences and the Arts in Düsseldorf, the Union of the German Academies of Sciences and Humanities in Berlin, and the University of Bonn. Former research associates who have been instrumental in the

Figure 11.2 The hieroglyphic inscription on Stela D from Pusilha
Source: Photograph by Christian Prager with kind permission of Danny Zborover, British Museum.

under the directorship of Nikolai Grube in collaboration with the Göttingen State and University Library (SLUB), Bonn University and State Library (ULB), and the Cologne Center for eHumanities (CCeH) (Prager et al. 2018). The project aims to develop an online text database featuring facsimiles of original hieroglyphic texts and a digital dictionary of Classic Mayan, the language of the hieroglyphs. To this end, over ten thousand text carriers are being meticulously examined through published literature and digitization, with the ultimate goal of making illustrations of and information about them accessible to the public via the virtual research environment TextGrid (Prager 2015). As of 2024, about one-third of known inscriptions, along with relevant metadata and scholarly literature, have been documented, and almost sixteen thousand images have already been made available in the 'Maya Image Archive (MIA)' (Diederichs et al. 2020). In the long term, research data with persistent identifiers will be published in the TextGrid repository to ensure open access through the project's research portal, which, as of 2024, is under development and will be enhanced with additional features and content in upcoming years.

realization of the project and made significant contributions include Maximilian Behnert-Brodhun (programming and metadata), Franziska Diehr (metadata), Dr. Sven Gronemeyer (epigraphy, linguistics, metadata, ALMAH), Uwe Sikora (metadata), and Céline Tamignaux (image archive).

Digital Documentation of Maya Hieroglyphic Texts

The Bonn-based TWKM research project is exploring Classic Mayan writing and language in the digital realm. The principal objective is to assemble a comprehensive text database and dictionary for Classic Mayan, which enables meticulous, detailed study of the literary language employed in Classic Maya texts—for example by comparing text passages using co-text and co-occurrence analysis. The database will also represent an important resource for the decipherment of signs that still cannot be read. In past decades, lack of the requisite technology hindered systematic and interconnected investigation of text, image, and information carriers from Classic Maya culture. Current digital humanities methodologies and technologies, however, allow the TWKM project to reach its goals. These technologies include existing tools and resources available in the virtual research environment TextGrid (Prager and Vertan 2022; see below). In addition, various new methods have been developed for the project over the past few years and implemented in TextGrid[2] as the 'Interdisciplinary Database of Classic Mayan (IDIOM)', which is being partially released via the research portal (Figure 11.3).

The Internet-based research environment TextGrid allows the project collaboratively to create, edit, publish, and link metadata about text-bearing artefacts and relevant agents, places and events, among other topics concerning the study of Maya hieroglyphic texts. Data are entered in an RDF-based ontology and modelled according to the CIDOC-Conceptual Reference Model (CRM) standard (Diederichs et al. 2016).[3] At the beginning of the project, a model was created in TextGrid to index the metadata of inscribed artefacts.[4] The model is based on a perspective derived from Ludwig Wittgenstein's philosophy of language, according to which the meaning of words is in their use; therefore, Classic Maya hieroglyphic texts cannot be fully understood without accounting for their medium and context of use. Some textual phrases are solely attested in texts recorded on certain carriers, for instance. The term *uk'ib*, which denotes a 'drinking vessel', is exclusively attested on vessels intended for drinking, whereas the expression *lakamtuun* 'stela' is encountered solely on monumental stelae (MacLeod 1990; Stuart 1996). This model offers the possibility of mapping non-textual information—for example, about writing media, find context, historical events, or named actors—into a CIDOC-CRM ontology and making it accessible in an RDF-based object database (Diederichs et al. 2016; Prager et al. 2018). The inscription and its carrier

[2] https://textgrid.de/

[3] The CIDOC-CRM standard is a conceptual reference model that provides a common language and structure for describing cultural heritage information and enables interoperability between different data systems.

[4] The metadata schema can be retrieved from https://classicmayan.org/documentations/idiom-schema.html

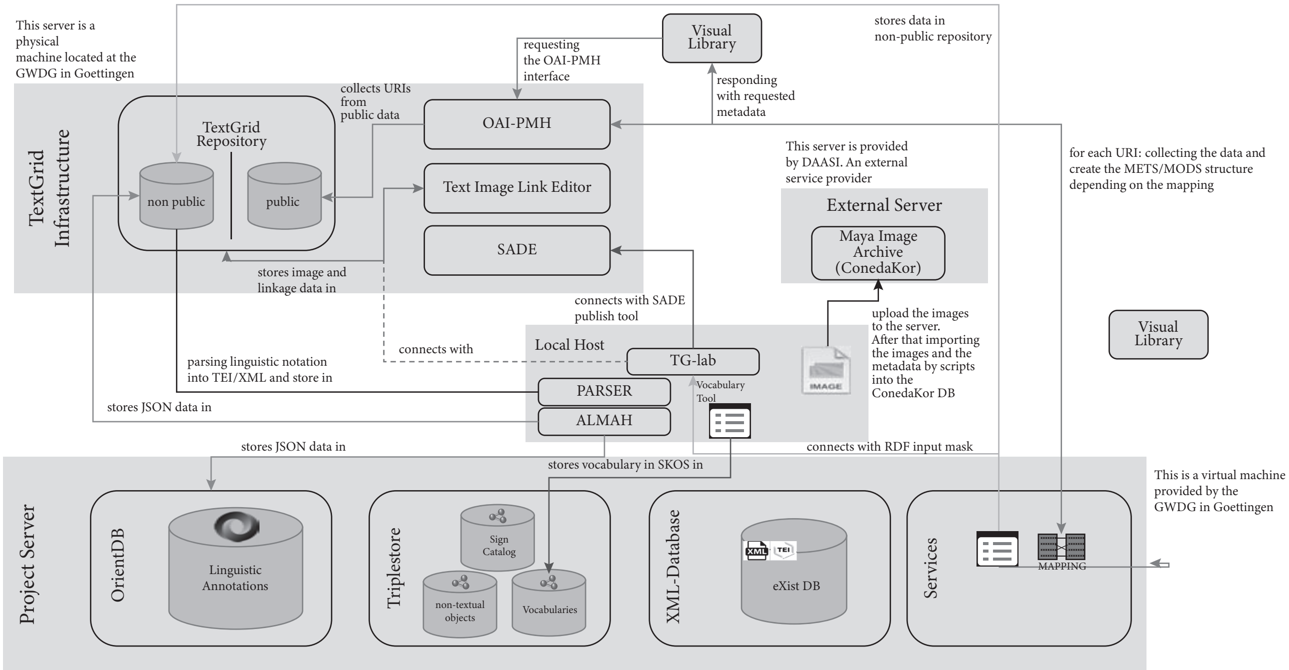

Figure 11.3 Overview of the data schema of IDIOM

Source: Concept by Maximilian Behnert-Brodhun.

are thus contextualized in the cultural history that is fundamental to deciphering, interpreting, and understanding them.

The metadata are further complemented by links to a literature database that is being maintained in and hosted externally by the open source software Zotero (Diederichs et al. 2016).[5, 6] This bibliography is publicly accessible, which supports compilation of bibliographic data through collaborative work from different locations.[7] The goal of the literature database is to provide a survey of history of research on Classic Maya civilization, including references to publications in which authors have previously examined a text carrier, discussed an inscription, or published a new linguistic reading of a hieroglyph. The bibliography in Zotero is linked to TextGrid and MIA via an application programming interface (API), which provides elements in the TextGrid database with bibliographic references (Figure 11.4). The project has also integrated several external applications into TextGrid, including a parser specifically developed automatically to generate TEI/XML documents; VocBench,[8] which was created to manage controlled vocabularies; and tools for managing image data and for transforming RDF data into METS/MODS for incorporation into the 'Maya Hieroglyphic Text and Image Archive' (see below).

In addition to textual analysis, TextGrid database entries include brief information about the text carrier, such as its dating, provenance, dimensions, material, and techniques of manufacture and last known custody. To obtain structured, concise description of the metadata for each text-bearing object, the project has defined controlled vocabularies based on the Getty Thesaurus of Geographic Names,[9] The Art and Architecture Thesaurus,[10] and Geonames.[11] However, we have supplemented these existing resources with SKOS vocabulary for artefact descriptions, find-spots, museum and institution names, among other parameters, since the Getty thesauri still lack consistent norm data for the Mesoamerican cultural area. Input of controlled vocabularies, mapping of norm data, and integration of data into the metadata schema of the object ontology are done using the open source tool VocBench, a web-based development and management platform for SKOS thesauri.[12] The knowledge organization systems developed for the project are used to enter information into the RDF input masks of the text artefact database, the digital sign catalog in TextGrid, and the image database (see below). Individual controlled vocabularies will be discussed below when describing relevant stages of data entry and epigraphic analysis (Prager et al. 2018) (Figure 11.5).

[5] The website https://classicmayan.org provides access to the bibliography and other databases.
[6] https://www.zotero.org/ [7] https://www.zotero.org/idiom_bibliography/library
[8] https://vocbench.uniroma2.it [9] https://www.getty.edu/research/tools/vocabularies/tgn/
[10] http://www.getty.edu/research/tools/vocabularies/aat/ [11] http://www.geonames.org/
[12] https://www.w3.org/2004/02/skos/

Maya Calendar Calculations: A Web Tool for the Calculation and Re...	Prager und Mercer	2021	Textdatenbank und Woerterbuch ...	ger	25.3.2022, 16:19:11
Visual Dimensions of Maya Hieroglyphic Writing: Meanings Beyond...	Prager	2021	The Social and Cultural Contexts o...	eng	17.3.2021, 22:06:02
A Logogram for WAX "Grey Fox" in Maya Hieroglyphic Writing	Prager	2021		eng	16.10.2021, 10:31:01
Voices and Narratives beyond Texts: The Life-History of a Classic Ma...	Ponce et al.	2021	The Mayanist	eng	11.6.2021, 14:20:19
Los mayas de hoy: reavivando el sistema de escritura antigua	Paz Joj	2021	The Mayanist	spa	11.6.2021, 14:15:34
The Stuccoed and Painted Benches of Xochicalco, Morelos, Mexico	Nielsen et al.	2021	Ancient Mesoamerica	eng	4.8.2021, 14:59:29
Zombie Words: Kaqchikel Revitalizationists' Use of Colonial Texts to ...	Maxwell	2021	The Mayanist	eng	11.6.2021, 11:26:59
Sculptural Traditionalism and Innovation in the Classic Maya Kingdo...	Matsumoto et al.	2021	Ancient Mesoamerica	eng	12.10.2021, 10:32:16
The Code of Maya Kings and Queens: Encoding and Markup of May...	Iglesia et al.	2021	Journal of the Text Encoding Initia...	eng	7.9.2021, 14:38:21
Building High-Precision Ams 14c Bayesian Models for the Formatio...	Hoggarth et al.	2021	Radiocarbon	eng	4.6.2021, 14:36:18
The Life Course of a Standard-Bearer: A Nonroyal Elite Burial at the ...	Cerezo-Román und Tsukamoto	2021	Latin American Antiquity		11.6.2021, 14:30:15
Un trono dividido: El origen y los movimientos de la Banca Jeroglífic...	Carter et al.	2021	Latin American Antiquity	spa	25.10.2021, 16:02:25
Inscripciones jeroglíficas mayas misceláneas sobre cerámica del clás...	Beliaev	2021	Arqueologia Iberoamericana	spa	20.12.2021, 14:24:31
Political Alliances and Trade Connections Observed in the Ceramic ...	Žrałka et al.	2020	Ancient Mesoamerica	eng	11.1.2021, 11:02:18
Disaster, Deluge, and Destruction on the Star War Vase	Zender	2020	The Mayanist	eng	11.6.2021, 10:17:27
La influencia de la escritura jeroglífica en el Yucatán colonial, revalo...	Sullivan	2020	Estudios de Cultura Maya	eng	27.7.2020, 21:50:45
A New Variant of the Syllable k'o in Maya Writing	Stuart	2020	Maya Decipherment	eng	22.6.2020, 10:49:17
Lost Maya Cities: Archaeological Quests in the Mexican Jungle	Šprajc	2020		eng	3.3.2020, 10:55:06
Reading Ancient Maya Hieroglyphic Books	Prager	2020		eng	12.7.2020, 16:15:50
Comparing Archaeological Cultures along the Northern and Southe...	Madhusudan Mehta und Holt Mehta	2020	The Mayanist	eng	11.6.2021, 11:07:33
Textual Reconstruction of Classic Maya Inscriptions: What Adaption...	Kupprat	2020	Axis Mundi	eng	27.8.2021, 09:14:00
Observations Based on Transillumination Photography of Diego de ...	Kettunen	2020	The Mayanist	eng	14.6.2021, 10:59:39
Hieroglyphic Texting: Ideologies and Practices of Classic Maya Writt...	Jackson	2020	Cambridge Archaeological Journal	eng	8.6.2021, 09:06:58
From Belize to Bagan: Framing a Comparative Analysis of Tropical S...	Iannone	2020	The Mayanist	eng	11.6.2021, 11:16:09
What Is a Hieroglyph ?	Houston und Stauder	2020	L'Homme. Revue française d'anth...	eng	27.7.2020, 09:16:56
Sedentism, Specialization, and Economic Activity among the Lowla...	Horowitz	2020	The Mayanist	eng	11.6.2021, 10:55:35
Under the Lordly Monarchs of the North: The Epigraphy of Northern...	Helmke	2020	Ancient Mesoamerica	eng	10.12.2020, 23:21:48
A Classic Maya Mystery of a Medicinal Plant and Maya Hieroglyphs	Ferrier et al.	2020	Heritage	eng	15.6.2020, 14:14:47
Reading (between) the Lines: Cultural Insight Through Palaeographi...	Davis-Hale	2020	The Mayanist	eng	11.6.2021, 11:08:02
La Corona: Negotiating a Landscape of Power	Canuto und Barrientos Q.	2020	Approaches to Monumental Land...	eng	6.7.2020, 10:25:19
Hidden in Plain Sight: The Codical Sign T548 and its Forerunner T694...	Biró et al.	2020	Estudios de Cultura Maya	eng	6.3.2020, 11:56:08
Stone Tables Found in Chichen Itza Reveal Unknown Information on...	Yucatan Times	2019	The Yucatan Times	eng	21.4.2020, 13:56:32
Discovery of Painted Hieroglyphic Vase Gives Clues About Breakdo...	Yucatan Times	2019	The Yucatan Times	eng	28.4.2020, 20:14:42
Annihilation of Ancient Maya City an Act of Warfare	Yucatan Times	2019	The Yucatan Times	eng	22.4.2020, 11:19:34
A Parallel Long-Reckoning between the Chilam Balam of Chumayel...	Stuart	2019	Maya Decipherment	eng	27.11.2019, 11:24:21
Prehispanic Maya Burnt Lime Pit-Kilns and Environmental Resource ...	Seligson	2019	The Mayanist	eng	14.6.2021, 10:45:13
Organization of Masonry Technology in the Eastern Puuc: Evidence ...	Parker et al.	2019	The Mayanist	eng	14.6.2021, 10:45:08
A Parallel Long-Reckoning Between the Chilam Balam of Chumayel...	Orejel	2019		eng	16.10.2021, 10:30:07
A Parallel Long-Reckoning Between the Chilam Balam of Chumayel...	Orejel	2019		eng	27.11.2019, 11:44:12
Breath and Smoke: Tobacco Use among the Maya	Loughmiller-Cardinal und Eppich	2019		eng	10.12.2019, 16:25:27
Distinguishing the Uses, Functions, and Purposes of Classic Maya "...	Loughmiller-Cardinal	2019	Ancient Mesoamerica	eng	13.6.2019, 11:10:53
Building Quality of Life and Social Cohesion at Ucanha During the T...	Kidder et al.	2019	The Mayanist	eng	14.6.2021, 10:45:03
The Return of the Toltecs: Reconsidering the "Toltec Invasion Hypot...	Guenter	2019	The Mayanist	eng	14.6.2021, 10:44:56
Estudio arqueológico y epigráfico del Altar 10 de El Palmar, Campec...	Esparza Olguin et al.	2019	Estudios de Cultura Maya	spa	27.8.2019, 13:45:21
Modelling Vagueness – A Criteria-based System for the Qualitative ...	Diehr et al.	2019	Proceedings of the Workshop on ...	eng	22.2.2019, 19:57:31
"Tobacco" as Mentioned in Hieroglyphic Texts on Classic Maya Pott...	Boot	2019	Breath and Smoke: Tobacco Use a...	eng	11.12.2019, 11:13:55
Reexamining the Role of Conflict in the Development of Puuc Maya...	Bey III und Gallareta Negrón	2019	Seeking Conflict in Mesoamerica: ...	eng	10.12.2019, 08:35:39
Classic Maya Gods of Flint and Obsidian	Bassie-Sweet	2019	Seeking Conflict in Mesoamerica: ...	eng	10.12.2019, 08:11:00
Applying Event History Analysis to Explain the Diffusion of Innovati...	Amati et al.	2019	Journal of Archaeological Science	eng	15.7.2019, 13:11:23
„Maya Image Archive" online: digitales Bildarchiv für Mayahierogly...	Prager und Diederichs	31.08.2018	DHdBlog: Digital Humanities im d...	ger	8.8.2019, 16:43:13
Negotiating Narrative Domains: Izapa's Place in the Discourse on Ea...	Strauss	2018	Ancient Mesoamerica	eng	27.5.2019, 13:41:55
The Digital Exploration of Maya Hieroglyphic Writing and Language	Prager et al.	2018	Crossing Experiences in Digital Epi...	eng	12.7.2020, 16:56:11
Neue Ergebnisse in der Erforschung der Graphemik und Graphetik d...	Prager und Gronemeyer	2018	Ägyptologische "Binsen"-Weisheit...	ger, eng	19.12.2018, 15:23:15
The Lexeme potz "to wrap, cover" in Classic Maya Hieroglyphic Texts	Prager	2018	Mexicon	eng	2.11.2018, 17:35:31

Figure 11.4 Extract from the Zotero bibliography database with a selection of entries on Mayan culture

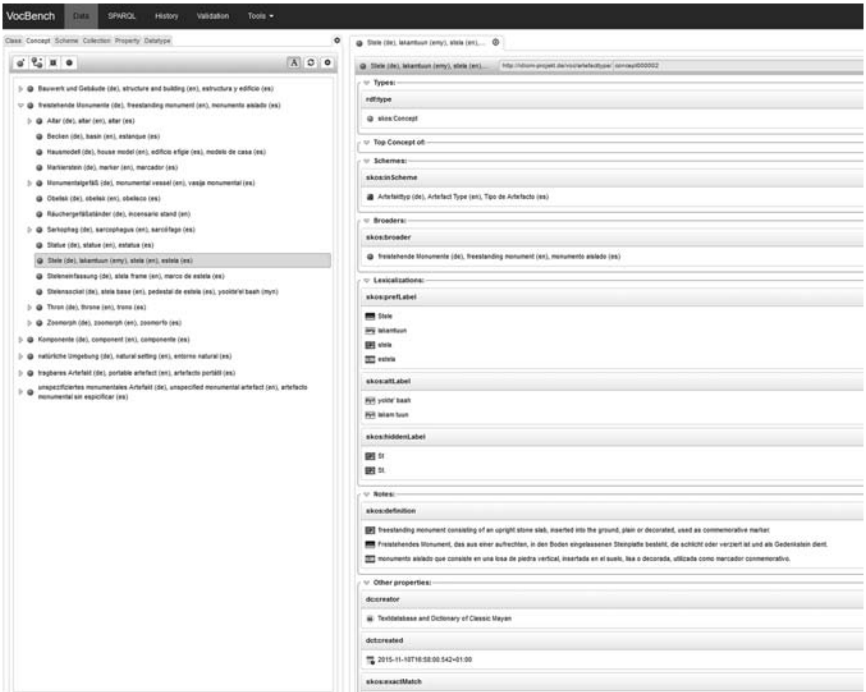

Figure 11.5 Screenshot of the Vocbench software used to manage the controlled vocabularies

Database Entry of Non-Textual Information

The TextGrid Lab tools and services described here allow the user digitally to execute all stages of the epigraphic workflow for studying Maya writing (Prager et al. 2018). In the first step, information about the text carriers and their respective contexts is entered into interconnected databases. After selecting a Maya site to study, we conduct research on and digitally assemble available images of inscriptions from that site through online and on-site literature and archive searches. The metadata gathered about the site's text carriers are systematically entered using the input mask implemented in the TextGrid Lab and automatically stored in RDF triples, a process that also links the metadata to our bibliography in Zotero.

