Glass and Glass Production in the Near East during the Iron Age

Evidence from objects, texts and chemical analysis

Katharina Schmidt

Archaeopress Archaeology

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To my family and Samar

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1. Foreword and Acknowledgements

The colour tones of the lands between the Euphrates and the Tigris are very light, dusty, and dull. They need for contrast pure strong colours. (...) But the general effect through the long eight months of yearly drought, and the prevalence in the landscape of the endless, barren, parched plains and little hills between and beside the rivers – all that is indeed dusty, and veiled in yellowish white insipidity, which spreads over villages and towns, over houses and streets, over palms and stepped flora (...). Men have there unconsciously a strong need for expressing themselves in arrangements of colours. (Andrae 1925: 1)

Today glass is an everyday commodity, often even considered a substitute, similar to plastic. In ancient Mesopotamia, where mud-brick and ceramics were the common materials, the situation was different. The quote of the archaeologist Walter Andrae above, who spent a considerable part of his life in Iraq, is an impressive testimony to the little diverse and colourful monotonous landscape of Mesopotamia, which did not differ much in its current appearance from the Bronze and Iron Age. But unlike today, coloured, shiny and smooth surfaces were rare in Iron Age Mesopotamia, on which this study focuses. Objects made of stone, metal and glazed materials that create a shiny and colourful effect were for the majority of people not part of their daily experience. That is why they were valuable. Due to its deep, bright colours and shiny surface, glass is one of the materials that share these highly appreciated properties and, as the youngest of the materials artificially produced in antiquity, ranks among the most admired materials of that time.

In the Late Bronze Age, when glass production was first introduced in Mesopotamia and Egypt, glass was a rare commodity and was used as a material for prestige objects available only to the elite. This book examines the history of glass in the first half of the 1st millennium BCE in Iron Age Mesopotamia, a time that has been underrepresented in research to date. In many cases, a hiatus in glass production was assumed for this period. It was only in Roman times, with the invention of glass blowing technology, that glass became an everyday commodity.

This monograph is intended to contribute to the history of glass and close the gap between the Late Bronze Age and the Hellenistic period, both of which have been well studied. It becomes clear that many glass technological developments that are of great importance for the following periods began and were prepared in Iron Age Mesopotamia. This is the reason why the presentation of the glass material from this period is of such great importance.

This monograph represents the revised version of the author's doctoral thesis, which was submitted in May 2016, and defended in June 2016 at the Department of Near Eastern Archaeology (Vorderasiatische Archäologie) at the Faculty of Cultural Studies (Fakultät für Kulturwissenschaften) at the Ludwig-Maximilians-University in Munich.

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The know-how of glassmakers and people with practical experience in handling glassy materials contributed significantly to this work. In this context I would like to thank sincerely the 'Roman Glassmakers' Mark Taylor

and David Hill for their comments and advice with regard to the manufacturing processes described in this monograph and their critical remarks on several parts of this text. I would like to also thank William Gudenrath from the Corning Museum of Glass, for various conversations with regard to the manufacturing process of glass, and Dr Zahed Taj-Eddin for stimulating discussions and many critical comments on the text.

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1.1. Aims and objectives

This book examines the history of glass in the first half of the 1st millennium BCE with a focus on Iron Age Mesopotamia (1000–539), a period that was previously underrepresented in glass research, and it is therefore the first to cover this topic comprehensively and in detail. The necessity of working on this subject resulted from the observations made with regard to the glass object corpora of the Late Bronze Age and the Hellenistic period, which compared with one another consist of very different types of glass objects and which were also appreciated in a different way within the society. This gave rise to the question of how the situation was in the intermediate period, the Iron Age, and the idea was born to write a study focusing on this period and region with the aim of presenting a compilation that was as far-reaching as possible and largely complete with regard to the existing types of glass.

The overall aim of this monograph is therefore to determine which glass finds date to the Iron Age period, and, as a result, to identify the different types of glass objects that exist and their respective manufacturing

techniques. Based on this fundamental question, another objective of this study is to understand how raw glass (primary production) and glass objects (secondary production) were manufactured at that time, and how both these industries were organised. This raises the further question of how widespread glass objects were in Mesopotamian society and how important, both the material glass and the individual glass objects were for the people in the Iron Age period.

In this monograph the principle of '*chaîne opératoire*' is not only employed with regard to archaeological data, but also with relation to cuneiform texts, archaeometric analyses and experimental-archaeological investigations. This enables the reconstruction of every single step of the operational sequence of primary and secondary glass production, to recreate a reasonable picture of the production of raw glass and glass objects in Iron Age Mesopotamia. The identified technological processes then serve as a starting point for considerations on the organisation of production and on further questions, such as the distribution of the objects, their function, and assumptions about how these objects were appreciated within society.

