

# The Meaning of Glass: Case Studies from Mesopotamia to Rome

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*The present article is dedicated to periods in the ancient history of glass-making when the art blossomed: the beginnings in the second millennium BCE in Mesopotamia and Egypt, and the first century CE, when glassblowing spread in the Roman Empire. While the appreciation of glass during these times has been generally acknowledged, the details of what glass really meant have been little studied. This article broadly looks at the mentalities that could have shaped ancient opinions about glass. For the early period, the focus is on the relation of these cultures to stone, the natural model for glass, as becomes apparent in the Mesopotamian epic *Ninurta and the Stones*. For the Roman period, texts by *Pliny the Elder*, *Seneca*, and others are discussed. The article aims at showing the fascinating diversity of potential meanings of glass in the ancient world.*

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*What seems natural to us is probably just something familiar in a long tradition that has forgotten the unfamiliar source from which it arose. And yet this unfamiliar source once struck man as strange and caused him to think and to wonder. —Martin Heidegger*

At the origin of the following study is a very simple question: What does glass mean? What does it mean to us? What did it mean to our ancestors, to people 3,500 years ago? Valuable attempts have been made at giving answers. In its interpretive approach toward glass from Eighteenth Dynasty Egypt, Birgit Schlick-Nolte's dissertation of 1968 remains quite outstanding to this day, and E. Marianne Stern's many publications are full of insight into what the Romans thought about glass.<sup>1</sup> Still, it seems to me that the question of the meaning of glass is somewhat neglected, to some extent remaining a prerogative of nineteenth-century historiography.<sup>2</sup>

There are various possible reasons for such hesitation. One could argue that the question has been dealt with sufficiently in the past: the evidence of books and

documents has already been exhausted, or so it seems, and only archaeology and chemistry still promise untapped knowledge. Also, the traditional approach may seem too vague, and not promising enough. Written sources are very scarce, they are unreliable, and they almost never provide exactly the information that the modern reader might be looking for. It is as if their authors deliberately avoided talking about their fascination with glass. Perhaps such a genre would have been considered superfluous, as the glass objects themselves “spoke,” telling a story that did not need to be retold in writing.

Can there be meaning in glass at all, and if so, is it worth looking for? This article suggests that it is. We can glimpse truly manifold, rich, and sometimes surprising ideas that people have developed when confronted with glass. But there are some serious caveats. If we learn about an author’s perspective, it does not necessarily mean that his contemporaries shared his thoughts. More important, evidence for meaning in glass is sketchy, commonly only hinted at in texts. To “excavate” such hints asks at times for courageous interpretation. The thoughts expressed henceforth can therefore never quite shed their hypothetical character. This contribution is less about the factual than about the potential meaning of glass through the ages—about pointing to a world in glass that can easily be overlooked.

This article is based on a presentation that the Bard Graduate Center kindly invited me to give in 2016, as part of the Paul and Irene Hollister Lectures on Glass.<sup>3</sup> Unlike the lecture, which provided case studies from the late Bronze Age to the Middle Ages, this article focuses on the ancients, on Mesopotamia, Egypt, and Rome. The author plans to pursue this perspective on glass with a forthcoming essay on the Middle Ages and the Renaissance.

## **The Stones of Mesopotamia**

To most of us today, glass is a “natural” given. But how did it appear back in time, at the very onset of its production? Since the advent of glass is shrouded in mystery, any attempts to find the answers seem futile. Glass finds in Mesopotamia are scarce (see fig. 1), and the written sources are notoriously difficult to interpret. On the one hand, particular terms that specialists believe to mean “glass” in a certain context cannot be fully trusted to mean the same in another, since it has to be doubted that writers consistently distinguished between glazed stones, faience, Egyptian blue, glassy faience, and glass. On the other hand, some sources—word lists and glass recipes that were edited by A. Leo Oppenheim in 1970—offer a perplexing number of different terms for glassy products and their intermediate stages.<sup>4</sup>

The available evidence of glass-making in Mesopotamia has been extensively researched, and while many questions remain in discussion, it may suffice in the present context to refer to recent overview publications.<sup>5</sup> Glass, or so it seems, was developed over a period of time, on the basis of and parallel with other processed glazings and glassy materials, so that the very first glass that was (accidentally?) made by humans may not have been perceived as a novelty



**Fig. 1**  
Flask, Middle Assyrian period, 14th–13th century BCE. Glass, core-formed, originally bright yellow with patterns in blue, red, and white;  $9\frac{1}{4} \times 3\frac{1}{4}$  in. (23.3 × 8.2 cm). Berlin, Staatliche Museen, Vorderasiatisches Museum (VA 5699; Ass 14331b). Photo: Sandra Steiß.