Controlled vocabularies and norm data support consistent recording of each artefact's type, form, material, manufacturing technique, state of preservation, and dimensions in TextGrid in the CIDOC class 'Artefact' (Figure 11.6). The project establishes a preferred designation for each artefact, which is based mainly on the standards set by the Corpus of Maya Hieroglyphic Inscriptions project at Harvard University. However, the project also documents alternative names that have been used for each text carrier, such as foreign-language designations, inventory numbers

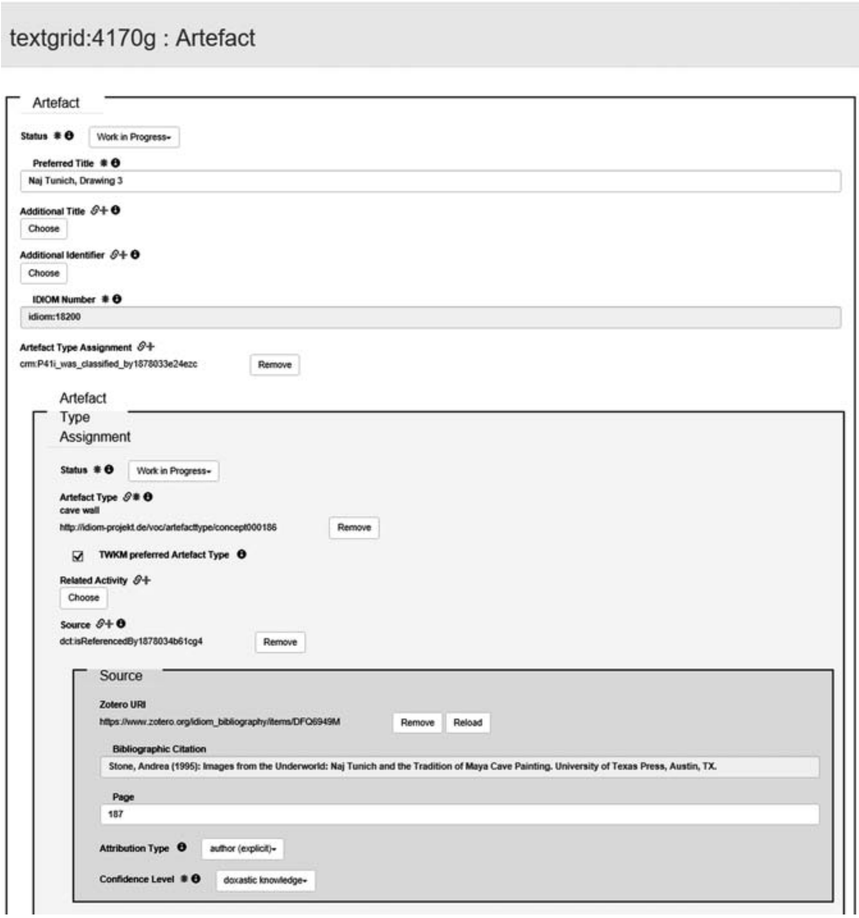

Figure 11.6 Screenshot of the entry mask of IDIOM to document information about an artefact

(museums, collections, auctions, archives, and so on), or common abbreviations, as well as the sources of the alternative designations. For instance, the tenth recorded lintel from the Mexican site of Yaxchilan is referred to as 'Yaxchilan, Lintel 10' in English, 'Yaxchilán, Dintel 10', in Spanish and 'Yaxchilan, Linteau 10' in French. In Classic Mayan, in turn, this type of artefact is known as a *pakbutuun*. All of these distinct nomenclatures can be readily recorded within the TextGrid platform.

The history, site, place, and time of discovery for each artefact are documented in TextGrid in the classes 'Discovery' and 'Place', respectively. Additional controlled vocabularies allow us consistently to document the artefact's orientation and position at the time of discovery. If the location or discoverer has previously been created in the database as an RDF object, it can be accessed and linked in the 'Discovery' input mask. Otherwise, the editor must first create it in the 'Place' or 'Non-Epigraphic Person' class, as appropriate, and link it to the 'Discovery' class.

The input mask for the 'Place' class can also be used to record different names of a place, connect it to the Getty Thesaurus of Geographic Names (TGN) or to Geonames, record its geographic coordinates, and document references made there to other locations. If a written object is no longer in its original discovery context or if it has been sold at auction or transferred in whole or in part to a museum, collection, or institution, this information can be linked to the object using the input masks for 'Part Removal', 'Current Custody', 'Former Custody', and 'Acquisition', respectively. Information about persons or institutions involved in these provenance events, in turn, is created and linked under 'Non-Epigraphic Person' or 'Non-Epigraphic Group'. Combined, these data represent an important contribution to provenance research on artefacts from the Maya area.

Text-bearing objects are documented using a CIDOC-CRM ontology developed for the project, which accounts for contextual information, including events mentioned in an artefact's inscription. Thanks to the event-based architecture of the ontology, events and activities such as wars, enthronements, building dedications, or agrarian rituals can also be recorded, along with details about actors involved and the duration or location of occurrence. The thousands of Maya inscriptions known today record nearly three thousand calendar dates and details of many different events and epigraphic actors. The project's controlled vocabularies allow us to classify events by type, such as war and conflict, specific rituals and places of performance, or aspects of domination and power. In the entry mask, we record the name or type of event, enter the original date as recorded in the inscription, and link the event to relevant entries in our other databases of epigraphic actors and places. This ontological documentation generates a network of historical events, actors, dates, and places that maps the sociocultural context of a text-bearing artefact and its message.

Historical information about the origin and commissioner of each text-bearing artefact, if known from the inscription, is also documented in the database. The commissioner, who in most cases was a king or a queen or another high-ranking dignitary, is entered in the database under 'Epigraphic Actor' and then linked to the artefact's commission in 'Dedication'. We not only record all name variations, biographical information, social roles, kinship relationships, and other information available for each epigraphic actor, whether historical or supernatural; we also link these data to relevant scholarly literature. If epigraphic personages are also depicted on an artefact, a note can be made to that effect in the 'Artefact' input mask under 'Depicts'.

As previously noted, many objects record calendrical information that marks their exact date of creation or ceremonial dedication. Maya dates can be entered into the database following the period-separated notation used by Mayanist scholars (e.g., 9.0.0.0.0) using the 'Dedication' class of IDIOM, and an algorithm automatically converts the date to the Julian and Gregorian calendars. Images in the 'Maya Image Archive' are also connected to the artefact's database entry in the input mask via API, and the hieroglyphic inscription is linked via 'Epigraphic

Unit' to a TEI/XML document created in the TextGrid repository using the TextGrid URI (see below). Free text fields accommodate any additional information that the editor wishes to add—for example, original citations, references to other databases, or comments specific to the artefact.

Another key component of our work with the text database is compiling references to text-bearing objects in IDIOM, a process that links previous research on Maya writing directly to our own epigraphic and linguistic analyses. Most calendric dates and many events were deciphered in the late nineteenth or twentieth century and have since been cited in numerous publications. The project is systematically working through the literature and incorporating citations of extant scholarship into the TextGrid repository. Moreover, Peter Mathews kindly donated to the project the contents of his Maya History Project, a collection of dates, monuments, and events that he has compiled over the past forty years (Mathews 2006). This resource, which forms the main foundation of our calendric data set, is as of 2024 being incorporated into the RDF database. The database is being continuously updated according to the latest research results and revised if necessary.

Documenting Illustrations and Images

The project also conducts research on inscribed artefacts in various media based on published literature, archival materials, and photo collections. The project's image database, 'Maya Image Archive' (MIA), is a long-term repository for digitized images of hieroglyphic inscriptions (photographs, drawings, and so on), all of which are published open access and made available under open licensing (e.g., CC0, CC BY, CC BY-SA) (Diederichs et al. 2020) (Figure 11.7). At the core of MIA is an extensive archive of tens of thousands of media elements that were donated to the project by colleagues, including Karl Herbert Mayer, Berthold Riese, and Ivan Šprajc (Prager 2014), and this archive is continuously being expanded and supplemented. The MIA's freely licensed content is already being used via its OAI-PMH interface by external projects such as the image archive Prometheus[13] and the Deutsche Digitale Bibliothek,[14] which expands the user community beyond specialists in Maya research.

MIA was created by adapting and expanding the open-source image database system ConedaKOR.[15] Image metadata are mapped into a coherent, domain-specific ontology and stored in a graph structure. The metadata schema stores each digitized image as an entity of the type 'medium' and links it with a variety of other entity types and their properties via different relation types. The MIA database thus creates a conceptual network of places, people, collections, museums,

[13] https://prometheus-bildarchiv.de/de/
[14] https://www.deutsche-digitale-bibliothek.de/
[15] https://coneda.net/

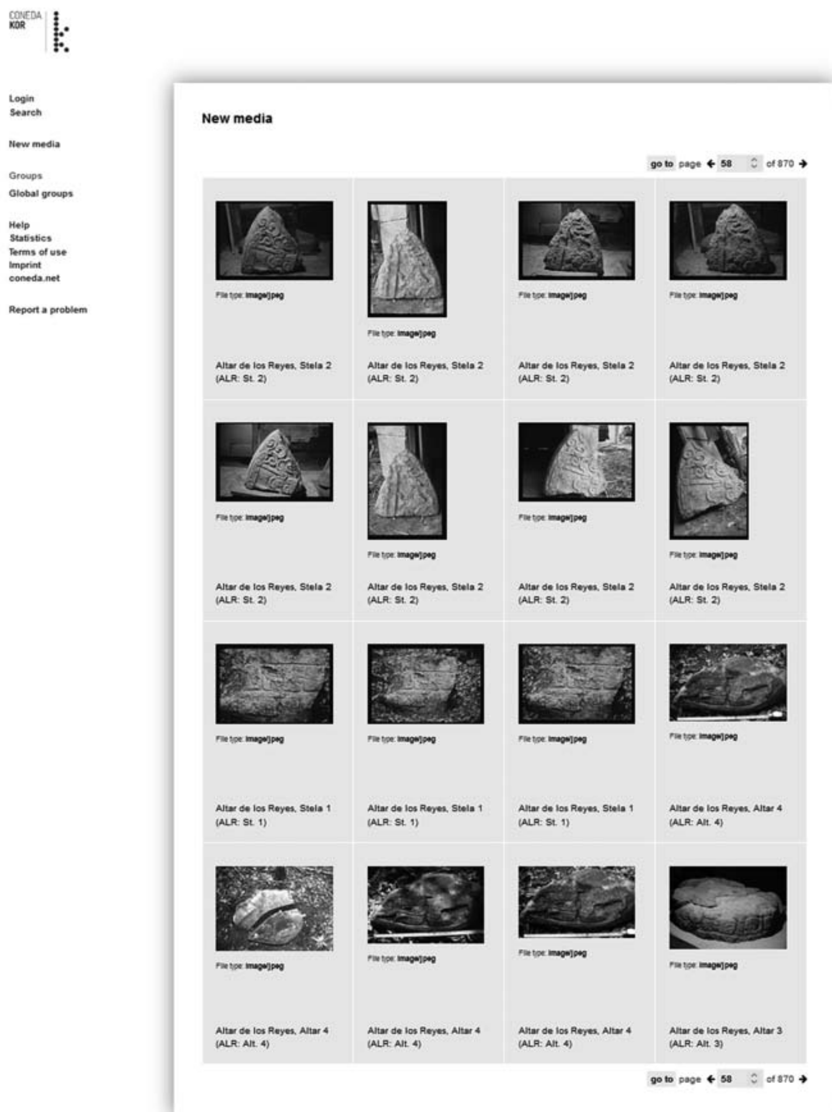

Figure 11.7 Example page of the Maya Image Archive

and literature references and generates a specific ontology for each image of a Maya hieroglyphic text. MIA's image-specific ontology supports annotation through a link to the object ontology in the TextGrid environment, where individual images from the MIA can be retrieved using a unique identifier (Uniform Resource Identifier, URI) within the CIDOC class 'Visual Object'.

At present, the MIA database includes almost 64,000 links among about 20,000 entities, including links from approximately 16,000 images to more than

2,700 artefacts, 297 sites, 306 locations, 148 museums and collections, and 87 individuals. For the research project, MIA is both a long-term archiving image repository with an ontology for text carriers in image form and an image source for the project's text analysis and annotations (see below). In collaboration with the ULB, selected content from the TextGrid repository and MIA is being published in the 'Maya Hieroglyphic Text and Image Archive', which forms an integral part of the ULB's Digital Collections.[16] Technical image information and images from MIA are fed into the 'Maya Hieroglyphic Text and Image Archive' via an OAI-PMH interface. Those data are then merged with annotations of the inscriptions that were made in the annotation tool (see below) and with relevant object information produced in the TextGrid Lab, such as find context, artefact type, material, or chronological classification.

Unlike MIA, the 'Maya Hieroglyphic Text and Image Archive' presents finished work and project results in a static environment. This public-facing archive makes hieroglyphic texts with epigraphic analysis, translation, and images widely accessible. The archive is integrated into the digital infrastructure of the ULB because such institutions typically serve as platforms for presenting content from university research projects, including data and publications, to the broader community. Consequently, the 'Maya Hieroglyphic Text and Image Archive' will enable the public to access the project's research data incrementally, even before the project has concluded. The content available in the 'Maya Hieroglyphic Text and Image Archive' can be considered as interim results from the project's ongoing pursuit of its ultimate goals—namely, full decipherment of Classic Maya hieroglyphs and compilation of a comprehensive dictionary of the Classic Mayan language.

Encoding Maya Hieroglyphic Texts

In recent years, the TWKM project has begun converting hieroglyphic texts into a machine-readable format according to TEI/XML standards. At the foundation of this work is the development of a digital inventory of all signs and their visual representations in the Classic Maya script, which currently encompasses more than 1,400 elements (Diehr et al. 2017, 2018, 2019) (Figure 11.8). Compilation of this inventory poses a unique challenge, because the decipherment of Maya writing remains incomplete. Consequently, phonemic transliteration of texts, although common practice in other epigraphic specialities, such as Egyptology, cuneiform studies, or Classics, is not currently feasible for Classic Maya hieroglyphs.

Instead, the project employs a system of alphanumeric transcription adapted from J. Eric Thompson's seminal catalog (1962) of Maya hieroglyphs, which has long been the standard reference for Maya epigraphers. However, the project

[16] https://digitale-sammlungen.ulb.uni-bonn.de/

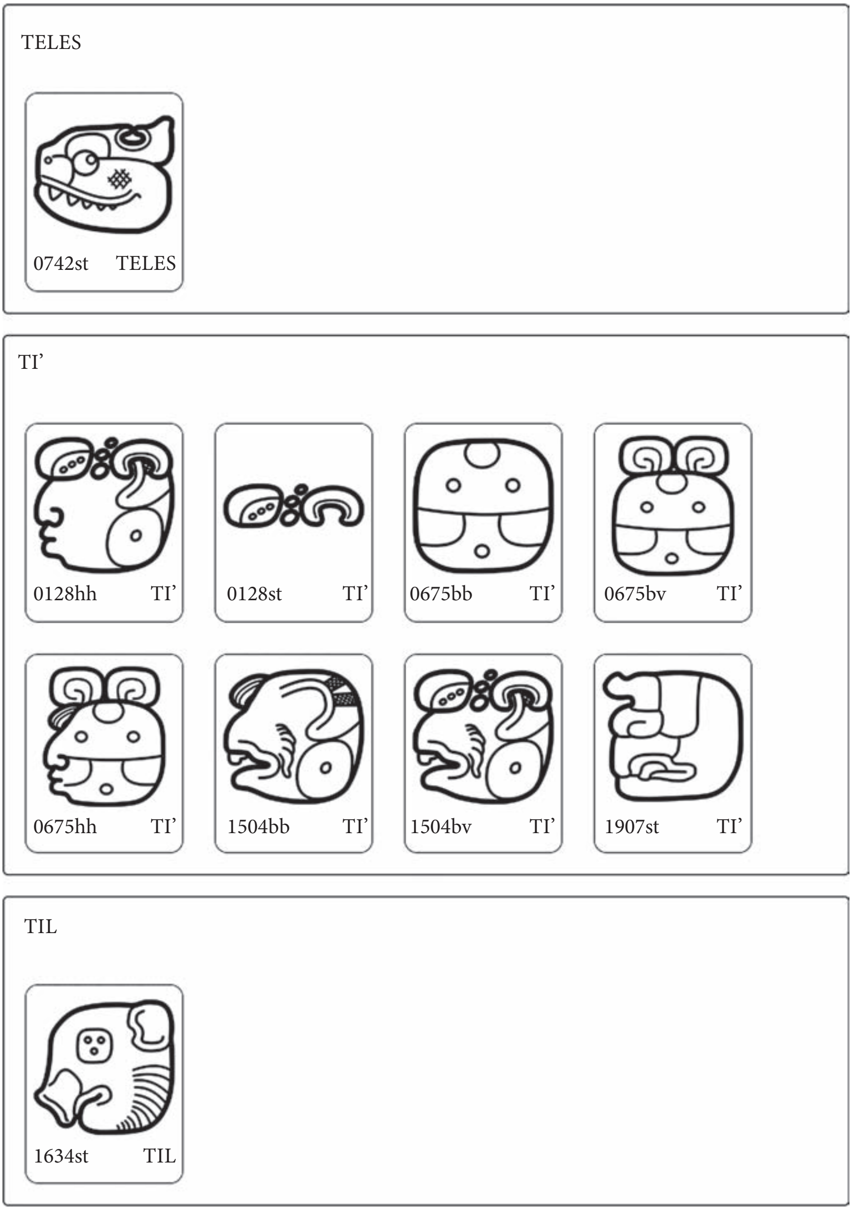

Figure 11.8 Excerpt from the digital sign catalog of Maya hieroglyphs
Source: Drawings by Christian Prager.

has modified and elaborated on Thompson’s sign codes to generate a more comprehensive, refined catalog (Prager and Gronemeyer 2018). From Thompson’s original total of 859 signs, 482 remained after our revisions, and 529 have since been added. To maximize its utility as a scholarly resource, the TWKM inventory references fourteen additional corpora of Maya hieroglyphs that were published between 1931 and 2022 and has introduced different classification systems. However, each of these resources includes redundant classifications from some variants of a single grapheme having been cataloged as separate signs, as well as under-classifications from several discrete graphemes having been conflated under one heading (Gates 1931; Zimmermann 1956; Evreinov et al. 1961; Thompson 1962; Knorozov 1963, 1999; Rendón and Spescha 1965; Grube 1990; Ringle and Smith-Stark 1996; Macri and Looper 2003; Macri and Vail 2009; Looper et al. 2022).