With regard to the different disciplines incorporated into this study, an attempt was made not to view them in isolation from each other but to establish connections between these areas, for example, to identify different manufacturing techniques, detailed investigations of the objects themselves must be combined with the practical experience of glassworking, since a fundamental understanding of the material is necessary. With regard to cuneiform texts, for example, a basic understanding of the chemical composition and physical properties of the material itself is required to comprehend the processes described in the texts. This combination and integration of disciplines is the second step. This is preceded by a detailed subject-specific analysis which is provided at the beginning of each chapter in this book.

Chapters 1 and 2 are to be understood as introductory chapters. The first chapter gives an overview of the geographical and chronological framework, and also explains the concept of *chaîne opératoire*, the history of research and the beginning of glass production in the Late Bronze Age. The second chapter deals with the physical and chemical properties of glass to understand the material.

A detailed discussion of the sites and archaeological contexts in which glass finds were made is provided in Chapter 3. This overview is of fundamental importance with regard to the date of the objects and their distribution, both geographically and contextually, and forms the basis for the evaluation of the entire corpus discussed in Chapter 5.

In Chapter 4 the material under study will be presented. The glass finds were compiled from museum collections, literature and excavation databases. With regard to most of the objects, the author was able to examine the artefacts visually within the limitations of museum accessibility (see Acknowledgements), in some cases only photographs could be used. Almost all types of objects made of glass during the Iron Age period are incorporated, only beads and seals are omitted, as their large number would have far exceeded the scope of the work.[1] First, the glass objects will be described in detail, listed in the catalogue and depicted in the plate section. Second, these glass objects were divided into different typological groups according to their specific manufacturing technique.

The following Chapter 5 deals with the geographical distribution of the finds, their specific finding contexts and the chronological range of the different types, including information discussed in detail in Chapters 3 and 4.

Philological evidence forms an intrinsic part of the monograph, which is described in Chapter 6. The texts represent the most extensive source for the reconstruction of glass production in Mesopotamia and thus form a central part of this monograph. As a case study, the recipe on the production of blue *zagindurû*-glass was selected, a text preserved in six different versions. The text is presented both in an edition and in a content-related commentary (Appendix 1). An intimate knowledge of the chemical and physical composition of glass, as well as of the contemporaneous glass finds, contributes essentially to the interpretation of the text.

Results based on chemical analysis are provided in Chapter 7, which is divided into two parts. The first part contains a general discussion of chemical components of glass and their occurrences. In the second part, the chemical analyses taken from glass at different sites are discussed. For this purpose, the chemical raw data were collected, standardised and compiled in a table (Appendix 2). In the course of this work, only published chemical raw data were integrated.

The main results of the study are comprised in the final conclusion. With the exception of the concept of the *chaîne opératoire*, no further theoretical approach to the topic is made. In the course of her dissertation work, the author dealt, however, extensively with the concepts of 'exchange' and 'network analyses', as well as with the various aspects of 'value and equivalence' in connection with glass, which are definitely worthwhile

[1] Detailed study of the glass seals would, however, be worthwhile for future research, especially with regard to a combined iconographic and archaeometric evaluation.

aspects for further studies, and which therefore deserve separate detailed works in the future.

At this point, some further remarks with regard to this monograph are made. The year dates are omitted in this study but refer to BCE unless otherwise specified. The study refers to the common site names and their spellings throughout the text, and are listed in Chapter 3. The spelling of king names follows 'The Royal Inscriptions of the Neo-Assyrian Period' (RIMA) guidelines. Special terms used in the study are marked with an asterisk and are explained and further defined in a technical index.

1.2. Primary and secondary production and the principles of *chaîne opératoire*

Glass production is divided into a 'primary production' which means the fusion of raw materials into a batch, and a 'secondary production' concerning the fashioning of the material into objects (Henderson 2013: 307). Objects associated with primary production are ingots, lumps and pieces of raw glass, as well as waste material. In contrast, glass objects that are not supposed to be further processed such as vessels, inlays, beads or pendants are the outcome of the secondary production process. Both branches of these industries differ considerably and require varying working conditions. First, different ranges of temperatures are needed. Glassmaking (primary production) demands very high temperatures which could either have been held for a short period of time at a very high level or for a longer period of time at a lower level. Glassworking (secondary production), in contrast, requires lower temperatures (Shortland 2012: 27–28). Some secondary processes are even only carried out by the use of cold-working techniques. The need for different temperatures has a direct effect on fuel, kiln construction, tools needed for manipulation, as well as on the shape and constitution of the crucibles in which glass was melted.