at all.<sup>6</sup> It took another thousand years or so for the tradition of glass-making to have its true beginning. The common understanding among archaeologists is that this beginning, around 1500 BCE, took place in the region of modern Iraq and Syria, at a time when the Old Babylonian empire was in decline and a number of different peoples, such as the Hittites (in modern Turkey) and the Mitanni (around Aleppo, in Syria), gained ground. This period coincided with Egypt's New Kingdom, when the Eighteenth Dynasty pharaohs extended their power into the region of today's Syria, thereby apparently creating the necessary links for the more or less simultaneous appearance of glass in Mesopotamia and Egypt—and, as is indicated by recent finds, in Anatolia.<sup>7</sup> The predominant color of early glass was blue, more or less resembling turquoise and lapis lazuli, but other colors were made from early on, such as white and two different types of opaque red.<sup>8</sup>

The advent of glass certainly fell on fertile ground in both Mesopotamia and Egypt. Both regions had a longer tradition of proto-glass production, most notably faience; but more important, both had a special relationship to stones and minerals, the natural models for glass. Mesopotamian mythology in particular is amazingly rich in references to stones—despite, or maybe just because of, stone's natural scarcity in the region. Even diorite and alabaster had to be imported and were considered precious goods.<sup>9</sup> Glass does not feature in these epics and may not even have been known at the time when they were first told. And yet these stories of old are treasure troves that give invaluable insight into Mesopotamian mentalities. Stones already play a prominent role in humankind's oldest written epic, the story of the hero-god Gilgamesh.<sup>10</sup> Frequently in this work, the strength of heroes is described as “powerful like a rock of Anum.” Anum being a Mesopotamian celestial deity or sun god, it seems reasonable to identify his rocks as the disastrous meteorites that he occasionally fancies flicking to earth. The epic also mentions a celestial bull with horns of lapis lazuli, and it describes a garden of trees that grow the most valued precious stones: turquoise, cornelian, and again, lapis lazuli.<sup>11</sup> Last but not least, a boatman whose services are crucial to Gilgamesh is assisted by “the stony ones.” Gilgamesh kills these stone rowers in order to force his way into the boat (and, having thus deprived the boat of its former means of propulsion, eventually invents the technique of sailing).

An even more important source in our context is the epic *Lugal-e*, or *Ninurta and the Stones*.<sup>12</sup> It is assumed to have been put into writing during the reign of King Gudea of Sumer (ca. 2150–25 BCE)—roughly the time of the earliest finds of glass beads and lumps.<sup>13</sup> The epic must have remained popular, however, as it is the best-preserved work of Sumerian poetry. It apparently was told and read for at least 1,500 years, and (together with *Gilgamesh* and many other sources) formed part of the vast library of the Neo-Babylonian king Assurbanipal in Nineveh (668–27 BCE). The epic is a mythological tale of creation, personified by the warrior-god Ninurta, and his war against Asag (or Asakku), a demon. Asag was born from the union of heaven and earth and built up an army of stones procreated through his intercourse with the mountains. The battles were fierce, but Ninurta, helped by his talking mace, called “smasher” or “flattener,” eventually succeeded in crushing the enemy. He piled up the

fallen stones to form a mountain ridge that would later fertilize the land of Sumer with its waters. Then—and in our context this is the crucial part of the epic—Ninurta is addressed by his aunt: “[T]he good lady whose powers excel all powers, Lady-creatrix-of-the-womb, Aruru, Enlil’s elder sister, stood before him: ‘Great hero whose word like that of his father is unalterable, lord: you have not fixed the destinies of the warriors that you have slain.’”<sup>14</sup>

What follows takes up a major portion, almost a third, of the whole epic: Ninurta turns to the fifty types of stone and speaks to them, one by one. He gives them names, he defines their gender, he judges the stones’ respective roles in the war, and either blesses or curses them.<sup>15</sup> Just two examples may be given, the blessing of lapis lazuli and related precious stones, and the cursing of flint:

My king . . . addressed the . . . *zagin* (lapis lazuli) [and other stones]:  
“How you came to my side, male and female in form, and in your own way! You committed no fault, and you supported me with strength. You exalted me in public. Now in my deliberation, I shall exalt you. . . . You shall all be decorated with precious metal. The principal among the gods shall cause the foreign lands to prostrate themselves before you, putting their noses to the ground.”