Furthermore, as printed works, these catalogs cannot be updated to reflect new findings or reinterpretations without preparing new editions, which is costly and time-consuming. The ongoing discovery of new inscriptions, some of which may contain previously unknown signs or record information that informs revision of existing classifications, poses a challenge to the completeness of any sign inventory. However, a digital catalog can accommodate such changes and allows the project to take a dynamic, comprehensive approach to the study of the Maya script. The TWKM digital sign catalog is designed to accommodate discoveries or potential reclassifications flexibly by using a data-processing method based on the RDF data model and the CIDOC-CRM metadata structure to incorporate new findings (Diehr et al. 2018).

The project's Maya catalog also differs from existing ones by adopting a novel framework that differentiates between the three components that comprise a hieroglyphic sign—namely, its signifier, its abstract conceptual entity, and its tangible graphical representation. Inspired by the linguistic theory of Ferdinand de Saussure (1931), this framework represents a triadic structure encompassing functional–linguistic properties (the sign), graphemic expressions (the grapheme), and their diverse visual manifestations (the graph). Within this model, each tangible element within a text is considered a distinct graph that embodies the essence of an abstract grapheme. An individual graph, in turn, stands in allographic relation to other graphs of the same grapheme. Collectively, these graphs represent the entire spectrum of visual configurations that the grapheme can assume. Finally, the grapheme itself is conceptually linked to an abstract sign that dictates the grapheme's specific linguistic function, whether logographic, syllabic, or diacritic (Diehr et al. 2017).

In addition to serving as a comprehensive reference for scholars of Classic Maya writing, the TWKM catalog provides the alphanumeric sign codes necessary to encode Maya texts in machine-readable format. In almost all cases, hieroglyphs are arranged within a Maya text in what scholars call glyph blocks, each of which contains at least one and, in some cases, over a dozen individual hieroglyphs; thus, the glyph block is also the basic unit for the project's encoding. Following established conventions in Maya epigraphy, adjacent signs within a glyph block are separated in the transcription with a period (.), whereas superposed signs are separated by a colon (:); in both cases, signs are transcribed in the order in which they are read. Square brackets [ ] enclose segments within a single hieroglyphic block. The insertion of one sign into another is denoted by a degree sign (°), and a plus sign (+) between two hieroglyphs indicates that they have been conflated (Prager and Gronemeyer 2018).

As an illustrative case, consider an intricate hieroglyphic composition encompassing the elements 93b, 228bl, 23st, 672st, 585st, and 74tb, all of which are arranged in a single glyph block (Figure 11.9). In accordance with our established conventions, this sequence can be transcribed as [93bl+228bl].[23st:[672st°585st]:74tb]. This numerical transcription indicates that the sign cataloged as 93bl is combined with the graph 228bl to form the initial segment within the larger glyph block. The second segment starts with the graph 23st, which is positioned atop the graph 672st and the graph 585st, the latter having been infixed into the former. Finally, the graph 74tb is inscribed at the bottom of this second segment. The relations between the elements within this hieroglyphic block are written out in Figure 11.9.

In accordance with TEI-P5 guidelines,[17] the project encodes hieroglyphic texts in XML, which provides a standardized framework for their organization and analysis within the TextGrid platform. A TEI-compliant, application-specific schema has been developed to capture not only the textual structure but also the intricate layout of hieroglyphs on the artefact and other inscription-specific characteristics. This schema enables documentation of all inscribed artefacts, including the four surviving Maya codices (Iglesia et al. 2021). The TEI schema and editorial guidelines provide predefined definitions and conventions for

[93bl+228bl].[23st:[672st°585st]:74tb]

[chʻa+a].[na:[ho°bi]:ma]

ch'ahoom anaab

"Sacrificer and Sculptor"

```
<tei:ab tei:n="[93bl+229bl].[23st:[672st°585st]:74tb]" tei:type="glyph-block" xml:id="A1-B1">
    <tei:seg tei:corresp="#A1-B1S2" tei:rend="left_beside" tei:type="glyph-group" xml:id="A1-B1S1">
        <tei:g tei:corresp="#A1-B1G2" tei:n="93bl" tei:ref="textgrid:3r3v8" tei:rend="conflated" xml:id="A1-B1G1"/>
        <tei:g tei:corresp="#A1-B1G1" tei:n="229bl" tei:ref="textgrid:3r56h" tei:rend="conflated" xml:id="A1-B1G2"/>
    </tei:seg>
    <tei:seg tei:corresp="#A1-B1S1" tei:rend="right_beside" tei:type="glyph-group" tei:xml:id="A1-B1S2">
        <tei:g tei:corresp="#A1-B1S3" tei:n="23st" tei:ref="textgrid:2stz0" tei:rend="above" xml:id="A1-B1G3"/>
        <tei:seg tei:corresp="#A1-B1G3" tei:rend="beneath" tei:type="glyph-group" xml:id="A1-B1S3">
            <tei:g tei:corresp="#A1-B1G5" tei:n="672st" tei:ref="textgrid:3rdfs" tei:rend="encloses" xml:id="A1-B1G4"/>
            <tei:g tei:corresp="#A1-B1G4" tei:n="585st" tei:ref="textgrid:3r9sb" tei:rend="infixed_in" xml:id="A1-B1G5"/>
        </tei:seg>
        <tei:g tei:corresp="#A1-B1S2" tei:n="74tb" tei:ref="textgrid:3r3sj" tei:rend="beneath" xml:id="A1-B1G6"/>
    </tei:seg>
</tei:ab>
```

Figure 11.9 Example of the transcription of a hieroglyphic block and the representation of its composition in TEI/XML code

[17] https://tei-c.org/guidelines/p5/

annotating a text's structure, specifying the reading order, indicating the topographic arrangement of the hieroglyphs, accounting for sections that are unreadable or must be reconstructed, and noting physical aspects of the text carrier, such as shape, relief depth, framing, and colouring.

Instead of the conventional approach of employing phonemically transliterated values in TEI/XML documents, however, the TWKM project embraces Semantic Web technology to reference resources stored in RDF within the XML files. Each individual sign or graph is recorded in the project's catalog as an independent resource and assigned a URI. Thus, the machine-readable transcription consists of alphanumeric values that point to these external resources and form a coherent, ontologically linked system by pointing to these external resources (Figure 11.10).

Because undeciphered graphs may be associated with multiple proposed readings within the RDF-based digital catalog, the machine-readable transcription can accommodate hypothesized readings for undeciphered hieroglyphs. This approach not only facilitates evaluation of proposed readings for undeciphered signs but also supports rigorous assessment of those proposals within the original source material according to formal criteria (Diehr et al. 2019). This XML-based approach allows the project to move beyond the limitations of traditional transcription methods and accommodate new or revised interpretations as decipherment of Maya hieroglyphic writing remains ongoing.

The TextGrid URI system ensures precise referencing of Maya signs within the TEI/XML files by requiring selection of the appropriate graph's URI during transcription. To streamline and automate this process, the project developed a special parser that uses a transcription code to link references in the TEI/XML document with the corresponding RDF objects. The parser then automatically generates the corresponding TEI structure, which is subsequently stored as a TEI/XML document in the TextGrid repository. Each TEI/XML document generated by the parser contains information about the text-bearing surfaces, as well as text fields and individual glyph blocks that have been numerically transliterated based on the sign codes in the digital sign catalog and in accordance with the conventions outlined in the project's editorial guidelines. The parser makes transcription significantly more efficient and creates a granular representation of individual signs' relations to others within an inscription. As previously noted, this URI-based approach also offers the flexibility seamlessly to integrate new decipherments into the corpus or remove obsolete readings. At the same time, the unique URIs ensure the stability of alphanumeric transcriptions within the catalog and corpus of transcriptions, independent of any changes to proposed decipherments (Diehr et al. 2019).

An important aspect of our epigraphic quality control involves comparison with the original inscription. Thus, the TEI/XML documents generated by the parser and stored in TextGrid are made accessible online for easy viewing, so that

```xml
<text>
  <body>
    <div type="textfield" xml:id="front">
      <ab xml:id="A" n="[??°??]:548bv" type="glyph-block">
        <seg xml:id="AS1" type="glyph-group" rend="above" corresp="#AG1">
          <damage agent="environment" degree="1" quantity="1" unit="g">
            <g xml:id="AG1" rend="encloses" corresp="#AG2"/>
          </damage>
          <damage agent="environment" degree="1" quantity="1" unit="g">
            <g xml:id="AG2" rend="infixed_in" corresp="#AG1"/>
          </damage>
        </seg>
        <g xml:id="AG3" n="548bv" ref="textgrid:3r8gk" rend="beneath" corresp="#AS1"/>
      </ab>
      <ab xml:id="B" n="*5009st.746st" type="glyph-block">
        <damage agent="environment" degree="1" quantity="0.75" unit="g">
          <supplied reason="damage" evidence="external" precision="high" ana="GK">
            <g xml:id="BG1" n="5009st" ref="textgrid:30gnx" rend="left_beside" corresp="#BG2"/>
          </supplied>
        </damage>
        <g xml:id="BG2" n="746st" ref="textgrid:3rpvw" rend="right_beside" corresp="#BG1"/>
      </ab>
      <ab xml:id="C" n="5014st.1034st" type="glyph-block">
        <g xml:id="CG1" n="5014st" ref="textgrid:3rb8q" rend="left_beside" corresp="#CG2"/>
        <g xml:id="CG2" n="1034st" ref="textgrid:3rqdc" rend="right_beside" corresp="#CG1"/>
      </ab>
      <ab xml:id="D" n="*5014st.1519st" type="glyph-block">
        <damage agent="environment" degree="1" quantity="0.75" unit="g">
          <supplied reason="damage" evidence="external" precision="high" ana="GK">
            <g xml:id="DG1" n="5014st" ref="textgrid:3rb8q" rend="left_beside" corresp="#DG2"/>
          </supplied>
        </damage>
        <g xml:id="DG2" n="1519st" ref="textgrid:3rqdf" rend="right_beside" corresp="#DG1"/>
      </ab>
      <ab xml:id="E" n="*5013st.548hp" type="glyph-block">
        <damage agent="environment" degree="1" quantity="0.5" unit="g">
          <supplied reason="damage" evidence="external" precision="high" ana="GK">
            <g xml:id="EG1" n="5013st" ref="textgrid:3rb8n" rend="left_beside" corresp="#EG2"/>
          </supplied>
        </damage>
        <g xml:id="EG2" n="548hp" ref="textgrid:3r8gh" rend="right_beside" corresp="#EG1"/>
      </ab>
      <ab xml:id="F" n="5019st.1697st" type="glyph-block">
        <g xml:id="FG1" n="5019st" ref="textgrid:3rb92" rend="left_beside" corresp="#FG2"/>
        <g xml:id="FG2" n="1697st" ref="textgrid:3w55j" rend="right_beside" corresp="#FG1"/>
      </ab>
      <ab xml:id="G" n="135st:545st?:74tb?" type="glyph-block">
        <g xml:id="GG1" n="135st" ref="textgrid:3r4tn" rend="above" corresp="#GG2"/>
        <damage agent="unknown" degree="0.25" quantity="1" unit="g">
          <supplied reason="damage" evidence="external" precision="high" ana="GK">
            <g xml:id="GG2" n="545st" ref="textgrid:3r8gb" rend="above" corresp="#GG3"/>
          </supplied>
        </damage>
        <damage agent="unknown" degree="0.25" quantity="1" unit="g">
          <supplied reason="damage" evidence="external" precision="high" ana="GHK">
            <g xml:id="GG3" n="74tb" ref="textgrid:3r3sj" rend="beneath" corresp="#GG2"/>
          </supplied>
        </damage>
      </ab>
```

Figure 11.10 An exemplary TEI document showing the XML encoding of a Maya hieroglyphic inscription

they can be meticulously examined for potential errors. Both the parser and the ALMAH annotator (see the next section) retrieve the image of each graph from the digital sign catalog using the alphanumeric sign code. This image is presented alongside the alphanumeric transliteration in the parser's result window, enabling detailed review and, if necessary, correction of the transliteration before the TEI document is further processed.

Once transliterations have been verified, the TEI document undergoes thorough examination and validation within the TextGrid environment. It should be noted that the parser does not automatically incorporate damages, reconstructions, explanations for reconstructed text passages, or the layout of the text carrier into the XML. These elements need to be manually edited in accordance with our editorial guidelines. In cases where annotation is required for unreadable or reconstructed text passages, the project employs a specific TEI-P5 application profile and follows the EpiDoc Guidelines, which provide a framework for documenting classical and other ancient texts in TEI/XML. Moving forward, the parser will be further developed to encompass these editorial functions, enabling the automated creation of these components in future endeavours.

Annotator for the Linguistic Analysis of Maya Hieroglyphs (ALMAH)

Once a hieroglyphic text has been transliterated into a machine-readable format according to the steps outlined in the previous section, it undergoes linguistic analysis using the 'Annotator for the Linguistic Analysis of Maya Hieroglyphs' (ALMAH) tool, which was developed in collaboration with computational linguist Cristina Vertan (Prager and Vertan 2022). Implemented in JAVA 1.8, ALMAH reads TEI/XML documents from the TextGrid repository and semi-automatically transliterates, analyses, and translates the alphanumerically encoded hieroglyphic texts. The corpus-based Dictionary of Classic Mayan that will be generated from these transliterations and translations will digitally map the Classic Mayan language and its usage in writing, providing a fundamental resource for a deeper comprehension of Classic Maya culture, history, religion, and society.

The data model employed in ALMAH corresponds to a graph- and document-oriented database selection. ALMAH links the TEI/XML document to the digital sign catalog to generate a transliteration of each text based on linguistic information stored in the catalog; subsequently, the linguistic transliteration can be manually accepted, rejected, or revised. Additionally, ALMAH facilitates linguistic annotation of the contents of each TEI/XML document, which are stored in JSON format in an OrientDB database and can be exported as needed. Linguistic annotation can accommodate multiple working hypotheses or variants by taking into account the probabilities stored in the RDF repository. Thus, the tool enables parallel analysis of hieroglyphic texts with two or more proposed decipherments, leading to more efficient analysis and translation.

Manual annotations of linguistic, calendrical, or other named entities can also be made at the level of the hieroglyphic block. ALMAH can even link linguistic analyses to the lexical database WordNet[18] to allow glossing of the basic meaning of Classic Mayan roots and stems in English. During analysis, ALMAH accesses data in the TextGrid repository and learns from previous analyses. For instance, if a hieroglyphic expression has already been analysed once, the system retrieves and automatically incorporates the decipherment and corresponding analysis into the annotation of subsequent inscriptions with the same expression.

The process of automatically generating a linguistic annotation with ALMAH, from alphanumeric transcription to syntactically and semantically supported transcription, is based on the linguistic backbone model described extensively in Gronemeyer (2014), which encompasses eleven epigraphic annotation levels. The contents of each level are derived dynamically from the preceding level's annotation. The workflow unfolds as follows.

Upon selecting a file, the ALMAH tool loads the TEI document from either TextGrid or a local OAI-PMH interface, initiating the automated analysis process. The initial levels (1–4) automatically generate alphanumeric and graphemic transliterations, which are displayed block by block and accompanied by imported images of individual graphemes from TextGrid. At level 2, the reading order of signs can be rearranged, and morpheme boundaries can be modified using a graphical interface. This manual intervention is necessary if the reading order of signs or blocks deviates from the order in which they are written in the text. Beginning at level 3, manual corrections and additions can be made, and analytical variants can be added to enable simultaneous exploration of multiple decipherment suggestions. Graphemic transliteration analysis facilitates the selection of specific readings stored in the digital sign catalog, and ALMAH generates corresponding graphemic transliteration variants for parallel analysis by the human editor (Figure 11.11).

Following the graphemic transliteration at level 4, phonemic transliteration is created at level 5. At this step, morpheme boundaries between phonemes are defined using a graphical interface that distinguishes between free and bound morphemes. Subsequently, at level 6, lexical and grammatical morphemes such as inflections, derivations, proclitics, or enclitics are segmented, reconstructed, and marked for redundant or missing sounds. These morphologically segmented transcriptions are further dissected into phonetic chains by removing redundant sounds, inserting necessary ones, establishing morpheme boundaries, and identifying null morphemes. Level 7 then proceeds with production of a morphophonemically consolidated transcription.