The primary and secondary production of every glass object presumes a selection of (raw) materials, tools, energy sources and techniques. In this regard, craftsmen had to choose from a range of different alternatives (Sillar and Tite 2000: 3). To be able to reconstruct the past production process and the choice for one specific technique, it is necessary to look at each step of the manufacturing sequence. This sequence of steps is defined as 'chaîne opératoire' and 'refers to the range of processes by which naturally occurring raw materials are selected, shaped and transformed into usable cultural products' (Schlanger 2005: 25).[2]

Regarding primary and secondary glass production, the requirements (materials, tools, energy sources, techniques) of the two production branches presupposes different knowledge and skills, and consequently result in a different configuration of the workshop itself. The choice for a specific alternative was in most of the cases a response to functional necessities that are directly connected with environmental, economic, social, political and also ideological factors (Sillar and Tite 2000: 5). For instance, environmental factors affect the availability of raw materials, tools and energy sources, whereas the economic and political situation provides information about possible trade routes and exchange systems that existed in a specific time period and region (Sillar and Tite 2000: 9). Therefore, it is assumed that technological developments are not only the cause of technological factors but also result from social, political, and ideological ones. These are crucial for technological innovation since they underlie every decision to adopt or reject a particular technological process. The procedures involved in the production of a glass artefact must therefore be understood and interpreted in their cultural context, and the object itself must be situated in the broader historical and political context of the time in which it was produced. During the Iron Age, the region under study underwent a fundamental change, i.e. the emergence of the first empire, which put an end to the political and cultural fragmentation of the preceding Late Bronze Age. These changes may also have an impact on the material culture and the production principles of glass, which is to be investigated in this study.

1.3. Previous studies on glass in the ancient Near East

The existence of pre-Hellenistic glass production was long denied by scientists concerned with the general history of glass (Kisa 1908: 102). Various excavators, on the other hand, who uncovered Late Bronze Age and Iron Age glass objects in their excavations, referred – in response to the assumption of Kisa – to these 'early' glass finds in their excavation publications, such as the excavators of Babylon (Koldewey 1913: 249–250), Nippur (Peters 1898: 134–135) or Nuzi (Starr 1939: 157–159). On this basis, Koldewey (1913) suggested that Mesopotamian glass production existed independently of Egypt already in the Late Bronze Age period. Starr (1939) even dedicated a separate chapter to the glass finds from Nuzi (15th/14th century) in his monograph and thus emphasised their significance. Similarly, the opinion was also held in Assyriology that there was an early glass industry in Mesopotamia that was independent of Egypt, in this context Meissner (1920: 235) in particular is to be mentioned (for details, see Chapter 6.1.1).

Enhanced interest in Mesopotamian glass finally developed out of the intensive research on Mediterranean core-formed vessels, which was

[2] For a literary review on this concept, see Sellet 1993: 106.

promoted by Fossing in 1940. In his monograph *Glass vessels before glass-blowing*, Fossing established from the scant number of objects known at that time, four major chronological and typological groups which are broadly still accepted today (for details, see Chapter 4.3.1). He also identified an early group of Mesopotamian vessels and pointed towards a Mesopotamian glass production which existed as early as 1300 (Fossing 1940: 31–41). Thus, pre-Hellenistic glass from Mesopotamia emerged as a field of interest in the discipline of glass research. As a consequence, glass became acknowledged in the field and was more frequently published in excavations reports.

Regarding Iron Age glass in particular, Nimrud yielded the majority of glass finds, which have been well discussed in a number of articles (for instance by Barag 1983; Brill 1978; Curtis 1999; Orchard 1978; Saldern 1966a). This can partly be explained through the broad discussions of the decorated ivories found at the site, which were also inlaid with glass (see Chapter 4.2.2.9). Similarly, glass inlays for ivories were also published from Samaria (Crowfoot and Crowfoot 1938: 44–45), and Arslan Taş (Thureau-Dangin 1931: 138). Articles devoted with great attention to glass finds can only be found sporadically at sites such as Hasanlu (de Schauensee 2001; Marcus 1991; Saldern 1966b), Aššur (Haevernick 1968) and Gordion (Jones 2009).

In the 1950s, technological and chemical questions became major concerns, not only in the research of glass, but also regarding other archaeological materials. This enhanced interest in materials in general was driven by the rapid development of scientific and technological methods which also promoted cooperation between the field of archaeology and natural science. The discipline of 'archaeometry' was finally coined by Hawkes, Professor of European Archaeology in Oxford, in the mid 1950s, which promptly also became the title of a journal (*Archaeometry*). Archaeometry denotes the application of physical, chemical, biological and earth sciences to archaeological problems and, since its emergence, has played an integral part in the field of archaeology (Wagner 2007: 5).[3]