My king turned to the *ĝîr-zu-ĝal* (flint), and frowned. The lord spoke to it angrily in the Land. Ninurta son of Enlil cursed it: “I shall rip you like a sack, and people will smash you into tiny pieces. The metalworker shall deal with you, he shall use his chisel on you. . . . [T]he carpenter . . . shall wet you with water . . . and shall crush you like malt.”<sup>16</sup>

When Ninurta finished this ritual, “[t]he hero had conquered the mountains.”<sup>17</sup> According to Irene J. Winter, the other stones that Ninurta addressed together with lapis lazuli in the above quote should be identified as agate, chalcedony, cornelian, jasper, “pearls,” and possibly garnet—that is, a large number of the most precious stones known in ancient Mesopotamia.<sup>18</sup>

What makes these stones so precious can be gathered from other sources: predominantly it is the light that emanates from them, their shine. “In all cases, it is apparently the combination of light-plus-sheen yielding a kind of lustrousness that is seen as particularly positive and auspicious, so that persons and things that are holy, ritually pure, joyous or beautiful are generally described in terms of light.”<sup>19</sup> Lapis lazuli, though dark-colored, was particularly appreciated, and its name was synonymous with great luxury. In the sense of “gleaming splendour,” it became an attribute of gods and heroes.<sup>20</sup> But stones are not merely rare and precious attributes of purity. In both *Gilgamesh* and *Lugal-e*, stones are seen as living creatures, as characters. They are given a personality, and they are distinguished either as good or evil; as they interact between the spheres of man and the gods, the stones gain a divine potential.<sup>21</sup> In such a context, the advent of glass-making must have been seen somehow as an act of conquering the divine world of nature—and that conquest was cherished and respected for a very long period. Even the glass-related mineral pigment Egyptian blue seems to have been accorded magical powers, as it is mentioned as forming part of apotropaic necklaces.<sup>22</sup> To quote the British historian of science

Eleanor Robson, “The manufacture of artificial precious stones touched upon the realms of their [i.e., the scholarly experts of Mesopotamia] expertise in magic, medicine, and religion. Thus, even when it was no longer fashionable to manufacture coloured glass, for the scholars it remained important to maintain a codified tradition of that knowledge.”<sup>23</sup> That codified tradition is preserved in the above-mentioned clay tablets with recipes for the making of glass.<sup>24</sup> Some of these texts describe the rituals involved in setting up a glass-making furnace:

When you set up the foundation of a kiln to [make] glass, you search in a favorable month for a propitious day, and you set up the foundation of the kiln. As soon as you have completely finished . . . you . . . place *Kūbu*-images, no outsider or stranger should enter, an unclean person must not pass in front of them. You regularly perform libation offerings before them. On the day when you plan to place the “metal” in the kiln, you make a sheep sacrifice before the *Kūbu*-images, you place juniper incense on the censer . . . and you make a fire in the hearth of the kiln and place the “metal” in the kiln. The persons whom you allow to come near the kiln have to be clean and you allow them to come down to the kiln.<sup>25</sup>

Oppenheim points out that the “ritual preparations and activities mentioned in this introduction are in no way atypical or extraordinary.”<sup>26</sup> Nevertheless, they should alert us that materials and their production then had a sacred connotation that we can hardly fathom now. For millennia, stones were linked to magic in Babylonia and accordingly described and represented in “stone books.” These were lists with names of minerals and very short descriptions—a color and a comparison to some other object or phenomenon—that sometimes included short medicinal notes, such as the following: “The stone whose appearance is like frit-glass [AN-ZAH *u*] and which is black, [“Light”-stone] is its name. For sick eyes.”<sup>27</sup> Stones served as charms and possessed healing powers. There was a distinction between male and female stones—at times, lapis lazuli seems to have had a male connotation, and cornelian a female—and also between male and female glass frits.<sup>28</sup> Glass and stone were closely related; their only distinction becomes apparent in an Akkadian term for glass—or, to be more cautious, for glassy materials—that can be traced back to about 1500 BCE: the manmade “lapis lazuli from the kiln” (*uqnū kūri*) in contrast to “lapis lazuli from the mountains” (*uqnū šadī*).<sup>29</sup> “Lapis lazuli” does not necessarily have to mean “blue,” however, as there is also mention of “reddish lapis lazuli colored glass.”<sup>30</sup> “Lapis lazuli” may rather have been a generic term for something precious, gleaming, and lustrous, thereby expressing admiration for the manmade material—not unlike the modern use of the terms “cristallo” and “crystal” for particularly fine glassware.