At level 8, the morphosyntactic glossing is consolidated by removing the special characters and brackets that were inserted at level 7. This process results in a clean transcription that then undergoes interlinear morpheme glossing of lexical and grammatical morphemes. ALMAH's morpheme glossing is based on

[18] https://wordnet.princeton.edu/

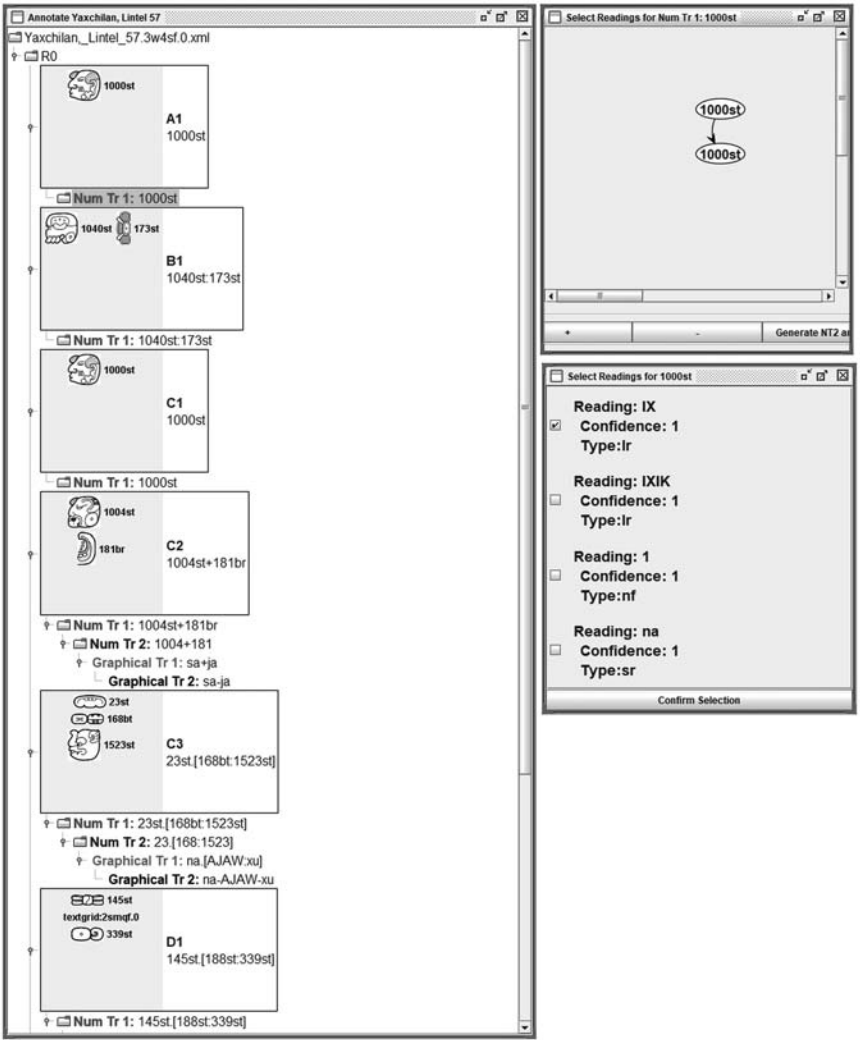

Figure 11.11 Screenshot showing the interface of the ALMAH tool

Sachse and Dürr's adaptation (2016) of the Leipzig glossing rules for analyzing Mayan language. Glosses are assigned to various lexical classes, including nouns, verbs, adjectives, adverbs, particles, pronouns, articles, classifiers, conjunctions, demonstratives, numerals, and prepositions. A matrix of language examples enables users to search for and select the appropriate gloss. In cases where a definite assignment is not possible, multiple glosses can be applied to a single morpheme.

Level 9 builds upon the preceding steps automatically to generate a consolidated transcription without special characters or brackets. Editors can then create a literal translation at annotation level 10 and a free translation at level 11. The capacity for free annotation also allows editors to annotate calendrical information, nominal phrases, place names, and events and ontologically to link this information to the corresponding data sets in TextGrid.

In sum, the ALMAH annotation tool enables comprehensive linguistic analysis, transliteration, and translation of Maya hieroglyphic texts. Additionally, it facilitates storage and export of linguistic annotations in JSON format, so that they can be used in further exploration of the Classic Mayan language. Thus, as the key tool for producing the project's corpus-based dictionary, ALMAH facilitates interpretation of the text and vocabulary of Classic Mayan in historical and sociocultural context. It also uses an ontology to connect over 150 years of research on Classic Maya culture, history, religion, and society to current epigraphic analyses.

Maya Calendar Calculations

Comprehensive study of Classic Maya inscriptions requires not only examining their linguistic contents but also deciphering the abundant and often intricate calendrical information that they contain. Often, however, the original calendrical data have eroded over time or been entirely lost, or they were only partially recorded. Reconstructing dates based on this incomplete information requires either arduous manual calculations or application of sophisticated algorithms tailored specifically to Classic Maya calendrics. Thus, to analyse the intricate chronological information recorded in the Classic Maya hieroglyphic corpus, the project has developed a web-based tool called 'Maya Calendar Calculations'. Besides converting Maya dates into Julian and Gregorian dates, this web tool enables calculation of various cycles in the Maya calendar and reconstruction of missing calendrical information based on surviving text passages. The 'Maya Calendar Calculations' tool offers three main functions: (1) calculating calendrical data based on ritual, solar, and lunar cycles; (2) determining the calendrical structure of an inscription; and (3) calculating astronomically expected solar and lunar eclipses (Prager and Mercer 2021).

The calendrical information recorded in Maya inscriptions is often ambiguous because dates are written in cyclical rather than absolute terms, for example, or because sections of the original record are missing, such as numerical coefficients or day or month names, and reconstructions must account for a range of possible solutions. Thus, the first function of our calendar calculator is to identify possible reconstructions of missing or vague calendrical information and to convert complete dates between calendrical cycles. The user can enter missing numbers and names as variables. If some of the known calendar information is non-unique, the algorithm can accommodate several possible numbers or names, or the user may indicate where a number or name is missing in input fields provided for this purpose. Unknown parameters can be specified with either an asterisk (*) or a blank field, multiple possible coefficients are separated with a comma (,) and a numerical range is defined with a minus sign (–).

The calendar tool's second function, 'Distance Number', automatically calculates an inscription's calendrical structure. Maya hieroglyphic inscriptions often record not only specific dates within one or more interlocking calendrical cycles but also distance numbers that identify the amount of time between two dates. If the first date is earlier, the distance number is added to it to arrive at the second, later date; if the first date is later, in turn, the distance number is subtracted from it to arrive at the second. If a user wants to check the distance between two calendar dates but is unsure which date is earlier, our tool's default setting simultaneously applies both calculation methods—addition to and subtraction from the first date to the second—and displays both results in the output. For users who want to calculate distance numbers only in one direction, addition or subtraction can be deactivated and reactivated individually.

The third function of the calculator tool is to calculate solar and lunar eclipses based on calendrical dates, which allows users to examine information that the Classic Maya recorded about these astronomical phenomena. For the time being, the archaeological site of Chichen Itza is designated as the observation site for solar eclipses. In a future version of the software, users will have the option to freely choose their preferred observation site.

For all three functions, calculation is done automatically after the user has input all calendrical data from an inscription into the tool. All results can be exported in one of several formats (PDF, TXT, XSLX, ODS) for further processing in a word processor or spreadsheet, for example.

State of the Project in 2024

As of mid-2024, the project's research data are available as analog images and text documents, as digital representations of analog data and as genuine digital and machine-readable objects. They are structured, identified, and referenced by means of norm data, controlled vocabularies, metadata formats, and ontologies. The data also include information about authors and legal stipulations of their use by third parties. In the following, we provide a quantitative overview of the data sets we have created to date and our strategies for their use, presentation, and publication.

MIA provides a solid illustrative basis for the project database. Since it was published in 2019, additional scholars have made their image archives available to the project for use and publication, including Justin Kerr's photographic archive of Maya ceramics and Ivan Šprajc's images of his archaeological explorations of

Campeche.[19] With these additional 167,216 digitized images, the project has a total of over a quarter of a million digitized images related to Classic Maya culture that will be successively described and made publicly available in MIA. The project's bibliographic database in Zotero, in turn, contains almost 38,000 bibliographic entries for literature on Maya civilization (mid-2024) and will continue to be updated throughout the project. It can be accessed via the project website, where all content is available in open access and can be downloaded in various formats.

The digital inventory of script- and image-bearing Maya artefacts comprises 5910 data objects from Mexico, Guatemala, Belize, and Honduras and their metadata, a quantity that represents about one-third of the estimated more than ten thousand known Maya hieroglyphic texts. Like the other data inventories mentioned in this chapter, it will be made accessible online in the project portal in the coming years. So far, the project has documented the history of discovery of 4227 artefacts and the dedication dates of 937 inscriptions. According to the database, 1777 of the 5910 hieroglyphic and pictorial media that have been recorded are held in museums or private collections, and this number will continue to increase with each database update. So far, 6798 locations have been indexed, including archaeological sites; individual buildings, plazas, and architectural complexes at those sites; historical or modern villages, towns and larger administrative units; and historical locations mentioned in the hieroglyphic inscriptions.

Several hundred epigraphic actors named in Classic Maya inscriptions, such as queens and kings, members of the royal court, and supernatural figures, have been documented as epigraphic actors and linked to citations of relevant research literature. A total of 805 individuals are listed in the database according to their proper names known from hieroglyphic texts, and some individuals are also identified with up to 30 name variants or aliases. Our biographical database also includes kinship relationships and thus establishes a foundation for the digital historiography and prosopography of the Classic Maya (Mathews 2005). The project's database for epigraphic events accounts for the historical Classic Maya context and the history of research on Classic Maya civilization. It registers 2381 events, including 169 royal inaugurations, 180 war activities, and 248 ritual acts, of an anticipated total of some 5,000 activities that are recorded in Maya inscriptions. Each activity is directly associated with the corresponding passage in the original hieroglyphic text via the annotation tool ALMAH.

The project's work includes creation of a comprehensive sign and graph catalog in TextGrid, along with new drawings of each grapheme. The digital catalog comprises 1011 signs manifested in more than 1,400 graph variants. We estimate that only 40 per cent of signs in the Maya script have been deciphered with

[19] https://www.mayavase.com/

certainty. For 392 signs, no linguistic decipherment has yet been confirmed—that is, only 58% of signs are considered deciphered. Of the 589 deciphered signs in the catalog, 184 represent syllables and 405 logograms. Nonetheless, only 410 of these 589 signs are readable with the highest confidence; the other signs have a lower reading confidence—for example, because no syllabic substitution for the sign has been found to date. Significant progress has also been made with the concordance of signs and graphs with the 9,102 total entries from the 14 sign catalogs that were published between 1931 and 2022, which allows us to identify elements registered in other catalogs that we have not yet included in our own. We ultimately expect a total of approximately 1,200 signs to be incorporated in the coming years. A preliminary version of the sign catalog is available online for internal use and for discussion with colleagues. It will be published as an inaugural feature of the project's portal in the near future.

Transliteration, transcription, and linguistic analysis of the machine-readable texts are being performed using the tool ALMAH, as described previously. To date, our text editing and analysis have focused on hieroglyphic sources from the Mexican states of Campeche, Chiapas, Yucatan, Quintana Roo, and Tabasco, as well as the Guatemalan department of Petén and the country of Belize. To date, more than 500 inscriptions from these regions have been recorded in machine-readable TEI/XML format and linked to facsimiles via the text-image link editor.

Using digital tools and methods to document, analyse, and edit Classic Maya text carriers provides a unique opportunity to not only dynamically map the state of research on a script that has been only partially deciphered but also comprehensively evaluate existing source material from scratch and (self-)critically advance decipherment. By qualitatively evaluating unconfirmed interpretations, we are pursuing a conservative, digitally innovative method of textual analysis. In addition, the project's digital approach offers the chance comprehensively and iteratively to publish the available source materials, which would not be possible in printed form. Digitality thus presents significant new opportunities for our discipline and a foundation for completely deciphering the Maya script in the future.

12
Looking for Readers in the Aegean Bronze Age

Sarah Finlayson

Prologue: Surrounded (or not) by Books

This is a pandemic chapter. An ongoing research interest in reading practices was brought into sudden and sharp focus by the enforced home office, home schooling, home everything; in the midst of the chaos, the unavoidable blurring of professional and domestic boundaries, I began to observe, at first with a somewhat nosy curiosity and then with perhaps a more scholarly eye, how many of us chose to appear online surrounded by books.[1] The shelves flanking speakers in these new and challenging online meeting spaces appeared as a kind of academic stage-dressing, a way perhaps of advertising our intellectual credentials—'here is everything I have read, even if the current circumstances prevent me from writing or even much from thinking'.

At the same time, with libraries closed, I found myself increasingly reliant on digital publications, not just online journals but also PDFs of scanned articles and chapters shared within the academic community. The transition away from the very familiar, comfortable bodily experience of reading books or photocopied papers towards what felt like a more alien and distanced interaction with screen-bound materials prompted me to reflect on how much of my own reading enjoyment is bound up with the physical material that carries the written text: reading as *haptic* as much as *cognitive* process perhaps.

This is probably a rather unexpected opening to a discussion about reading practices in the Bronze Age Aegean, but these two reflections—that reading can be an intrinsic part of how we, the academic community, choose to present ourselves, and that reading is often a deeply pleasurable activity (although with considerable scope for personal preferences or prejudices to guide it)—have very much shaped my own thinking through the archaeological material, and are perhaps also shaping your own response as you read this. Bowman and Woolf's

[1] 'Zoom bookshelves' in fact became something of a sociocultural phenomenon during this period, https://www.theguardian.com/books/booksblog/2020/apr/07/our-new-lockdown-game-judging-famous-people-by-their-bookshelves (accessed 2 April 2022).

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DOI: 10.1093/oso/9780198908746.003.0013

sharp observation (1994: 1) that literacy studies is 'the ultimate self-reflexive academic discourse' remains as pertinent and provocative as ever; I would add that this is especially true of the analysis of reading practices.

Introduction: Problematizing Reading

In Linear B, the word for seed grain, σπέρμα, is written *pe-ma* or *pe-mo* (the first spelling is used on Crete and by Scribal Hand 24 at Pylos, while the second spelling is the norm for mainland Greek Linear B (Palaima 1998–9: 206, 214–19; Duhoux 2008: 262, 306)). We can explain this in a logical fashion: the Linear B script uses signs that represent open syllables, but the language it records, Mycenaean Greek, contains consonant clusters, and, furthermore, because you cannot write an initial *s*- before a consonant or an *r*- before a consonant, the word must be transcribed as *pe-ma* or *pe-mo* (for Linear B spelling rules, see summaries in Sharypkin 2008; Duhoux 2011). These rules are clear, but how might Mycenaeans read this tablet? Would they read the written signs exactly as they appear, or would they expand what they saw into the Greek word that is signified?

This is a deceptively simple question that contains within it further increasingly disquieting questions. How *would* Mycenaeans read this tablet? Would they read in their heads or out loud? To whom? Would anyone, in fact, actually read this tablet, once it had been written?

I will unpick different aspects of these questions—of how people read, what they read, and what the significances might be—from different directions during the course of this chapter, but with no pretence that I can provide any definitive answers; in fact, I intend to raise more questions than I answer, and this is deliberate. Our understanding of writing practices in the Bronze Age Aegean has become considerably more nuanced over the last couple of decades, but there is still a great deal that we do not understand, and reading remains particularly under-researched. I start by reviewing what reading is, what happens between hands and eyes and brain, before unpicking what reading can look like in the archaeological record—how we can identify past readers and their acts of reading. These discussions will inform our attempts to find readers in the Aegean Bronze Age material.

What Is Reading?

Reading is, like writing, simultaneously deeply familiar, a set of practices embedded in our daily lives, and curiously hard to pin down—how can we even begin to create a universal definition of reading that captures the infinite variations of practice observable through time and cross-culturally? This slipperiness is one of the reasons that I, along with many other scholars researching ancient writing and marking practices, broadly follow the social model (sometimes also called the ideological model) of literacy practices; this model was first proposed by Street to understand his anthropological research on the range of literacy practices in 1970s Iran, and it has subsequently been picked up and expanded by other authors (Street 1984; and see, e.g., Collins and Blott 2003 for an analysis of the further development and impact of this model). The key point to pull out here is that the nature of reading and writing practices is dependent on the contexts in which they are embedded. Literacy is not neutral and autonomous, but shaped by its sociocultural, political, and ideological setting—there is, in fact, no single, uniform, and universal model of *literacy*, but instead diverse historically and culturally variable *literacies* (Collins 1995; Street 2017). As we look for readers in the archaeological material, we must not only honour the particular shape a practice has in its specific geographic and temporal setting but also make space for multivalence in people's motivations and experiences of literacies in their time (and in our interpretations of them).

The division between proponents of an autonomous model of literacy and those who favour the social model is now entrenched in the scholarly literature, but it is surely significant that the UNESCO definition of literacy has been refined over time to become similarly pluralist and socially embedded, focusing on the acquiring of the skills needed successfully to participate in one's own society (it is also significant that Thomas 2011 explicitly draws on the UNESCO position in her review of uses of reading and writing in Classical Athens; see my comments above).[2] Fundamentally, literacy and illiteracy are not mutually exclusive precise categories, and there are many ways to be literate; people can learn to read and write but then forget or have few opportunities to use their skills. One person's self-definition of useful literacy might be perceived by someone else as merely functional or stunted; at the same time, not being able to read does not necessarily prevent one from listening to others reading and participating in discussion with them.

So, what is reading? You are reading this, I very much hope with interest even if not active enjoyment, but what are you actually doing? At the most basic level, reading is the process of extracting and/or making meaning out of signs, whether glottographic or semasiographic. Houston (2004: 240), in his valuable paper on the archaeology of communication technologies, observes laconically that reading is a process of scanning and response, in contrast to writing, which is a mechanical and kinetic act. First, one scans the writing-bearing material with the eyes, or, in the case of things like braille, with the fingers (the very simplified explanation I give in this and the following paragraphs is derived from the much more detailed information in Duñabeitia et al. 2014; Pegado et al. 2014; Overmann

[2] A UNESCO position paper discussing this policy shift is accessible online, https://unesdoc.unesco.org/ark:/48223/pf0000136246 (accessed 2 April 2022).

2016, 2021). The brain takes this visual or tactile information and decodes it—that is, it assigns meanings (which can include sound values) to each visual element. The eyes scan over the text with a mix of short rapid movements and stops—in alphabetic writing, some words are read letter by letter while others are reconstructed from their length and shape, with all letters processed simultaneously.

Most of the brain is involved in this, but particularly the Visual Word Form Area; our brains evolved long before writing was developed, and this area, which shows strong responses to visual categories including faces and tools, has stretched to respond also to written marks. Acquiring literacy increases the efficiency and amount with which the Visual Word Form Area interacts with the entire left-hemisphere spoken language network, including Wernicke's Area, which is responsible for comprehending speech, and Exner's Area, which is involved in planning and executing motor movement—for example, handwriting.