Since the 1950s, chemical analysis has become increasingly important in glass research. Today, it has become an integral part of glass research. Of particular importance for this development are the three volumes of *Chemical Analysis of Early Glasse*s published by Brill (1999; 1999a) and Brill and Stapleton (2012). The volumes contain the largest compilation of chemical raw data and their interpretation (vol. 3) for the eastern Mediterranean that have so far been published. These monographs are among the few in which data from Mesopotamian sites, including the Iron Age period, have been recognised. This is particularly important against the background that the amount of published archaeometric data from Iron Age Mesopotamian sites is very small compared, for example, to Late Bronze Age glass or analyses from other regions and periods. So far, archaeometrical research on Iron Age glass material was only sporadically published from sites such as Nimrud (Bimson and Freestone 1985; Brill 1978; Brill 1999b: 47–49; Cable and Smedley 1987; Reade *et al*. 2005; Turner 1955; 1956), Hasanlu (Brill 1999b:44; Stapleton and Swanson 2002a; 2002b; Stapleton 2003; 2011), Gordion (Privat *et al.* 2014; Reade *et al.* 2012) and Pella (Privat *et al.* 2014).

The foundation of the Corning Museum of Glass in 1951 is another milestone in the history of glass research. The museum is the world's largest institution in the field of glass research, as it houses not only an extensive collection of antique and modern glass objects, but also laboratories for analytical and experimental studies and an extensive library on glass history. Of particular importance is the publication series *The Corning Museum of Glass Monographs* and the journal *Journal of Glass Studies*, published by the Corning Museum, which contribute to glass research.

One of the most important monographs on Mesopotamian glass yet published is *Glass and glassmaking in ancient Mesopotamia* by Oppenheim (1970). The approach pursued in this study is the joint work of philology (Oppenheim 1970), archaeometry (Brill 1970) and archaeology (Barag 1970; Saldern 1970), which has led to the most comprehensive reconstruction of ancient glass production in Mesopotamia to date.

Publications on ancient Near Eastern glass were primarily presented in the form of catalogues. An important contribution was published in 1985 by Barag, who first presented the collection of Mesopotamian glass objects from the Bronze and Iron Ages in the British Museum (1985). Harden (1981) focused specifically on the Mediterranean core-formed vessels from the British Museum, including earlier Mesopotamian pieces in his typology. An important study, which not only catalogues the finds from the Toledo Museum of Art, but also makes typological and chronological considerations and contributes to the discussion about the production techniques of the different glass vessels was published by Grose in 1989. This was followed in a similar way in *Frühes Glas der alten Welt* by Stern and Schlick-Nolte (1994), which includes the objects from the private Ernesto Wolf collection and also considers their manufacturing techniques. The discussions about

[3] The first issue of Archaeometry was published in 1958. It is still one of the most important journals in the field, see http://www.arch.ox.ac.uk/rlaha.html (accessed: 2.3.2016). A cooperation between archaeology, assyriology and the natural sciences can sporadically be observed already in the early 20th century and was led by the assyrologist Oppenheim, among others, for details see Chapter 6.1.

production methods from both publications mentioned above are partly based on experimental studies.

Moorey (1994) also included a chapter on glass in his comprehensive work on all materials existing in ancient Mesopotamia – *Ancient Mesopotamian Materials and Industries*. He lists all glass objects of the Bronze and Iron Age known at that time, including their archaeological contexts and dating. He also presents an overview of the manufacturing techniques and gives technological considerations on glass and its connections to other materials.

One of the most comprehensive studies on the history of ancient glass in general was provided by Saldern in 2004, incorporating glass finds from the Late Bronze Age to the Roman period. This monograph includes a broad range of glass objects, including their occurrence and development in an historical context.

The research of glass in the Near East has gained increasing importance in recent years and was driven, as previously stated, by a rising interest and study of chemical composition. *Lapis Lazuli from the kiln* by Shortland is concerned with Late Bronze Age glass from the Near East and Egypt (2012). On a large scale, the interaction between these two early centres for glassmaking and forming are discussed, and questions about technology, workshops, and the use of raw materials are also considered.

Henderson's monograph *Ancient Glass* incorporates data from the Near East, Europe, Asia and Africa from the Late Bronze Age to the Islamic period (2013). This study draws its focus particularly from chemical compositions and their relations, but also includes case studies of individual sites of this vast region.

Despite the growing interest in studies on glass from Iron-Age Mesopotamia, which is evident from the growing number of articles, a monograph that takes typological, chronological and technological considerations for the entire region into account has not yet been published. The present study therefore attempts to take a first step in this direction on the basis of the research history presented here and with the incorporation of previously unexplored artifacts.