The literate brain is able to decode these visual stimuli because it has been trained; it has learnt the writing system and its orthography. The orthography provides rules and cues for the eyes and the hands as well as the brain—which way up you hold the book, for example, or whether the script runs from left to right, as well as the finer details of spelling, pronunciation or conventional meaning. The brain learns to identify individual signs through a combination of local features, such as the number of strokes that make up each sign, and global features, such as repeating combinations of several signs and their contexts.

The extraction of meaning is not entirely a neurological process though, and this is where the fuzzier idea of reading as 'making meaning' comes in. Meaning is built up out of the text's semantic content certainly, but also the factors specific to an individual reader, such as their expectations based on textual and contextual cues, or their experiences of previous interactions with written material, their current situation, and their world views. We could all read the same text, but what we take from it would differ depending on factors as small and definable as whether we had read it before, to as large and nebulous as our educational background or social class. Reading is a situated activity, positioning one in a web of culturally stipulated relations between bodies, minds, and texts as artefacts and symbols (Sterponi 2008; Piquette 2018).

The specific sociocultural setting holding together each text and each reader is key here—and by sociocultural setting I mean the space that holds the people who are producing and consuming written materials at this particular point, who are enmeshed in reading and writing practices, together with the social, cultural, political, and economic factors that shape, motivate, and constrain their behaviour. All of this together determines what value reading is afforded within a society, who gets to do it and how, as well as what materials and contents are appropriate and the hierarchy of value in which they are fixed. This broader setting is also what defuses or negotiates the tension between the need for socially agreed, conventional meanings and the possibility of multiple individual readings.

In contemporary Western culture, reading has a high value, in both political and economic terms and socioculturally—although one can, of course, drill down to find different hierarchies of value within materials and contents, some of which are rooted in little more than social or intellectual prejudice (romance novels being the obvious example of a genre subject to widespread, often misogynist, mockery (Cameron 2020)). Sociological research has established a correlation between the early introduction of reading with children within the family and improved educational outcomes and increased opportunities for social mobility—but this rather dry and joyless conclusion is softened by the acknowledgement that one extremely significant aspect of reading is that it is pleasurable.[3] We read by ourselves, or aloud to our children, or listen to audiobooks, or join book clubs, because it is enjoyable. This widely accepted cultural value, which has pleasure at its core, is not afforded in the same generous way to the act of writing or to numeracy—for this reason I would like to suggest that, of all the practices bundled within literacies, reading is the hardest to examine with a coolly dispassionate academic mind.

What Does Reading Look Like Archaeologically?

At least theoretically, the existence of writing presupposes the existence of readers. However, while writing has a material correlate in the written text, reading can be a completely invisible process, entirely within the brain—and herein lies the challenge for archaeologists and historians.

If enough written material has been excavated, then we can potentially identify a script community, a group of people using that writing system over a period of time in a consistent way (again, Houston 2004 gives a very clear overview here). The idea of the script community presupposes mechanisms of teaching and learning to enable the writing system to be transmitted and sustained. While one can study this material to reconstruct how the writing system operated, its orthography, even how many people wrote the material that survives, it is very much harder to identify how reading was practised, by how many people, and what value it carried. The ongoing debate among researchers with materials from the 1700s onwards over whether you can use the presence of a signature on an official document as a proxy for wider reading ability illustrates well how slippery it can be to make this jump from writers to readers; generally, we suppose that readers outnumbered writers in the ancient world (although Harris 1989 sounds a note of

[3] The Book Trust brings these two aspects together perfectly, its research-informed mission to encourage children into reading from very early childhood accompanied by the robust assertion that reading can, and should, be for all a lifelong pleasure, https://www.booktrust.org.uk/ (accessed 2 April 2022).

caution about assuming this to be universally true for the Classical world). It does seem certain that literacy levels were always extremely low, and reading and writing were primarily the preserve of elites within society (Moreland 2001, 2006).

Readers are not entirely invisible though. Among the very rich documents and correspondence of the Hittite Empire, for example, there are references to the practice of reading aloud documents, for ceremonial effect and as part of rituals or during administrative processes: 'And when the tablet had been read out loud to them [by a slave or functionary], my father spoke as follows…' (Biography of Suppiluliuma I, CTH 40, NS, quoted in van den Hout 2020: 260). This need not imply that the king could not read, but, within the context of the celebration of a successfully negotiated marriage treaty, it is presumably more appropriate for the political theatre to have your scribe standing by with the document to hand. Letters also often contain instructions relating to their reading, which could be stock formal phrases, but there can also be postscript additions addressed from the scribe writing to the scribe reading that are not intended to be read by anyone else, or to be read aloud for that matter—a fascinating insight into the working or personal relationships within these scribal communities. It is worth flagging here that reading silently and reading aloud do not exist in opposition within a culture—a reader can do both, but the social context and the material provide rules or cues as to which is appropriate (van den Hout 2020).

Depictions of readers in material culture are trickier; whereas the scribe has clearly identifiable standard attributes (think of those proud Egyptian scribes, who chose to have themselves depicted cross-legged with papyrus stretched across their lap and brush and ink to hand—their professional skills and status as clear as their tools (Baines 1983 gives a clear overview of the complex hierarchies of scribal status from elite writers down)), what exactly does the reader look like? In the Aegean world certainly, we must wait until the Classical period for images of readers clearly distinguished from writers; the tutor on the so-called School Cup by Douris,[4] for example, shows a scroll to a rather bored looking pupil, which incidentally also reveals it to the cup's users and to us.

What we do find in the Ancient Near East and Egypt are inscriptions on buildings, statues, and other objects that suggest the possibility of readers—although, bearing in mind the earlier point about the very low levels of literacy, these readers are potentially extracting or making meaning in ways not dependent on deciphering the text itself, or they are reliant on someone else's reading skills. Hammurabi's Code Stele makes for a powerful and ominous statement of his control over every aspect of your life even if you cannot read a word of it, because the rules apply to you regardless—Hammurabi's choice to have himself depicted at the top, eye-to-eye with the sun god Šamaš, giver of

[4] Berlin, Antikensammlung: F2285.

justice, makes this very clear (Feldman 2007). Other examples are physically impossible for a mortal to read; the inscriptions on Egyptian temple walls are too high to be visible to anyone except the gods, and there are copies of Coffin Texts or Books of the Dead in tombs that are written in gibberish, pseudo-hieroglyphs (Baines 2007).

We are on rather firmer ground with what might be called the 'infrastructure' of reading—physical locations such as bookshops or libraries, known either through excavation or again through their appearance in written materials of various sorts. Bookshops and libraries exist to serve the needs of readers. The first public libraries in Rome were founded in the 30s BCE, and booksellers were already well established by then, creating a sort of literacy district around them; the area became a place to hang out, with the layout of the shops including seating areas and thus more or less requiring loitering as White (2011: 5) puts it (something that will resonate with many of us, I am sure). These bookshops speak to a regular demand for buying books—newly published, old, specially commissioned, papyri and codices—because reading is now a recognized activity; in fact, it is more than that, with a sort of hyperliteracy being used to define a particular kind of elite identity, literacy as powerful social performance. There is a reading culture in which not only can one pleasurably read alone, but books are also read and debated, their meanings negotiated, in text-centred events that act as a space for displaying one's own literary knowledge and insight but also one's social connections (Johnson 2011; White 2011).

I will round off this survey with those readers made visible through their interventions in other writers' texts—the makers of corrections or writers of marginalia. These direct interventions can break down and re-create the written text in a very physical way, and are a part of this making of meaning that goes beyond semantic decoding. What is interesting here is that practices such as annotations or markings can disrupt the intended reading of the text—they form a cognitive scaffolding[5] that supports a more selective and targeted attention. In strategically marking up the text, you reduce its complexity, and the reader can identify only the most relevant information (according to the person who made the annotations of course) without having to read or reread everything. Corrections are also significant; the reader has evaluated the text and found it to be wrong in some way that cannot simply be passed over. In order for the text to be meaningful in future readings, it must be corrected, the reader becoming a re-writer—and I do not think it is too much of a stretch to say that, in some acts of correction, there is an implied criticism of the writer

[5] Cognitive scaffolding is a term I borrow from educational psychology, where it describes those teacher behaviours that assist a student to do something that would be beyond their unassisted ability (Wood et al. 1976).

(or completely explicit criticism, in the case of the exasperated reader who noted ‘Whoever translated these Gospels, did a very poor job!’ on a Latin–Dutch Bible translation[6]).

The Aegean Background

The Aegean is at one end of the great arc of Bronze Age cultures of the Ancient Near East that use clay as their primary writing support, and, as so often happens at the ends, sealing, marking, and writing practices arrive here relatively late. Seal use comes first, with the small-scale chiefdoms of Early Helladic Greece (roughly 3100–2200 BCE) making use of seals and sealings in community-wide storage practices; while there is still some debate over whether this is centralized storage, or something more like the material remains of intracommunity social events, the socio-economic context here is presumably one in which these farming and crafting communities have a developed notion of private or personal property, as well, perhaps, as a growing sense of mistrust between neighbours (Pullen 2008 and Forsén 2010 offer good introductions to this period; Krzyszkowska 2005 should always be a starting point for Aegean seals and sealings; Peperaki 2004; Maran and Kostoula 2014).

Prepalatial Crete (roughly 3100–1900 BCE) offers a contrasting set of evidence, with only a small amount of seal impressions but with seals being a relatively common grave-good; pools of motifs across areas like the Mesara suggest the importance of these objects in the construction of group identities of some sort (for the general background, see Wilson 2008 and Tomkins and Schoep 2010; Krzyszkowska 2005 again for the seals and sealings; Relaki 2012). While the wave of destructions at the end of the Early Bronze Age on mainland Greece and the Cyclades causes widespread social disruption there, on Crete communities grow ever more complex, and their seal usage intensifies; this culminates in the Late Prepalatial with the appearance of the first Aegean script, the ‘Arkhanes Script’, on a handful of seals from the elite cemetery at Arkhanes and elsewhere. Our understanding of the familial relationship between this script and the two that follow is still evolving, but by the end of the First Palace period (roughly 1900–1700 BCE), Cretan Hieroglyphic and Linear A are used alongside seals in the writing-assisted administration of different elite and palatial groups (for the most recent view of ‘Arkhanes Script’, see Ferrara et al. 2021; Tomas 2010a introduces Cretan Hieroglyphic and Linear A; for the socio-political setting, see Schoep 2010). The two scripts overlap, or intertwine, in certain contexts but also show radical differences—not least the widespread usage of Cretan Hieroglyphic signs as one

[6] A photograph of this text, Vienna, ÖNB, S.n. 12.857, fo. 95^{v}, is available at https://medievalbooks.nl/2014/09/05/getting-personal-in-the-margin/ (accessed 2 April 2022).

element in the motif on seals, very much problematizing our neat divisions of meaningful image versus script sign.

This use of script as one element in the construction of elite group identity could well be a contributing factor in Cretan Hieroglyphic's 'extinction'; following a series of destruction events, Cretan Hieroglyphic disappears from view during the Second Palace period (1700–1425 BCE approximately), and Linear A usage spreads widely both within and beyond Crete (Schoep 2006, 2007). While still very much a tool in the administrative management of palaces and elite households, Linear A also has considerable value in other areas of elite behaviour, appearing on stone offering vessels and jewellery (Davis 2014 offers an extensive analysis of the stone vessels; the jewellery is published in Godart and Olivier 1982).

Linear A ceases to be used at some point after the end of the Second Palace period, the destruction horizon that marks the end of this period preserving most of the surviving documents. The jump from Linear A to Linear B is somewhat obscure though—the relationship between the two scripts is clear enough, with the script signs of Linear A being adapted to record a new language, Mycenaean Greek (Salgarella 2020)—but the circumstances, mainland Greek invaders at Knossos or a Knossian elite reorienting itself to the Greek mainland, remain disputed (see Hallager 2010 for the former view, and Bennet 2008 for the latter). Either way, the Linear B script and associated administrative system are carried to the small palatial states on mainland Greece and used there in a remarkably uniform and unimaginative way for some two hundred years until the destruction events around 1100 BCE, which bring the Aegean Bronze Age to an end (Palaima 2010 provides a concise review of the Linear B evidence).

This is very much an abbreviated history of a period rich in socio-political changes and technological developments. The litany of destruction horizons is a necessary detail; the primary material used to carry seal impressions or incised text is raw and unbaked clay, and every tablet or sealing that has survived has been preserved completely accidentally in some sort of fire. One must always bear in mind the essential randomness and unpredictability of what is available to us and how this impacts on our interpretations; to give but one example, the appearance of the 'Arkhanes Script' on seals looks highly significant for what it suggests about the development of script-based writing and its conceptual link with the idea and social role of the seal, but is it actually rather the case that we lack the contexts in which other kinds of writing supports might have been preserved (Bennet 2008)?

Glimpses of Reading in the Bronze Age Aegean

We can certainly identify script communities in the Bronze Age Aegean—that is, the core of people who made and used Cretan Hieroglyphic, Linear A and Linear B documents; the documents themselves, where they are found, and their contents (where we can read them, as both Cretan Hieroglyphic and Linear A remain undeciphered), all give a visible shape to these communities. However, if we want to move beyond the writers and look for readers, the limitations of the evidence become clear. The Aegean is missing most of the media I discussed above; there is no literature, no visual representations of readers, or writers for that matter, and, perhaps most tellingly, there is no self-referentiality, no references in texts to the acts of writing or reading. Nevertheless, there are more oblique glimpses of readers and reading activity.

A starting point is to think more critically around the question of readability. While we cannot read Cretan Hieroglyphic and Linear A in the sense of extract the meaning of every sign, a number of ideograms have been more or less securely identified, and many Linear A syllabograms share a sign-form with later Linear B signs, so we can tentatively infer their sound values (these are conventionally called the AB signs; Olivier and Godart (1996: 19) provide a conservative comparison of signs common to all three scripts). However, while it is possible to say the tablets record agricultural produce, craft items, and people's activities, we cannot go much further. This is a source of considerable frustration, and it leaks out, I think, in a scholarly preoccupation with the Linear A tablets' messiness and irregularity.

There is a certain value, though, in embracing and engaging with our temporary illiteracy—it is extremely difficult for highly literate people, immersed in a particularly rarefied kind of relationship with writing and writing practices, to think ourselves into the perspective of someone who cannot read. One of the consequences is a tendency to overestimate the extent to which people might be able to puzzle their way through a document by decoding the ideograms. The problem with ideograms, though, is that it is very hard to gauge how readable they are; as Kelly has pointed out, in his paper to the INSCRIBE 2021 workshop on the invention of writing, visual iconographic conventions are *very* context specific.[7] How can outsiders evaluate the relative iconicity or abstract nature of signs, or infer meanings without instruction? There is perhaps a sliding scale of guessability with signs that maintain what Houston (2004: 226) calls an existential tether to real-world referents potentially more easy to decode, and beyond this you would need to learn the agreed meaning in order to be able to decipher the sign.

It is always the case, though, that, if you remain outside the system of socially agreed conventional meanings—because you lack opportunities to learn the script, for example—you are not necessarily prevented from making your own meanings, drawing on your expectations of what would be likely. This is one of the elements of functional literacy—actively pulling together your own most

[7] https://site.unibo.it/inscribe/en/events/conference-the-invention-of-writing-image-production-and-linguistic-notation (accessed 2 April 2022).

meaningful readings based on your particular knowledge and experiences, in order to get successfully through the process in which you must participate.

Something that can be crucial here are aids to reading. Whereas Linear B tablets have clear rules for their layout that ensure consistency and provide guides to reading, Cretan Hieroglyphic and Linear A are written considerably more erratically—things like word separation, ruled lines, or marks to indicate where to start reading are found, but they are not used in any way consistently (Duhoux 2017). It is even possible to write signs that are oriented on a vertical axis, for example, AB 67, both ways round. There is not a lot of help here for the less skilled or experienced reader—and one should be mindful that we, as fluent readers, tend to underestimate the extent to which we are reliant on these sorts of aids for making meaning out of text (Duhoux 2017). This could suggest that, for Cretan Hieroglyphic and Linear A documents, other contextual clues are relied on to aid reading; the range of document shapes used in both administrative systems is very wide, particularly with sealings, and it does look very much as though the different shapes are meaningful in and of themselves—that is, the shape is part of how the document works and it also signals this to the reader (or perhaps better here—the meaning-maker) (Finlayson 2013).

Focusing in on a specific example, Figure 12.1 shows a Cretan Hieroglyphic crescent: what exactly can be read here? There are multiple pieces of information on this sealing: the incised text on sides β, γ, and δ; the seal impressions on face α, one of which itself contains Cretan Hieroglyphic signs as part of the seal motif (seal reference *CMS* II.8 number 037); the overall shape of the document; then beyond the sealing there are the seal faces that made the impressions and the object to which the sealing is attached. These layers of significance could potentially even encompass the physical location in which the sealing is made and used, the people involved in the transaction, and their relationships or the network of obligations in which they are enmeshed. In the broad context of making meaning as you read, each of these components contributes a piece of

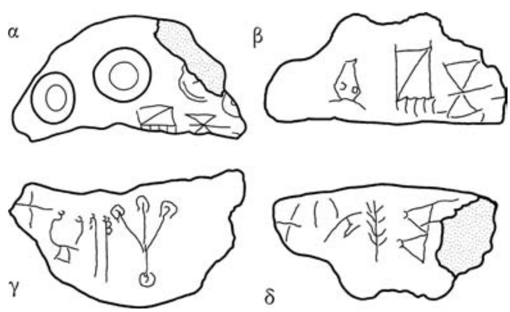

Figure 12.1 The four faces of Cretan Hieroglyphic crescent *CHIC* #027, KN Ha (05) 01

Source: Adapted from Olivier and Godart (1996: 82); drawings by Michael Anderson.

information about the overall transaction and each is encoded differently, requiring a different kind of knowledge to unpack the meaning.

So how you read a sealing like this, which of the pieces of information you place most weight on, depends on your reading ability, your familiarity with the process, and the extent to which you are actively engaged in assembling this meaning as opposed to being a more passive or peripheral participant. And it does beg the question whether everybody is reading the same message. How far people are able to learn the skills necessary to participate in administrative activities—not just how much of the Linear A or Cretan Hieroglyphic script they can read, but how literate they are in extracting all of these other kinds of meaning—is unknowable, and a lot depends on our own re-creations of these practices and the upwardly mobilizing redistributive systems that lie behind them. Are they open and inclusive, with all participants fully knowledgeable and engaged, or are they exploitative, relying on many peoples' inability to read and fully to understand the documents they are forced to interact with (Cherry's criticism (1984: 27–8) of the 'friendly bank managers' overseeing redistribution in many reconstructions remains pertinent)?

The second part of the puzzle, as it were, is physical location—in order to be able to read, you need to have access to the written material as much as you need access to the literacy skills. You need to be close enough to see, you perhaps need to handle the writing support yourself, to manipulate it as your eyes scan the text. I have written elsewhere (Finlayson 2021: 265–6, fig. 13.3) about some significant patterns observable in the Aegean; documents that carry a longer text (the Linear A and very rare Cretan Hieroglyphic tablets, various forms of bar, the parchment documents to which Linear A single-hole hanging nodules are perhaps attached, and some flat-based nodules that also seal parchment) belong within *structures*, within palaces and elite complexes. They can be read only by people who are allowed into these spaces. At the boundary between these inner and outer zones are the sealings that mediate transactions between the central authority and outsiders; using the example of the Linear A roundel, the person in charge of the storeroom (perhaps) and the recipient of the goods together make this sealing to record their transaction. This would be a good candidate for a situation where the reader relied heavily on contextual clues, and could perhaps read little beyond the ideogram representing the item he or she delivered or received—as Weingarten (2017: 100–1) so neatly puts it, the roundel is a document for the functionally illiterate, its design catering to people who count using cardinal rather than abstract numbers (1 seal impression = 1 unit).

What we could call 'travelling sealings'—Cretan Hieroglyphic crescents that come into the central place from the hinterland, some of the Linear A flat-based nodules that definitely travelled, and noduli, found in both systems—present another dimension in this picture. These sealings could potentially be seen by anyone *en route*, not just those directly involved in the transaction. The flat-based nodules are very carefully constructed so that the clay sealing secures the parchment document (Pini 1983)—but is this because there is a legitimate concern that the document might be opened and read between sender and intended recipient? That would certainly imply moderately widespread reading ability. Or is this rather more about creating a sort of mystique around these channels of communication? Not only is the message written on a different medium (parchment rather than the clay of quotidian administration), but its treatment, the folding and securing with threads and sealing with clay to be followed by the breaking of the clay, cutting of the threads, and so on, create quite an elaborate physical and material performance around the act of reading.

One category of material carrying Linear A texts that potentially have a much greater capacity for wider visibility are the stone offering tables or vessels—these could be seen in processions, or at sanctuary sites (Bevan 2007; Davis 2014). Who reads them? The dedicator? The priests or other ritual staff who facilitate the acts of offering perhaps (Tomas 2010b)? Definitely the gods—I do not think it a stretch to say that a written dedication or prayer implies that the gods can both read and appreciate the value of a dedication enhanced with writing. Most stone vessels like these do not have a text, suggesting that the dedicators of the marked vessels want them to be visually differentiated.

The ring and pins with Linear A inscriptions of running syllabic text without ideograms also potentially exist in this sort of zone; but much depends on whether they are made specifically as grave-goods, to be seen only by those honoured with closeness in the burial rites, or are worn in life and therefore visible on the body. These are all precious things, a prayer or meditation or dedication made tangible, and they do important work both in mediating your relationship with the divine, and also in advertising your status—not only as a person who can commission an exquisite craft item but also as someone who can call on writing in this way.

We use these objects as evidence for a moderately wide degree of literacy among the elite (discussed in Finlayson 2021). This is reasonable, but one should still ask whether the owner or dedicator necessarily has to be able to read the inscription for it to be efficacious? All of these objects invite handling and interaction. Turning a vessel around to follow the inscription, or running your fingers over the text as you fix a pin in your hair or clothing, could potentially be a kind of meaning-making as important to the owner/user as his or her semantic reading of the written text. And, if the wearer of the ring, for example, can read its inscription, does it have a fixed meaning, the same with each reading, or does the meaning-making depend on the moment? Whereas an administrative tablet has to have, at some level, an element of fixed reading to be useful,[8] the inscriptions

[8] By this I mean that a tablet recording, say, twenty ewes could be read by different individuals more loosely as referring to sheep, to wool-bearing animals, even to 'my flock that I tend to', and still serve its administrative function.

on these ritually charged objects have the potential to be much more fluid in how they can be read as the relationship with the divine is negotiated.

In this matrix of readability and visibility, these objects represent potential points of tension; all are things that could be read outside their intended context by anyone who had the requisite skills, and what might have been a piece of written text intended to have a single and fixed meaning could instead be given meanings much more polyvalent or context specific. When we think about the kinds of reading skills people on Crete might have had during the First and Second Palace periods, we need somehow to construct a spectrum that can stretch to encompass everything from the functional understanding of an administrative process, perhaps knowing only the ideogram for the raw material you provide to the palace, through to the use of narrative text in correspondence or ritual practices, and all the infinite graduations in between—while also allowing for uncontrolled, 'unofficial' meaning-making. Yeo's concept (2021: 182) of the 'boundary object' is helpful here: objects—for example, administrative records—that straddle different modes of understanding within and between communities, each community encountering it with its own perspectives on exactly what it represents.

So far, this has been very tentative and impressionistic. When we focus on Linear B practices, we have the opposite problem, almost a superfluity of detail. The way information is collected and managed is well understood, and we can reconstruct the general administrative cycle with consecutive stages of writing, reading, and collating. Agricultural products, for example, come into the palace accompanied by sealings, the gable-shaped nodules. The data on the sealings, the sender or some details about the goods, are read and transferred onto a palm-leaf tablet. Several palm-leaf tablets recording related transactions are then read and compiled onto a page-shaped tablet (Palaima 2003 gives examples from Pylos of the complete administrative cycle).

Because such careful palaeographic work has been done to identify individual writers, we can see that another important part of palatial administration involved the reading, compiling, or summarizing of longer or more strategic information across different formats—data relating to different aspects of landholdings on the Eb and Eo tablets written by Hand 41 are summarized by Hand 1 in the En and Ep series, for example. You can certainly copy text without reading and understanding it (a possibility for the more routine transferring of data from sealings to palm-leaf tablets perhaps), but summarizing is a more complex activity requiring reading comprehension and also broader contextual knowledge that can guide you in extracting the most relevant information.

At the most detailed level, one writer could read and correct another writer's tablet. On tablet Cn 599, Hand 1, the leading administrator at Pylos, has checked Hand 21's text, and made the necessary corrections, adding a word and erasing a line of text before rewriting it (for a very clear illustration, see Palaima 2011: fig. 12.25). This sort of direct intervention is unique to Pylos though, and perhaps speaks to a working environment in which there is a greater degree of top-down supervision and cross-checking. At Knossos, there are examples of two different hands appearing on tablets, one writing on each side; on a series of tablets dealing with cloth, Hand 113 writes the recto and 115 the verso (Olivier 1967; Palaima 1988). This does not directly suggest reading, but it does certainly imply close cooperation in the making and writing of documents.

So far, this reading has been integral to the ongoing quotidian administration of raw materials, animals, people's activities, and so on. This is, after all, one of the use values of writing—you cannot hold all this information in your head, so you put it in an external device that can remember it for you. At Pylos there is an additional level though, the higher level: summary tablets are placed in what is conventionally called the Archives Room, stored in labelled baskets on shelves (Palaima and Wright 1985; Palaima 2011). The absolutely crucial question to ask here is: once these documents are placed in the Archives Room, does anyone read them?

The Pylos tax records record debts carried over from the previous year, so administrators can clearly consult older records of tax payments (Killen 1984), but what about all the records of completed transactions, where no obligation is outstanding? Is there any further need to read these records? Does anyone, for example, take down a random tablet and browse it out of curiosity? Or are the shelves carefully filled with neatly filed records because that feels like the right thing to do, the correct way to end the administrative cycle? Given the large and significant gaps in what is recorded in the Linear B documents, which suggest that the administrative system is very strongly shaped by non-utilitarian factors, together with the likely link between being an administrator and holding elite status (see Bendall 2007 for the first point and Bennet 2001 for the second), we should certainly be open to the possibility that it is primarily for the satisfaction of the process, and there is no ultimate reader.

It is ironic that the Linear B texts most likely to be visible outside the palaces are those that we afford least value—the painted inscriptions on stirrup jars, often hard to read, sometimes sliding between a text and something more decorative in their detail (van Alfen 2008). The inscription has a fixed meaning, relating to the delivery of oil from producer to palace, but, as the jars are used and reused, shipped between Crete and mainland Greece and back again, the possibilities for reading and meaning-making unsanctioned by the palace are myriad, but at the same time access to the skills required for reading has been radically restricted.

Conclusions: Does a Text Need a Reader?

To conclude, I will unpick a little further the most fundamental, and I suspect the most unanswerable, question here—does a text really need a reader?

We started with the statement that the existence of writing presupposes the existence of a reader, but does it really? Much depends here on where you place most emphasis and value in definitions of what constitutes writing and what its purpose is; if you, for example, posit that the purpose of writing is to store information that at some later point in time can and will be retrieved, then you need a reader who is interested in retrieving it. How clearly that reader is conceptualized or visualized, and whether he or she is separate from the writer remains open and would presumably vary from script community to script community. This is, I would suggest, very much how we view writing and reading now—as inextricably entangled. But has this always been so?

As we have seen, reading practices and skills in the Bronze Age Aegean encompass, at different points, divine readers, skilled readers who made summaries or corrections, as well as readers who might actually be 'reading' the process and not the written text. Meanings can be fixed, they can potentially be highly context specific, and sometimes perhaps they are negotiated in the reading; set against this is always the question of accessibility to the materials bearing writing, by both the intended and the more accidental audiences, a factor that could shape reading experiences as much as access to literacy skills. Fundamentally, readers need something to read.

Against such a background, I would suggest that reading and writing might not always be so tightly bound together, and, in fact, for consumers of Cretan Hieroglyphic and Linear A there are reading opportunities and meaning-making opportunities very separate from the initial act of writing, and perhaps sometimes in conflict with the idea of a single fixed message. For sealings and incised stone vessels in particular, it is possible that there is often an unintended reader and an unintended reading.

Linear B is different though. By pulling writing back into the palaces, making it an almost entirely inward-facing practice that exists only within an administrative context, opportunities for reading are very much reduced. This must be caused by, or bring about, a radical shift in how the activities 'reading' and 'writing' are conceptualized, and what their relative values are within the Linear B script community. The fact that the Mycenaean gods do not receive offerings bearing writing, and therefore presumably cannot read, seems absolutely crucial here, but I leave open whether the change in practices comes before or after the change in attitudes, and to what extent this reflects cultural differences between mainland Greece and Crete.

Now, I would suggest, reading and writing are just recurring points in the cycle of administrative activity. The Linear B administrators write knowing that they or their fellow administrators will read their texts—*if* the process requires it. The reader is no longer other, separate from the writer.

In fact, the important thing is that something was written down—there is not necessarily any expectation that it will be read.

13
Looking for Writers in the Archives of King Nestor

Louis Godart

The publication of the volumes dedicated to the corpus of inscriptions in Linear B from Pylos and to the scribes of Pylos, in particular to the creation of the facsimiles of the tablets (Godart and Sacconi 2019, 2020), opens new and vast fields of investigation to philological and historical research. In this chapter, the attribution of specific documents to the specific hand of a single scribe helps us to define the religious and secular areas involved with the requisition of bronze and gold contributions within the territory of Mycenaean Messenia. In addition, the analysis of the hands of the scribes combined with considerations of seals and seal impressions, frescoes, ivories, and, above all, the lack of fortifications around the Palace of Pylos can help us to redefine the chronology related to its fall. We will first consider the role played by a very important scribe, and then turn to the evidence related to the material culture.

Scribe 602

Scribe 602 is an important functionary in the palace of Pylos. He is one of the most prolific officials among the Pylian scribes (Godart 2021: 22, 97–9). The attribution to this scribe of documents Jo 438 and Jn 829 helps us better to understand the role he played within the administration of the Mycenaean state of Pylos. The activity of scribe 602 covered the entire territory of the state, as indicated by the documents of the Jn, Jo, and Ma series, related to metals and to taxation, respectively.

Tablet Jn 829 paints a very clear picture of this state of affairs:

.1 jo-do-so-si , ko-re-te-re , du-ma-te-qe
.2 po-ro-ko-re-te-re-qe , ka-ra-wi-po-ro-qe , o-pi-su-ko-qe , o-pi-ka-pe-e-we-qe
.3 ka-ko , na-wi-jo , pa-ta-jo-i-qe , e-ke-si-qe a_3-ka-sa-ma

In the header it appears that several officials (the *ko-re-te-re*, *du-ma-te*, *po-ro-ko-re-te-re*, *ka-ra-wi-po-ro*, *o-pi-su-ko*, and *o-pi-ka-pe-e-we* (the enclitic *–qe* = -τϵ

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associates these various characters) are responsible for delivering (*do-so-si* = δώσονσι, future of δίδωμι) bronze (*ka-ko* = χαλκόν) qualified as *na-wi-jo* at Pylos.

Scholars have written extensively on the meaning of *na-wi-jo* on line 3 of this tablet (for an excursus on the literature, see Del Freo 2005: 793–803).[1] In the first case we would be dealing with an adjectival form corresponding to *νηϝιος = 'the bronze of the ship', in the second to *ναϝϝιος = 'the bronze of the temple' (*D.Mic. II*, s.v. *na-wi-jo*). The contexts lead us to favour the interpretation whereby *ka-ko na-wi-jo* is to be read as 'the bronze of the temple'. In the first place, the bronze samples for which the officials mentioned in Jn 829 are responsible concern the sixteen district capitals of the Pylian state. While some of the communities in question are on the coast, others are inland. It is difficult to see these last localities, clearly dealing with bronze, belonging to the fleet.

Secondly, some of the officials called upon to deliver the bronze in question are part of the religious personnel. This is, for instance, the case of *ka-ra-wi-po-ro*. The word *ka-ra-wi-po-ro* is a function name always associated with a female character. A *ka-pa-ti-ja* is mentioned twice in tablets Eb 338.A and Ep 704.7 as *ka-ra-wi-po-ro*.[2] We meet *ka-ra-wi-po-ro i-je-re-ja* (*i-je-re-ja* corresponds to alphabetical Greek ἱέρεια) in Ed 317.1; these *ka-ra-wi-po-ro* are priestesses. In Un 6, we find this same association between *ka-ra-wi-po-ro* and *i-je-re-ja*. In PY Vn 48.5, five *ka-ra-wi-po-ro* are listed in a document that deals with sanctuaries and mentions at least one deity, the *e-re-wi-jo-po-ti-ni-ja*, the Πότνια of *e-re-wi-jo*. It therefore appears that *ka-ra-wi-po-ro* are priestesses exercising their functions in sanctuaries (*D.Mic.* I, 324). All commentators agree that *ka-ra-wi-po-ro* are κλαϝιφόρος (Ionian κληδοῦχος, Attic κλειδοῦχος, Dorian κλαδοφόρος)—in other words, 'keepers of seals', people controlling the treasure of the sanctuaries.

That these treasures existed becomes moreover clear according to tablet PY Ae 303, where we read: *pu-ro, i-je-re-ja*, *do-e-ra*, *e-ne-ka*, *ku-ru-so-jo i-je-ro-jo* MUL 14 to translate: in Pylos, 14 sacred slaves (ἱέρειαι δοῦλαι) for (*id est* are in charge of) the gold (preposition *e-ne-ka* = ἕνεκα in charge of *ku-ru-so-jo* = χρυσόιο) of the sanctuary (*i-je-ro-jo* = ἱερόιο genitive of ἱερόν). It is accepted that *o-pi-su-ko* are stewards of figs (*ὀπίσῦκοι from *ὀπί + σῦκον). Here too it is about serving sanctuaries (*D.Mic.* II, 43).

The term *o-pi-ka-pe-e-we* was interpreted by Palmer (1969: 283, 438), then followed by Perpillou (1973: 375 and n. 10), as "ὀπισκαφεῆϝες, people taking care of sacred dishes". It is therefore obvious that among the officials in charge of the requisition of *ka-ko na-wi-jo* in the two provinces of the Pylian state we find

[1] Del Freo (2005: 797) summarizes the hypotheses that have been put forward to explain the expression *ka-ko na-wi-jo*.

[2] *ka-pa-ti-ja* is a feminine anthroponym corresponding to *Καρπαθία; cf. Καρπάθιος, ethnic from Κάρπαθος, 'the woman of Karpathos'.

sanctuary servants. This is the reason why it seems to me that *na-wi-jo* means 'of the sanctuary' and is ultimately to be connected to *ναός*.

The first officials to be mentioned in the title are the *ko-re-te-re*, which, on lines .4–19 of the tablet, are associated with *po-ro-ko-re-te-re*. These are agent names in *–τήρ*. Since there is nothing to allow us to associate the *ko-re-te-re* with the religious realm, it is clear that these officials belong to the secular sphere. It should be noted that in line .1 of the document, following the *ko-re-te-re*, are mentioned the *du-ma-te*, which precede the *po-ro-ko-re-te-re*, which open line .2.[3] The *du-ma/da-ma* was tied to alphabetical Greek *δάμαρ* and translated as 'steward' (Chantraine 1968: s.v. *δάμαρ*). In association with the word *du-ma* (plural *du-ma-te*) there is also a *po*[-*ro*-]*da-ma* (a vice-intendant in Jo 438 *lat. sin.*), as well as *me-ri-du-ma-te/me-ri-da-ma-te* (**μελι-δύμαρτες*, honeystewards). It is proven that the *me-ri-du-ma-te/me-ri-da-ma-te* belong to the category of attendants of sanctuary (Lejeune 1972: 131 and n. 48).

There is no reason to say that this is the case with the *du-ma*. The fact that *du-ma* are cited immediately after *ko-re-te-re* and before *po-ro-ko-re-te-re* could mean that they are high-ranking provincial officials. In the tablets of the scribe 109 of the C series of Knossos are attested two *du-ma*, to which are intended a pig: the first in C 1030 is associated with the locality of *e-ko-so*; the second in C 1039, a mutilated tablet that recorded at least two localities as indicated by the enclitic *–qe* (*-τε*) following the toponym **56*-] *ko-we-qe*, was dealing with a territory comprising at least two villages. The two texts of Knossos by associating the *du-ma* with toponyms prove that this official had competences and exercised authority—whatever the latter—at the provincial level. In the performance of his duties, he was assisted by a *po-ro-du-ma/po-ro-da-ma*, just as the *ko-re-te* was assisted by a *po-ro-ko-re-te*.