1.4. Geographical and chronological framework

The glass objects included in this study are distributed over a geographically broad area, with Mesopotamia (Assyria and Babylonia) as the core region and including its adjoining land masses. The easternmost sites comprise Susa in southwest and Hasanlu in northwest Iran. The southern boundary is Babylonia, which comprises the territory of southern Iraq. Towards the west, the area of interest stretches over northern Mesopotamia, which includes the upper Tigris region and the Khabur triangle, as well as the region of the Middle Euphrates, situated in the modern states of Syria and Turkey. Further west, the area of the Levantine coast, here divided into northern and southern Levant, is also included in this study and incorporates the land that stretches from the Amanus Mountains in the north to the eastern fringes of the Egyptian Delta in the south. Singular glass objects found in western central Anatolia (Gordion), Cyprus (Idalion), Rhodes (Kameiros), Crete (Fortetsa), Italy (Praeneste), and Tunisia (Carthage) are also incorporated, since these pieces represent key objects in glass research.

A brief outline of the history of Assyria and Babylonia, as well as the northern and southern Levant, will be provided in this chapter. Singular sites in central Anatolia and the Mediterranean mentioned above will be discussed separately.

1.4.1 Assyria and Babylonia

The most important political units in Mesopotamia during the Iron Age were the Assyrian and Babylonian empires.

1.4.1.1 The Neo-Assyrian period

The way the Neo-Assyrian empire was politically and socially structured, and, in particular, how its conquered territories were organised reflects greatly on the way objects and ideas travel. The following section largely takes the study by Radner (2014) as its basis, in order to focus on this aspect in particular. The core region of Assyria (northern Mesopotamia) is situated in the north of modern Iraq, from which the state controlled most of the Near East during that time, governing its territory of influence either directly or indirectly (see below). The beginning of the Neo-Assyrian period is difficult to determine. Different rulers are considered the first Neo-Assyrian kings, such as Tiglath-pileser I (1114–1076), Ashurnasirpal I (1049–1031) or Aššur-dān (911–890), amongst others. Also in respect to archaeology, the beginning of the Neo-Assyrian period cannot be determined exactly. Therefore the year 1000 is followed in this study for convenience (Liverani 2011; Roaf 2001).

In the 11th and 10th centuries the territory of Assyria was reduced to the city of Aššur and its hinterland, due to political and social disturbances caused by migrating people in the region at the end of the Late Bronze Age (see Chapter 1.4.2). By about 1100, the Assyrians faced the Arameans, who were tribal groups in the north of Syria. Later, the Arameans were incorporated into Assyria, forming an Aramean-Assyrian symbiosis, which is also visible in the material culture (Berlejung *et al.* 2017; Tadmor 1982). By the mid 9th century,

Assyria had recaptured the territories located in the north and west of the core region, with Shalmaneser III (858–824) consolidating this regained territory. This was achieved by the establishment of client states with 'royal cities', ruled by local dynasts who were bound to the Neo-Assyrian king by oath and treaty (Radner 2011: 103, 105). During the 8th century, Assyria suffered a brief phase of political decline, caused by aggressive rival states (Urartu, Upper Egypt), as well as by weak Assyrian monarchs. Finally, after 754,[4] Tiglath-pileser III (744–727), Shalmaneser V (726–722), and Sargon II (721–705) reasserted power by sending armies beyond their traditional Assyrian territories, such as Syria, Palestine and parts of Egypt, Anatolia and Iran. Finally, in the middle of the 7th century, the Assyrian Empire reached its maximum expansion, relocating strategically large amounts of people - in particular for economic exploitation. In this regard, Sennacherib (704–681) was the monarch who moved the greatest numbers of people across the Empire compared to his predecessors and successors, with the majority of people coming from Babylonia (Oded 1979: 20–21; Radner 2014: 109). In particular, experts from different fields were brought to the Assyrian heartland – in the time of Sennacherib mainly to Nineveh – to generate knowledge and wealth. Craftsmen have to be considered among this class of individuals, skilled people needed to furnish those temples and palaces that were (re-)built in the capitals (Oded 1979; Radner 2009; Radner 2014: 106, 108–109). From the 8th century onwards, the territory was organised into provinces, governed by local provincial governors appointed by the king (Radner 2006). The expansion of the Neo-Assyrian Empire, in particular towards the west, and the relocation of experts, played an important role with regard to production traditions and distribution of different types of objects. The extent to which this resettlement of experts has an impact on the spread of glass technology in the early 1st millennium is part of the investigation of this study.

The fall of the Neo-Assyrian empire occurred with the collapse of the major centres in the years 614 (Aššur) and 612 (Nineveh), which was caused by the attacks of Babylonians and Medes (Radner 2014: 111). The period after 612 is still broadly obscure and can archaeologically only be determined at some sites, for instance at Nimrud, Nineveh or Dur-Katlimmu, to mention only a few. This period is commonly referred to as post-Assyrian, and is marked by squatter occupations that exist at almost all the major sites. The post-Assyrian period is characterised by a continuity in material culture that makes a distinction between Neo-Assyrian and post-Assyrian difficult (Curtis 2003: 164; Kreppner 2006: 128).

[4] The year of the accession of Aššur-nārārī V.

1.4.1.2 The Neo-Babylonian period

According to Jursa (2014: 125, 140), the Neo-Babylonian empire cannot be disconnected from Assyrian rule over Babylonian regions and its fate; also because later it served as a cultural bridge between the Neo-Assyrian and Achaemenid periods. The Neo-Babylonian period (612–539), is historically marked by Babylonian domination in Mesopotamia and its bordering regions. During this period, the Babylonians gained control over southern and northern Mesopotamia, as well as over parts of south-west Iran, Syria and the Levant. This was mainly achieved by Nabopolassar (626–605), the founder of the Neo-Babylonian state (Da Riva 2008: 1–16; Jursa 2014: 124). The expansion to the west was mainly carried out by Nebuchadnezzar II (605–562), a process which also included colonisation and province formation. Unfortunately, royal inscriptions only vaguely report on this. Booty from Assyria, Syria and the Levant funded large, royally-sponsored building programs, in particular within the city of Babylon, and allowed Babylonia to experience a phase of great prosperity. Finally, in 539, Cyrus the Great defeated the last Neo-Babylonian king, Nabonidus (556–539), captured Babylon, and terminated the Neo-Babylonian empire by incorporating their territory into the Persian empire (Jursa 2014: 125–126, 140–142). Already in the previous years, Cyrus had captured those bordering regions in the east and north that had previously been known as Media and Lydia. By incorporating the territory of the Neo-Babylonian Empire, Cyrus finally created an empire of previously unknown size (Rollinger 2014: 150).

1.4.2 Levant

1.4.2.1 History and chronology of the Levant

The chronological nomenclature for the Levant is adopted from the European pre- and proto-history and its classification of Stone, Bronze and Iron Ages, and stands therefore in contrast to the historical nomenclature of Mesopotamia. The Iron Age in the Levant is estimated around 200 years earlier than in Mesopotamia, with Iron Age I therefore stretching from 1200/1150 to 980/930 BCE. Its beginning is marked by an epochal transition which kept the eastern Mediterranean Late Bronze Age world and changed it radically. Its breakdown has to be contextualised with the fall of the superpower Egypt and the Hittite Empire, the decline of the Mycenaean city-states with their palatial structures.[5] This ultimately resulted in a new geopolitical situation in the subsequent Iron Age II period, characterised by smaller and independent political units, associated with new group identities –

[5] For a detailed study and summary of all factors with further literature, see Cline 2014.

known as the kingdoms of Ammon, Moab, Edom, Aram, Israel, Juda, and the northern 'Phoenician' and southern 'Philistine' city-states. The emergence of these units was a gradual process, and only little is known about their political and social organisation as textual sources are largely missing (Weippert 1988: 353).[6]

The Iron Age IIA/B periodisation is heavily discussed. The main protagonists in this diverse chronological debate are Finkelstein, Mazar and Garfinkel. The discourse is based on a missing chronological anchor between the 12th and 8th centuries which would make it possible to correlate archaeological data with absolute dates. A detailed discussion of the Iron Age chronological debate is omitted here, and, for convenience, the 'Conventional Chronology' is applied.[7] In this investigation, however, the term 'Iron Age' is used in a general sense as the period of the first half of the 1st millennium BCE.

Dates for the 'Conventional Chronology' in the Levant

Iron IA	1200/1150–980/930
Iron IIA	1000–926/900
Iron IIB	830/800–730/700
Iron IIC	700–520

Historically, the 8th and 7th centuries are marked by the conquest of the region by the Neo-Assyrian Empire. The first phase of the Assyrian expansion took place under Ashurnasirpal II (883–859) and Shalmaneser III (858–824), which affected the northern Levant more than its southern part, since Aram still served as a buffer zone. Assyrian influence grew successively in the first half of the 8th century, in particular under Tiglath-pileser III (744–727). By the 7th century, the Assyrian Empire had grown into a 'world power', which was secured by Sennacherib (704–681) and Esarhaddon (680–669). Under Ashurbanipal (669–627) the empire finally reached its maximum expansion. The Assyrians left allies or vassals in the northern and southern Levant. For many parts of the region, in particular for Trans- and Cisjordan, it is not clear how the provincial system was exactly governed in the different regions (Bagg 2011; 2013: 132–135; Parpola 2004; Routledge 1997; Ussishkin 2006: 339–358). Some of the provinces in the west were, however, primarily established to generate trade between Assyria and the neighbouring regions, such as Ashdod (established in 711), and Sidon (established in 677) (Radner 2004). The Neo-Assyrian empire is furthermore characterised by massive deportations and resettlements of large groups of people and a supra-regional economic and trading system, all factors which also influenced the way objects, knowledge and ideas were distributed (George 1997; Gitin 1997; Oded 1979). To which extent Assyrians were present in the Levant is discussed controversially (Bagg 2011: 281; Parpola 2003).