Quoted immediately following the *ko-re-te-re-re* in both Jn 829 and On 300 (lines .5 and .6 for the records of the lower province and lines .11 and .12 for the upper province), it is tempting to imagine that the skills of these officials of poorly known attributions could lead them to collaborate with the *ko-re-te-re* (this is the case in Jn 829 and On 300), but that in the Mycenaean hierarchy they were inferior to them, while being, as pointed out in note 9, more important than the *po-ro-ko-re-te*.

In tablet Jn 829, all the ministers of religion are mentioned in line .2 following the *ko-re-te-re*, *du-ma-te*, and *po-ro-ko-re-te-re* and are no longer mentioned in the rest of the document. On lines .4-19 of the tablet, for each district capital, appear only the *ko-re-te* and his collaborator, the *po-ro-ko-re-te*, followed each

[3] In a first stage of writing the tablet, the scribe, at line .1, had engraved *po-ro-ko-re-te-qe* immediately following *ko-re-te-re*; then he realized that the hierarchical order of the people called to provide the bronze of the temple was different, and he erased the word, writing in its place *du-ma-te-qe*. Then, moving to line .2, he started by writing *po-ro-ko-re-te-re-qe*.

time by the AES logogram (AES standing for bronze) and the weight of the metal concerned. These two officials therefore appear to be the only ones responsible for transporting the bronze requisitioned in the sanctuaries to the palace. If this is indeed the case, it can be concluded that the state can intervene in the management of sanctuaries and ask the ministers of religion to deposit with its lay representatives, in this case the *ko-re-te*, the *du-ma-te*, and the *po-ro-ko-re-te*, the goods required, so that they are transmitted to the palace, which exercises its centralized control this way.

From the heading of the tablet Jo 438, only the word *ko-re-te* remains.[4] Despite this, it is obvious that the document is closely parallel to Jn 829, although, in addition to the *ko-re-te*, his deputy the *po-ro-ko-re-te*, and the *da-*]*ma* or *du-*]*ma*, other people are also involved in the supply of gold: three officials (*mo-ro-qa*, *a-to-mo*, and *qa-si-re-u*) and five individuals not appearing in Jn 829 (*ne-da-wa-ta* in .7, *e-ke-me-de* in .8, *a-ka-wo* in .18, *po-ki-ro-qo* in .22, and *au-ke-wa* in .23).[5] The *mo-ro-qa* is a title related to the possession of a property (clearly in terms of landowning, as it appears in tablet PY Aq 64). *a-to-mo* is also a provincial civil servant's name. The tablet C 979 of Knossos, from the hand of scribe 109, as C 1030 and C 1039 cited about *du-ma*, tells us that the *a-to-mo* received a pig and exercised his functions in four cities of Crete (*do-ti-ja, ra-ja*, *pu-na-so*, and *ra-su-to*), which suggests that he held prestige and authority, to an extent at least comparable to that of the *du-ma* and *da-mo-ko-ro* (KN C 7058), also recipients of a pig. The *qa-si-re-u*, alphabetical Greek *βασιλεύς*, appears to be a simple workshop leader (Godart 2020: 289–94).

We will therefore note an essential difference between tablets Jn 829 and Jo 438. In the first document, the religious officials (*ka-ra-wi-po-ro-qe*, *o-pi-su-ko-qe*, *o-pi-ka-pe-e-we-qe*) are responsible for providing the official representatives of the king in the two provinces of the state with the bronze of the temples that will be used for the manufacture of arrowheads and spears. In the second document, the sanctuary servants no longer appear: we have only provincial officials (*ko-re-te*, *po-ro-ko-re-te*, *a-to-mo*, *du-ma*, and *po-ro-da-ma*), a workshop manager (*a-ke-ro*, qualified as *qa-si-re-u* in Jn 438.20), carpenters (*te-ko*[*-to* '*τέκτων*' in Jo 438. 2), rowers (*e-re-ta ἐρέτας*, Attic *ἐρέτης*, A, in Jo 438.2), and individuals (*ne-da-wa-ta* in Jo 438.7, *e-ke-me-de* in Jo 438.8, *a-ka-wo* in Jo 438.18, *po-ki-ro-qo* in Jo 438.22, *au-ke-wa* in Jo 438.23), who will supply the palace with the quantities of gold required in the administrative districts of the kingdom. These five characters are undoubtedly important people, possessing abundant resources including gold (Godart, forthcoming). In other words, compared to

4 Chadwick (2002: 31–7).

5 *po*[*-ro*]*da-ma* on the left side of the document is of course 'a vice-*da-ma* or *du-ma*', called here to play in the levy of gold a role identical to that of the *du-ma* in the taking of bronze from the temple in Jn 829.

the requisition of bronze in Jn 829, the collection of gold in Jo 438 became secularized. The reason is simple: this gold was not that of the sanctuaries but emanated from a production circuit outside the religious sphere.

In conclusion, if scribe 602 records distributions of offerings of barley to deities and sanctuary servants in the Fn series, perfumed oil to ministers of worship, deities, and the *wanax* in Fr, and if he draws up the inventory of royal furniture in the Ta series, he appears to be the main character in charge of reporting on the collection of the tax in the Messenia region (series Jo, Jn, Ma, Mn). He takes note of the contributions to be made to the palace by cities, shrines, civil servants, certain professional categories, and certain individuals. He is a kind of 'secretary general' of the 'minister of finance' of the king of Pylos.[6]

The Ma series relates to taxation and the requisition of commodities from various districts. The first word of each Ma tablet is a toponym; the same is therefore true of the first line in the document, which helps us to throw light on scribe 602, Ma 397.1 (Figure 13.1). So far, in all editions of Pylos' texts, this word has been read: *a*-[•]-ta_2.[7] The examination of the document and the photographic enlargements have allowed us better to grasp the complexity of this text and to reconstruct what scribe 602 did at the beginning of the line. Indeed, the scribe wrote *a*-ta_2 and subsequently, realizing that he was making a mistake, erased ta_2, and on

Figure 13.1 The sequence *a*-*63-ta_2 on tablet PY Ma 397.1
Source: Photograph by K. Xenikakis, courtesy of the Athens National Museum.

[6] We believe that the Mycenaean scribes, far from being heads of departments, as has been argued, simply transcribed the observations and accounts of the members of the aristocracy (the Collectors!), which were called upon to manage the various sectors of the kingdom's economy (Godart 2021: 80–2).

[7] Thus, in *PTT I*, 192. Thereafter, neither *PTT*^{2} 2020, 184, nor *PTT*^{3} 2021, 151, propose identification for the second sign of Ma 397.1 and read *a*-[•]-ta_2.

Table 13.1 Districts mentioned in the tablets of the Ma series, Jn 829, and On 300

Jn 829	**Ma series**	**On 300**
Jn 829.13 *ti-mi-to-a-ke-e*	Ma 123 *ti-mi-to-a-ke-e*	On 300.10 *te-mi-ti-ja*
Jn 829.14 *ra-]wa-ra-ta*$_2$	Ma 216 *ra-wa-ra-ta*$_2$	On 300.9 *ra-u-ra-ti-ja*
Jn 829.15 *sa-]ma-ra*	Ma 378 *sa-ma-ra*	On 300.11 *sa-ma[-ra*
Jn 829.16 *a-si-ja-ti-ja*	Ma 397 *a-*63-ta*$_2$	On 300.11 *a-si-ja-ti-ja*
Jn 829.17 *e-ra-te-re-wa-pi*	Ma 333 *e-ra-te-re-we*	On 300.10 *e-[ra-te]-re-wa-o*
Jn 829.18 *za-ma-e-wi-ja*	Ma 393 *za-ma-e-wi-ja*	
Jn 829.19 *e-re-i*		
	Ma 330 *e-sa-re-wi-ja*	On 300.9 *e-sa-re-wi-ja*

this section (the poorly erased upper left part of *ta*$_2$ is still visible) he wrote **63* before completing the word by engraving *ta*$_2$, so that the toponym that opened the document must read *a-*63-ta*$_2$.

In the seminal article he devoted to the administrative districts of Pylos, Lejeune (1972: 115–33) elaborates on the toponyms present in the Ma series. These districts are also mentioned in tablets Jn 829 and On 300 (Table 13.1). Lejeune (1972: 120) notes the absences of *e-re-i* on Ma and On and of *e-sa-re-wi-ja* on Jn, and he attributes these absences to an administrative change affecting the XVI district of the kingdom. Conversely, we note that district XIII has the name *a-si-ja-ti-ja* in Jn 829.16 and On 300.11, while in Ma it is called *a-*63-ta*$_2$. It is clear, then, that we should consider that scribe 602, author of the Ma series, when he wrote *a-*63-ta*$_2$, in fact intended to write *a-si-ja-ti-ja*. The syllabogram *ta*$_2$ corresponds undoubtedly to *tja* (Lejeune 1972: 116, n. 5). Therefore, proposing a value *sja* to the syllabogram **63* seems to us a hypothesis that shows potential.

Certainly the number of words containing the syllabogram **63* is limited, and it is difficult to verify the relevance of the equation **63* = *sja*. Besides *a-*63-ta*$_2$, this syllabogram is attested only in *ku-*63-so* in En 74.14 and Eo 247.5, **63-o-wa* in Vn 34.3, and for Thebes the allative **63-te-ra-de* and the anthroponym **63-u-ro* (Aravantinos et al. 2001: 398).

Logogram *249

We will now turn to another piece of evidence, logogram **249*. Its attestations help us to build a picture of the relations with other syllabograms and the role played by scribe 602. Logogram **249* shares many features with Linear B sign **86* and Linear A signs *565* (86 '188') and *566* (86+188) (*GORILA V*, XXV. 271). While **86* evokes a boat equipped to its left with a row, A *565* and A *566* resemble a boat with a '*château-arrière*'.

We have six attestations of **86* in Linear B (Judson 2020: 115). In Knossos, in Ce 61.1 we read *me-*86-ta*, an anthroponym with which an ox is associated; in Dc 1117. B *wa-*86-re* is 'shepherd' in the locality of *ku-ta-to*; in Pylos, three attestations of **86* (*u-ra-*86* in Na 466, *u-ra-*]**86* in Na 1039, and *u-ra-*]**86* in Na 1086) probably concern the same word, namely *u-ra-*86*, which is a toponym. Finally, in PY Ua 1586.a, a tablet published in 2019, we have an excellent example of **86*, which Judson (2020: 115) analyses impeccably.

In Linear B the logogram **249* is represented in three different ways, twice on PY Mn 11, a tax document made by the hand of scribe 602, as well as on the verso of An 724, a tablet written by scribe 601. In the first case (Mn 11.1: Figure 13.2), the bow of the boat is on the left and right appears a '*château-arrière*' that evokes the 'captain's cabins', which can be distinguished on some of the boats depicted in the fresco of the Naval Parade found in the West House on the frescoes at Thera, Santorini. In the second instance (Mn 11.7: Figure 13.3), the scribe represented a simple boat, and the sign corresponds to the syllabogram **86* (Poursat 2014: 191, pl. LVI).

Linear B offers a third version of **249* on the verso of tablet An 724, in which the '*château-arrière*' is lying down, which would perhaps tend to prove that the boat thus represented was not fit to set sail but under repair (Figure 13.4).[8] Tablet An 724 registers people called to serve in the fleet as rowers. The link between the front and back of this tablet is obvious: the scribe records rowers, and on the back of the document he draws a boat.

Figure 13.2 Logogram **249* on tablet PY Mn 11.1
Source: Photograph by K. Xenikakis, courtesy of the Athens National Museum.

[8] *PTT*², 189, failed to bring the logogram closer **249* in Mn 11 of the graffito of An 724ᵛ while putting forward the hypothesis that the sign of An 724ᵛ could represent sign **34* or a ship. *PTT*³, 155, followed Olivier and Del Freo without commenting on the logogram **249* and pointing out in turn that the sign on An 724ᵛ could represent either the sign **34* or a ship.

Figure 13.3 Logogram **249* on tablet PY Mn 11.7
Source: Photograph by K. Xenikakis, courtesy of the Athens National Museum.

Figure 13.4 Sign **249* on tablet PY An 724^{v}
Source: Photograph by K. Xenikakis, courtesy of the Athens National Museum.

The Chronology of the Pylos Tablets

Finally, I would like to examine the problems concerning the chronology of Pylos in Messenia that the Americans excavated in 1939 and then from 1952 to 1966 (Figures 13.5 and 13.6), and the palace of Ayios Vasileios in Laconia, which has been cleared for some ten years by a Greek team led by Adamantia Vassilogamvrou. The physiognomy of these last two palaces contrasts sharply with that of the other continental Mycenaean palaces: there are no Cyclopean walls around what was

Figure 13.5 Overview of the Palace of Pylos
Source: Photograph by K. Xenikakis.

Figure 13.6 Partial view of the Palace of Pylos with the 'Archive Room'
Source: Photograph by K. Xenikakis.

the palace of old Nestor or the residence of Menelaus. Is it reasonable to assume that, as is commonly held, all these constructions are more or less contemporary and that the destruction of these sites was verified at the same time?[9]

Popham (1991: 315–24), who of course was not familiar with the excavations of Ayios Vassileios, wondered 'why the palace at Pylos was unfortified at the time of its destruction, which was usually placed at the very end of the century' (Popham 1991: 315). In his article Popham demonstrates that there was a reoccupation of the site of Pylos after the fall of the Mycenaean palace, because vases of the Late Helladic IIIC or the very beginning of the Iron Age were erroneously attributed to the final catastrophe, which in reality, as the re-examination of ceramics suggests, dates back to the end of Late Helladic IIIA2 or the very beginning of Late Helladic IIIB1 (around 1300 BCE). The same problem of the lack of fortifications in Pylos intrigued J.-C. Poursat (2014: 147).

Thomas (2004: 207–24) in turn addressed the question of the dating for the palace. If, as Thomas writes, the palace was in operation throughout the Late Helladic IIIB period, where is the evidence for the Group B deep bowls, the deep rosette bowls, and the undecorated conical kylixes so characteristic of the Late Helladic IIIB2 period (1250–1200 BCE) in Argolid, Corinth, and Attica? Popham's suggestion that the palace was destroyed at the very beginning of the Late Helladic IIIB period, perhaps shortly after the beginning of Late Helladic IIIB1 (1300 BCE), deserves further consideration. If we place the destruction of Pylos at the beginning of the IIIB period, we solve the question of the dating of most of the ceramics discovered in the palace, as well as the absence of typical forms of the Late Helladic IIIB2 pottery, and we can explain the significant difference between the wares that appeared on sites like Nichoria and the wares of the Argolid. If the palace had been in operation throughout the Late Helladic IIIB period, why would the close historical relations with the Argolid in terms of ceramics and other types of material culture have ceased?

The article published by Lis in 2016 questions the dating of the fall of Pylos. At the end of his examination, Lis points out that the group of vases, partly hand-shaped, from room 60 shows several unique features that set it apart from other Pylian pottery assemblages. At this point, he adds, it is necessary to recall the tiny amount of decorated pottery, the small number of vases found in rooms other than kitchens, and the mass of stylistically older vases belonging to a time prior to the date generally proposed for the fall of Pylos—that is, around 1200 BCE (Lis 2016: 532–3). Moreover, several items of material culture can help us frame the issue of dating. We will survey the evidence below.

[9] If the Palace of Pylos was never protected by a perimeter wall, the latter has in no way the Cyclopean character of the defence systems characterizing Mycenae, Tiryns, Thebes, Gla, Midea, etc. (Zangger et al. 1997: 606–13).

Seals and Seal Impressions

The analysis of the seals and seal impressions discovered both in the tombs of Messenia near the Palace of Pylos and in the layers of destruction of the palace itself produces elements worthy of inclusion in the debate on the dating of the fall of Pylos. It is paradoxical that most commentators, with the exception of Poursat, consider that all users of the seals of Pylos would have inherited seals older than 150 or even 200 years. It is certainly possible that, in at least some cases, these seals may have represented heirlooms that would have spanned centuries (from 1450/1370 to 1200/1180 BCE), if we place the end of Pylos within the Late Helladic IIIB2–Late Helladic IIIC period. It is, however, more difficult to admit that all the seals used in Pylos belonged to the ancestors of the administrators of the palace, if we place the end of the latter between 1200 and 1180 BCE (Poursat 2014: 112, 178).[10]

The Frescoes of Pylos

The decoration of the throne room of the palace has obvious similarities with the decoration of the throne room of the Mycenaean Palace at Knossos. Suffice it to quote Blegen, who stressed the 'narrow ideological rapport associating these two Mycenaean compositions' with reference to the frescoes discovered in the throne room of Pylos (Blegen and Rawson 1966: 79, fig. 74).

Ivories

Poursat (2014: 117), in his analysis of Mycenaean ivories, shows that it was at the time between Late Helladic IIB and Late Helladic IIIA1 (1450–1400 BCE) that the repertoire of Mycenaean ivories was established. The Pylos ivories are related to a period largely prior to Late Helladic IIIB2– Late Helladic IIIC (1200–1180 BCE). In the ivories of Pylos we find elements such as meanders, unknown in the other sites, as well as a very particular treatment of the foliate bands that recall the peculiarities that Lang was able to recognize in the secondary decoration of the frescoes (Poursat 1977: 175–6). It is, therefore, more than tempting to associate the date of the frescoes of Pylos with that of the ivories presenting this type of decoration.

[10] 'In mainland Greece the seals are numerous in contexts of the Late Helladic IIIB in Mycenae, Pylos, Thebes, Tiryns, but the imprints seem to be everywhere, those of seals of ancient date preserved by the officials of the administration. In Pylos, most of the fingerprints match to the seals of the Late Helladic IIB–IIIA1'(Poursat 2014: 178).

The Linear B Documents and their Chronology

Do the inscriptions in Linear B on vases, on the one hand, and the tablets of Pylos, on the other, provide us with data likely to add elements to the debate on the chronology of the palace and its demise? Pylos had relations with the island of Crete, and Cretan craftsmen were surely present in Messenia.

In the Ta tablet series, which draws up an inventory of royal furniture, and specifically on tablet Ta 641.1, two tripods are mentioned (*ti-ri-po-de* *201^{vas}) *a$_3$-ke-u* (decorated with goats or with handles shaped like goats heads) called *ke-re-si-jo* (Chantraine 1968: s.v. *αἴξ*) *we-ke*, that is κρησιο-ϝεργής 'of Cretan manufacture', as well as another tripod (*ti-ri-po*) *ke-re-si-jo we-ke,* whose legs are burned: *a-pu ke-ka-u-me-no ke-re-a$_2$*, that is *ἀπυκεκαυμένος *σκέλεhα (plural of σκέλος 'the leg'). In Ta 709.3 a tripod decorated with a goat's heads is mentioned and a tripod whose decoration is described by the adjective *o-pi-ke-wi-ri-je-u* of difficult interpretation (Ventris and Chadwick 1973: 533–53), both again qualified as *ke-re-si-jo we-ke* 'of Cretan manufacture' (*D.Mic.* II, s.v.).