By the end of the Assyrian supremacy in the region, the Babylonians rose to power. Nebuchadnezzar (605–562) conquered Syria and defeated the Egyptian king Nechos II at Carchemish in 605. In the subsequent years he captured large parts of the northern and southern Levant. However, the exact way of the execution of Babylonian domination over the Levant is a matter of debate, its presence can only be realised to a small extent in the material culture, e.g. the rock reliefs (da Riva 2008: 2–19; Jursa 2014: 124–126; Lipschitz 2005: 3–48, 66).

1.4.2.2 'Phoenicia' and related terminological difficulties

'Eastern Mediterranean', 'Phoenicia', 'Syria' or 'Syria-Phoenicia' can be either understood as geographic locations, or they are connected with a specific group of people. To avoid controversial terminology, the term 'Phoenician' is not used in this study, unless it serves as part of an established name, in favour of the more general differentiation between the northern and southern Levant.[8] The northern Levant finds its northern boundary in Cilicia and incorporates large parts of western Syria, from its coastal line up to the middle Euphrates. The southern Levant is defined as 'greater Syria', bounded by the Antilibanon in the north, and Egypt (Wādī el-Ġazze/el-'Arīš) in the south.

Regarding ancient glass, the term 'Phoenician' is particularly widely used in literature, and needs therefore to be discussed here. The Phoenicians are elusive in history because they never designated themselves as such.[9] Often they are referred to as successors of the Canaanites, and are therefore categorised regarding chronological considerations. Even if both groups are regarded as inhabitants of the same geographical region, a dividing line between them is often drawn chronologically, and marks the transition between the Bronze Age (Canaanites) and the Iron Age

[6] The relatively short phase of the Iron Age IIA ends around 918/7 or 926/5 BCE, when Pharaoh Sheshonq I carried out a number of military campaigns into the southern Levant to regain Egyptian influence in the region. This is witnessed by many destruction layers in various settlements of the Iron Age IIA period – although it is not always certain they were caused by Sheshonk I (Nakhai 2001: 183; Weippert 1988: 426).

[7] For the discussion of the 'Low Chronology' (Finkelstein) and the 'Modified Conventional Chronology' (Mazar), see, i. a., summarising Levy et al. 2005; Mazar 2011 with further literature, Finkelstein 2011 with further literature, as well as Ben-Tor 2000: 9–15.

[8] The designation 'Levanti' is also controversial; for a summary of the discussion, see Fischer 2007: 5–7.

[9] The original name *phoínikes* is of Greek origin, a word of Indo-European root indicating 'red', 'blood', or 'death'; Aubet 1993: 6–7. This word is linked by Greek lexicographers to a dark-purple colour, which is connected to the Phoenicians because of a dye they produced to create the most valuable purple fabrics by using a secretion of a sea-snail called murex; see Tubb 2014b: 132. The etymology is, however, by no means entirely clear; for a detailed discussion on etymology, see Aubet 1993: 5–11.

(Phoenicians), even though this cannot be confirmed by textual sources (Albright 1961; Aubet 1993: 10).[10] It is commonly accepted that the transition from the Late Bronze to the Iron Age period has to be seen as a subtle and regionally specific change, rather than as an abrupt event that can be connected with a specific date (Ussishkin 1985). The geographical demarcation of 'Phoenicia' – the region where 'Phoenicians' settled – is based on historical and linguistic considerations (Elayi 2000: 332). According to this, the northern border is situated around the island of Arwad, and the southern frontier is placed around the site of Akko. The eastern border is formed by the various mountains of Lebanon. The area is divided into city-states.[11]

The establishment of a chronological sequence of the Levantine coast has been moved forward only slowly, for which there are different reasons. To begin with, there is a general lack of a continuous stratigraphic sequence of the Iron Age in the coastal region, because many ancient sites like Beirut, Sidon or Tyre either have been overbuilt by modern settlements or show large Hellenistic, Roman, Byzantine, and Islamic superstructures. This makes the study of older periods almost impossible. Secondly, the exploration of the Levantine coast had already started in the 19th century CE, when archaeological techniques were non-existent or in their infancy. Many finds therefore lack information about provenance or an adequate description. Third, military conflicts in this region have consistently interrupted scientific work. Only in recent years have excavations yielded adequately documented results at sites such as Kamid el-Loz, Tell Kazel, Sarepta, Tell Arqa, Tell el-Burak, or Beirut, to mention only few.[12] Finally, and most significantly, this region is of interest for different archaeological disciplines, such as Near-Eastern Archaeology, Biblical Archaeology, Egyptology, and Classical Archaeology, which in pursuit of their specific aims and approaches has resulted in a lack of typological, sequential, chronological and terminological homogeneity.

In the case of the Iron Age glass finds from the Levant that have been compiled in this book, this means that a large number of glass objects from the Levant are to be expected that have either not yet been excavated or have not been published, or are very difficult to date, since archaeological structures above them have damaged Iron Age contexts.

1.5. The beginnings of glass production in ancient Mesopotamia

Before the first glass was made artificially, naturally occurring glass, such as obsidian, was used widely.[13] Additionally, accidentally-formed glass has to be considered as the predecessor of intentionally made glass. In this regard, glassy slags need to be mentioned, which could occur in any high-temperature environment, as for example in kilns and furnaces in which metals were smelted, pots were fired, or in which faience* objects were produced. These slags were probably the first glassy materials observed by ancient craftsmen (Henderson 2013: 6).

It is also important to clearly differentiate between the very first singular glass finds that occur before the 16th century and the first regularly produced glass present from the late 16th century onwards. Glass that dates prior to the 16th century is rare and often cannot be attributed to secure archaeological contexts. Firmly datable early glass objects comprise a bead from Tell Judeideh that dates to the early 3rd millennium, and a pin-head from Nuzi (burial 5A, stratum IV), dating to the Old Akkadian period (2340–2200).[14] One of the most significant early finds is a translucent blue glass lump from Eridu and attributed to the Ur III period (2112–2004).[15] Chemical analysis has shown that the lump was coloured by a cobalt-rich material, which could indicate that the piece was produced deliberately (Garner 1956: 147–148).[16] It is debatable whether these early glass finds can be regarded as intentional or non-intentional products.[17]

Glass objects on a larger scale appear regularly in the early Kassite period (around 1595), and were promoted by the core-forming* technique (see Chapter 4.3.2) and the production of vessels of this type.

[10] The terms 'Punic' and 'Carthaginian' instead refer to Phoenicians from the region of North Africa from the 6th century onwards; see Aubet 1993: 11–12. The fact that this dividing line is vague can, for instance, be seen on the basis of excavations at Kamid el-Loz: here the term 'frühe Phönizier' is used to refer to the Late Bronze Age occupation; see Hachmann 1983. For a summary of essential literature with regard to textual sources, see Fischer 2007: 3–4, in particular footnote 3.

[11] Tubb (2014a: 38) in this regard remarks that the part of the Levantine coast that was spared by the destructions of the 'Sea People' later became the territory where the 'Phoenicians' settled. An expansion of the 'Phoenician' territory to northern Syria can probably be recognised on the basis of pottery, which has been claimed to be 'Phoenician' pottery, as well as by 'Phoenician' inscriptions. The latter appear in larger quantities not before the 9th and 8th centuries, and show an increasing interaction during this time with the northern Syrian region; see Lehmann 2008: 241.

[12] See Nunez Calvo 2008; for a summary of most of the sites, see Fontan 2007: 267–280.

[13] Obsidian is formed from volcanic magma. Natural glass, furthermore, incorporates fulgurites and tektites formed by lightening or metorites, for example in the Sahara Desert; see therefore Henderson 2013: 6; Shortland 2012: 28–29.

[14] For literature and details on these objects, as well as on further earlier glass finds, see Moorey 1994: 190–191.

[15] The lump was found in the 'rubbish', but not directly on the pavement of the house, immediately beneath a pavement dated to the time of Amar-Sîn; see Hall 1930: 213–214.

[16] Henderson (2013: 8) refers to an unpublished find of a greenish glassy slag found in an Akkadian burial.

[17] Shortland (2012: 46) doubts the intentional production of these early finds. Moorey (1994: 193), in contrast, argues that some kind of glass production must have existed prior to 1650.

In this regard, the earliest vessels come from Syrian Alalakh, level VI (late 16th century, according to McClellan) (Moorey 1994: 193).[18] In Egypt the oldest vessels date to the reign of Tuthmosis III (middle 15th century). On this basis, a slightly earlier date to Syria for regular vessel production was therefore often assumedin the past.[19] Some of this evidence has recently been questioned by Shortland *et al.* 2017, who, based on newevidence from Nuzi's glass finds, suggest that glass production in Egypt was no later than in the Near East. Glass finds in Late Bronze Age Mesopotamia and Syria have been well studied, in particular by Barag (1970: 135–154; 1985: 35–49), Henderson (2013: 127–143), Moorey (1994: 196–202), and Shortland (2012: 47–84). Glass objects disappear almost entirely in Mesopotamia and Egypt towards 1200, in the wake of the political, social and economic changes in the region (see Chapter 1.4.2).

[18] Also early mould-made objects, for instance naked figurines, occur at Tell Atchana; see Barag 1985: pl. 2, no. 15, 16. For the latest research on glass from Alalakh, see Dardeniz 2016.

[19] For an extensive discussion on the Egyptian vessels, see Schlick-Nolte 1968; for a recent summary and comparison with Near-Eastern glass, also incorporating chemical data, see Shortland 2012: 47–62.