A tripod vase from a tomb of Volimidia, adorned with three heads of animals (two of deer, one of a bull), provides a good illustration of what scribe 602 describes in Ta 641.1 (Poursat 2014: 212, fig. 292). This vase is dated by Koehl (2006: nos 44–61) to the Late Helladic IIIB1 period and by L. Papazoglou-Manioudaki (2003) to the fourteenth century BCE. Vases with animal heads are rare, but there is a series of them in a workshop at Kydonia dating back to the Late Minoan IIIA2 period (1370–1300 BCE), which corresponds and corroborates the attestation of the 'Cretan manufacture' indicated in the tablet detailed above.[11] All these vases seem to predate 1250 BCE, or even 1300 BCE. If, as Poursat still writes to me, 'Scribe 602, author of the Ta series, recorded material of his time, the latter could in no way be later than LH IIIB1' (Poursat, pers. comm).

I would add that the similarities between the descriptions of Scribe 602 in the Ta series, the animal heads' vases from the Kydonia workshop, and the Volimidia rhyton argue in favour of a dating located at the turn of the end of the fourteenth and the beginning of the thirteenth century BCE for the Pylos archives (between the end of the Late Helladic IIIA2 and the beginning of the Late Helladic IIIB1 period). This conclusion is in line with that suggested by Popham, who, on the basis of the re-examination of the Pylos ceramics, suggests that the final catastrophe that swept away the palace dates back to the period between the end of the Late Helladic IIIA2 and the beginning of the Late Helladic III B1 period.

Moreover, in Pylos, five *ke-re-te* are mentioned (PY An 128.3)—that is to say, five Cretans (*Κρῆτες*, plural of *Κρής*), called *ka-si-ko-no*, a term that undoubtedly serves

[11] The Late Minoan IIIA2 period is the time of great changes in the architecture of the houses discovered on the mound of Kastelli at Kydonia. Cf. Pl. LII for the ritual vase with hare head and papyri decoration of that time (Godart and Tzedakis 1992: 35–6).

to designate craftsmen. The existence of itinerant craftsmen is well documented in the Mycenaean world. It is therefore likely that five Cretans exercising the profession of *ka-si-ko-no*[12] were inserted into the mechanisms of the Pylian administration.[13] The economic and cultural relations between Crete and the Palace of Pylos were therefore active at the time of the Linear B tablets discovered in the Palace of Nestor.

At the time of the Late Minoan III B1 period (1250 BCE), the political and administrative centre of Kydonia in western Crete (*ku-do-ni-ja* in Linear B) imposed itself on the island in the aftermath of the fall of Knossos. This centre exported stirrup jars to the Greek mainland, especially to Mycenae, Tiryns, Midea, Thebes, and Eleusis. The clay of these vases is indeed a clay of western Crete, and the scribes who painted Linear B texts on these amphorae exercised their activity in Kydonia. Inscriptions painted by these scribes have been unearthed both in Kydonia and in the continental Mycenaean localities.

Is it not strange that no inscribed stirrup jar from western Crete has been discovered in Pylos when we know that the Mycenaean centres of the continent have yielded in abundance this type of vessel and that Pylos, as evidenced by the tablets in its archives, had close relations with Crete? Is it not simply because the palace had ceased to exist before 1250 BCE, when exports to the continent of stirrup jars from western Crete were located? If this is indeed the case, it would be Knossos that would have been at the centre of relations with Messenia, with the Linear B tablets bearing witness to a time before the end of Late Helladic IIIB1.[14]

Tablets Ae 995, La 994, Xa 1419, Xa 1420, and Xn 1449

About these documents Palaima (1988: 164–5) writes:

> Two other tablets from the SW Area were found in a different context and are disassociated not only from the mainstream of scribal activity in the palace

[12] *ka-si-ko-no* in the Ra series of Knossos, who reports on the registration of swords, is put on the same footing as *pi-ri-je-te*, an agent name in -τηρ; it is possible that both terms refer to craftsmen involved in the making of swords (*DMic I*, s.v.).

[13] Godart (2020: 211, 253). The presence of iconographic themes in frescoes from different palatial sites suggested the existence of itinerant painters who went from one palace to another and even (if we take into consideration the frescoes of Avaris in Egypt, which are undoubtedly the work of Minoan painters), from one country to another, to practise their art. This helps to explain the extraordinary similarity between the depictions of wild boar hunting in the frescoes of Tiryns and Orchomenos, and processions of Mycenae, Pylos, Tiryns, and Thebes.

[14] Popham (1991: 322) clearly sets out the question: 'If we consider that the vases of the late IIIC period cannot belong to the layer of destruction of the palace, then what is the answer to be provided to the question I was asking myself: when the palace was destroyed? I would say: to a very ancient phase of the Late Helladic IIIB. This would explain the presence of the few decorated bowls and conical kylix. This would also explain the strongly marked character "Helladic Recent IIIA" of much of the ceramics, decorated or not. Among the vases cited by Blegen (p. 421) there is a stirrup amphora imported from Crete that could perfectly well belong to a considerably ancient period of the sequence in question (fig. 348, 1-4).'

proper, but even from the 34 tablets that constitute the primary data from the record-keeping in the SW Building. During the 1960 season, George Papathanasopoloulos excavated along and above the outer southwestern wall of the SW Building. Unfortunately, his trench notebook is missing from the University of Cincinnati Excavations Archives; but according to C. W. Blegen, Papathanasopoulos began at the extreme western corner of Room 81 and moved southeastward in increments of roughly two metres until he eventually reached the main hall, Room 65, in GP 10. In Trench GP 2 he discovered tablet Xa 1420 (Blegen and Rawson 1966: 20–1);[15] in Trench GP 5, 0.85 below the surface in a disturbed stratum with mixed stratigraphy, tablet Xa 1419 (Blegen and Rawson 1966: 283–5). As noted in the analysis of hands, these tablets together with Ae 995, Xn 1449 and Ua 994 (today La 994) form a unique group, not only for Pylos but for the entire Greek mainland, possessing a distinctively Knossian–Cretan graphic style.[16] The running northeastward inside the outer wall of the SW Building from Room 65 into Room 81 is a segment of impressive wall antedating the LH IIIB palace and destroyed by the bedding trench for the outer wall of the SW Building. It is possible that Xa 1419 and 1420 may be chance remains from the earlier structure deposited in the bedding trench when the SW Building was constructed (Blegen and Rawson 1966: 282–3). Tablets Ua (La) 994 and Ae 995, which are related paleographically, are also from a context in which rooms of the later palace were built over successive phases of wall from the period LH IIIA or earlier (Blegen et al. 1973: 35–7).

Tablets La 994 and Ae 995 were discovered in the area under Rooms 55, 56, and 57 in the Archives Room (Blegen et al. 1973: 35–7). Palaima (1988: 169) writes:

In 1953 Theokaris, whose notebook is missing from the University of Cincinnati Excavations Archives, excavated Rooms 55–57. He uncovered, despite the confusion created by earlier intrusions, at least three successive and stratigraphically complicated phases of occupation, together with wares of Mycenaean III A (Blegen et al. 1973: 35–7). One example of the earlier periods is a large pithos containing conical cups beneath the floor of Room 55 and belonging to a stage before the palace was built (Blegen and Rawson 1966: 223). From these Rooms comes Ae 995 and perhaps Ua (La) 994.

[15] Blegen notes that the ninth excavation campaign took fourteen weeks from 23 April to 1 August 1960. At the place where Papathanasopoulos excavated, walls appeared associated with ceramics of the Late Helladic IIIA, but the plan of a previous construction could not be recovered.

[16] Fragment Xn 1449 was connected by J. L. Melena to the tablet Vn 1339 from Room 99 of the palace (Godart and Sacconi 2020: 281).

Thus, the group of four tablets come from the the south-west complex (SW Building).[17] In particular, the area west of Room 81 (Xa 1419 and 1420), as well as Rooms 55–7 located in the opposite region, the south-east wing of the palace (Ae 995 and La 994), dates from the Late Helladic III A period (c.1370–1320 BCE). As these are documents accidentally burnt in the fire that devastated these rooms, it is obvious that the palace suffered destruction during the fourteenth century BCE and probably towards its very end.

Tablet La 994 shows the base of a mutilated sign (the upper part has disappeared) whose identification is, all the same, certain: it is the logogram for wool (Figure 13.7). This logogram, which evokes a cat's head and which goes back to a well-known prototype in Linear A, has here a very particular characteristic: two eyes are drawn on either side of the vertical stroke representing the nose of the animal.[18]

However, two Pylos tablets, La 632 (Figure 13.8) and La 635 (Figure 13.9), present the logogram of wool having exactly these characteristics—namely, the two eyes drawn on either side of the stroke that depicts the cat's nose.

Such a characteristic element is not found either in Pylos nor in all the many texts in Linear B presenting the logogram for wool. Here are some of the logograms for wool attested at Pylos:

Un 267.8 (scribe 601);  Un 443.2 (scribe 606) 

From this paleographic excursus, the conclusion seems straightforward: tablets La 994, La 632, and La 635 come from the hand of the same scribe. In addition, tablets La 632 and La 635 are from Room 6 (Throne Room), Northeast Sector (Palaima 1988: 137). These documents were unearthed in 1952. They were

Figure 13.7 Tablet La 994 (MNA 23969; Rooms 55 and 57?; scribe 664)
Source: Photograph by K. Xenikakis, courtesy of the Athens National Museum.

[17] Poursat (2014: 150) notes that 'the function of the South-West building, very poorly preserved, remains indeterminate; it does not seem that it was a first palace but rather a contemporary residential building of the palace'.

[18] Ventris and Chadwick (1973: 314) observe that 'the ideogram translated as wool is derived from a Linear A monogram of the sign *MA+RU*'. This is the logogram A 559 of Linear A, composed of the signs *80+26*, attested in PH 3 a.1, PH 3 a.2, PH 3 .3, HT 12 .4, HT 24 .2, .3, .4, .5, HT 43 .1. Linear B modified this monogram to *MA+RE*; this is, of course, the syllabogram *ma*, which, in its most archaic form, evokes a cat's head (as, e.g., in ZA 5 b.1, ZA 15 a.4, PH 7 a.3, KN Zf 1, AR Zf 2, IO Za 2d.1, KO Za 1d, to name just a few examples taken from archival documents as well as votive inscriptions on stone or metal).

Figure 13.8 Tablet La 632 (MNA 23700; Room 6, NE Sector; scribe 664)
Source: Photograph by K. Xenikakis, courtesy of the Athens National Museum.

Figure 13.9 Tablet La 635 (MNA 23703; Room 6, NE Sector; scribe 664)
Source: Photograph by K. Xenikakis, courtesy of the Athens National Museum and facsimile by Louis Godart.

attributed to the layer of destruction of the palace, the one that Blegen dates to the Late Helladic IIIB2–IIIC period (1200–1180 BCE) (Shelmerdine 1998: 294).

However, if, as we have seen above, La 994 belongs to the Late Helladic IIIA2 period (1320 BCE), it follows that it is impossible that tablets La 632 and La 635, which are inscribed by the same scribe, can date to Late Helladic IIIB2–IIIC (1200–1180 BCE). More than a hundred years separate the Late Helladic IIIA2 from the Late Helladic IIIB2–IIIC period, and far exceed the life expectancy of a Mycenaean scribe. It must, therefore, be concluded that the destruction of the Palace of Pylos, as argued by Popham, Poursat, Thomas, and Lis, must date back to a period that sits well before 1200 BCE.

It is to this very conclusion about tablets La 632 and La 635 that Skelton (2009, 2011) arrives in two articles questioning the dating of the tablets discovered in the *megaron* (or Throne Room) of the Palace of Pylos. Doubts about the dating of the La tablets had already been raised by Melena (2000–1). These are strong arguments to be included in any assessment related to the destruction of the palace.

Another document supplies evidence. Tablet Xn 1449, which Palaima and the excavators of Pylos date to the Late Helladic IIIA2 period, was connected to tablet Vn 1339 (Figure 13.10), which would go back to the Late Helladic IIIB2–IIIC period. The writing of this tablet, as Palaima has argued, is to be compared to the

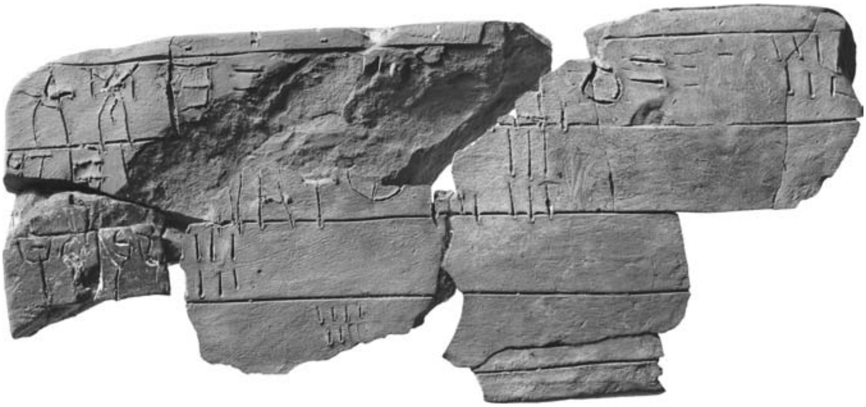

Figure 13.10 Tablet Vn 1339, to which the fragment Xn 1449 was connected in the lower left part
Source: Photograph by K. Xenikakis, courtesy of the Athens National Museum.

handwriting of scribe 691, who is responsible for tablets Ae 995 and Xa 1419, which in turn date to an older period (Late Helladic IIIA2). If this is indeed the case, it must be concluded that tablet Vn 1339, discovered in Room 99, is also to be dated to the Late Helladic IIIA2 period. And, of course, the same is true for all documents associated with Room 99.

However, as it is claimed in *Les Scribes de Pylos*, Room 99 yielded documents from the hand of scribe 614, who is also active in the south-west region (SW Area), in the Archives Complex, and in Court 47. It is, therefore, a real domino effect in action: this inevitably leads to dating the Linear B archives of Pylos to a time to be set between the end of Late Helladic IIIA2 period and the beginning of Late Helladic IIIB1 (Godart 2021: 91).

Conclusions

To conclude, the following can be surmised:

(1) Popham demonstrates that there was a reoccupation of the site of Pylos after the fall of its Mycenaean palace, because vases of the Late Helladic IIIC or the very beginning of the Bronze Age were erroneously attributed to the final catastrophe, which in reality, as suggested by the re-examination of ceramics, dates back to the end of Late Helladic IIIA2 period or the very beginning of Late Helladic IIIB 1 (1300 BCE).[19]

[19] This is also the opinion expounded in Lis (2016: 533): ‘the high number of vessels that are stylistically earlier than the commonly accepted destruction date of the palace, i.e., around 1200 BC.’

(2) The absence of pottery shapes typical of the Late Helladic IIIB2 in Pylos and the isolation of the site from the Argolid culture of the second half of the thirteenth century (between 1250 and 1200 BCE) suggest, as explained by Thomas, that the palace was destroyed well before the Late Helladic IIIB2 period.
(3) The very high date associated with all the seals and seal impressions discovered in the layer of destruction at Pylos does not fit well with a dating of the latter to the Late Helladic IIIB2–Late Helladic IIIC period (1200–1180 BCE.
(4) The close similarities between the decorations of the throne rooms at Knossos and Pylos make it difficult to envisage a gap of nearly two centuries between the destruction of these two settings.
(5) The ivories of Pylos, as shown by Poursat, are related to a period largely prior to Late Helladic IIIB1–IIIC, and present elements such as meanders and foliate bands that recall the peculiarities detected by Land in the frescoes. This piece of evidence makes it therefore tempting to associate the date of the frescoes and, as a result, the fall of the palace with the date of the ivories showing this type of decoration.
(6) Contacts were close between Crete and Pylos to the point that Cretan craftsmen were present in the palace.
(7) The absence of stirrup jars bearing inscriptions in Linear B in Pylos while all the other continental palaces have yielded an abundance of this kind of object, dating to the end of Late Helladic IIIB1, suggests that the palace was destroyed before 1250 BCE and that the contacts that Pylos had with Crete mainly concerned Knossos.
(8) The hand of the same scribe is responsible for tablets La 994, a document dated to the Late Helladic IIIA period, and tablets La 632 and 635. This, and the connection between tablet fragment Xn 1449, dated to the Late Helladic IIIA, and tablet Vn 1339, attributed to the Late Helladic IIIB2/ Late Helladic IIIC period, suggest that the fall of the palace occurred at the very end of the fourteenth century BCE or, even better, at the very beginning of the thirteenth century BCE.[20]

[20] There is no doubt that the Mycenaean palace from Ayios Vasileios, which, like Pylos, is not defended by walls such as those of Mycenae, Tiryns, Midea, or Thebes, looks very much like the Palace of Pylos. Waiting for more precise information on the excavation of this large Mycenaean centre of Laconia, we must be satisfied with the preliminary remarks given to us by the excavators. According to the latter, the Western 'Stoa' associated with the tablets unearthed on the site would date back to Late Helladic IIIB1: 'So far, the West Stoa is undoubtedly the most important.... Its upper Storey contained several pithoi and a Linear B archive, the first ever found in Laconia. The Stoa was destroyed by an immense fire during the Late Helladic IIIB1 period, while the whole site was abandoned in early Late Helladic IIIC and it was reinhabited almost two thousand years later during the Byzantine times' (Karadimas et al. 2022). The date of the fall of Ayios Vasileios (Late Helladic IIIB1) would therefore be practically contemporary with the fall of Pylos as I envisage it in this article (at the turn of Late Helladic IIIA2 and the beginning of Late Helladic IIIB1, around 1300 BCE). It is, indeed, the chronology proposed by Kardamaki (2017: 75): 'The following study aims to establish the sequence of pottery phases of the site from the early Mycenaean period up to the conflagration that destroyed the palace at the end of the XIV or at the beginning of the XIII century BC.'

The end of Pylos would therefore have preceded that of the other palaces. It is likely that, alarmed by the catastrophe that had struck one of the centres of Mycenaean power, the authorities of Mycenae, Tiryns, Thebes, and other continental palatial centres decided to build or strengthen the defence systems that protected their residences. It would, therefore, be from this time (the very end of the fourteenth–beginning of the thirteenth century BCE) that the first turbulences would have manifested in the south of the Peloponnese, in Messenia and Laconia. These ultimately led to the disappearance of the Mycenaean palatial civilization around 1200 BCE.

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Chapter 1

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