## **The Gods of Egypt**

While glass finds especially from royal tombs survived in abundance and mint condition, written sources on glass from Egypt are surprisingly rare. Vivid depictions in the tombs of high Egyptian officials of almost all the crafts offer

a rich insight into Egyptian life, but the origin and making of glass seem completely absent from texts and images.<sup>31</sup> The textual tradition therefore essentially consists of only three significant sources that mention glassy materials: (1) the presentation of the tributes given by Thutmose III to the temple of Karnak in the Hall of Annals of that temple, probably including blue and turquoise-colored glass ingots; (2) 5 of the about 350 so-called Amarna letters, which date to the mid-fourteenth century (from the period of Amenhotep III to somewhat after Akhenaten) and mention the pharaoh's orders for glass or glass-related materials from his vassals in the Near East; and (3) the Great Harris Papyrus from the period of the twentieth dynasty, about 1186–1069 BCE, in the British Museum (EA9999), which lists the tributes of Ramses III for various temples and also includes glass (or glassy materials).<sup>32</sup> The variety of terms used for glass and probably for other glazed and glassy materials in these sources are derived from the vocabulary for stones, with particular reference either to lapis lazuli and turquoise or to their artificial origin as “molten stone” or “stone of the kind that flows.”<sup>33</sup> Distinctions among glassy materials are not evident, which seems strange, according to Schlick-Nolte, as other new materials were termed very precisely, often including information on whether they were produced at home or abroad.<sup>34</sup> Not unlike in Mesopotamia, glass was apparently seen as a variety of stone in ancient Egypt, rather than a new material. The “glassy” terms show that it was important to distinguish between natural and artificial stone, but not necessarily between different types of artificial stone.

Schlick-Nolte interprets the appearance of ancient Egyptian glass vessels as imitating stone. In some instances, the imitation seems evident, as in the case of the turquoise-colored lotiform chalice in the Metropolitan Museum of Art (fig. 2).<sup>35</sup> Accordingly, the combed, colored glass threads that adorn a great number of ancient Egyptian core-formed vessels may be interpreted as stylized renderings of striations in stones.<sup>36</sup> The shapes of these vessels are derived from larger models in clay, stone, or metal.<sup>37</sup>

Given the close relation of Egyptian glass to stones, it is worth looking at what the latter meant to the Egyptians. Here, the sources are more abundant but very scattered, and it is impossible for nonspecialists to make coherent sense of them. Sydney Aufrère has confronted the challenge with his two-volume dissertation about the world of minerals in Egyptian thought, which he subsequently digested in a number of journal articles.<sup>38</sup> The following observations are based on his synthesis of 1997.<sup>39</sup> While Egyptian life took place on the banks of the river Nile, minerals and metals came from the deserts beyond: to a lesser degree from the flatlands to the west, and in greater quantities from the mountains in the east. Access to these places was difficult and subject to rituals; the mountains in particular, with their veins of metal and mineral ores, were considered divine. Minerals were thus seen as emanations of divinity, as holders of *numen*. Even the salts that were harvested from the Wadi el Natrûn were interpreted as an exudation of Osiris, which gave particular meaning to their roles as a preservative in the practice of mummification and as an agent in the ritual purification of priests. “Lithomania” turned into “litholatry,” as it were, as a result of a growing pantheism, so much so that minerals were not considered

**Fig. 2**  
Lotiform chalice with royal  
cartouche of Thutmose III,  
Egypt, New Kingdom,  
Eighteenth Dynasty, reign  
of Thutmose III, ca. 1479–25  
BCE. Turquoise-colored  
glass, cast(?), engraved, gold  
rim; 3 × 3<sup>3</sup>/<sub>8</sub> in. (7.5 × 8.6 cm).  
New York, The Metropolitan  
Museum of Art, bequest of  
the Earl of Carnarvon, 1923  
(23.9). Photo: public domain.



simply the property of the gods, but more: precious metals and minerals formed an integral part of the gods, if they weren't gods themselves.<sup>40</sup> "The mineral and the metal have their own principle of action insofar as they are consubstantial to the divine."<sup>41</sup> There was metaphorical meaning to the various minerals: alabaster stood for purity, sand for multitude and stability; and stones were imbued with supernatural powers of inspiration and divination—and not least with the hope for eternity.

What, then, does this mean for the artificial reproduction of such divine materials? Aufrère considers such surrogates as working substitutes but nevertheless of lower value and less power than the natural material. He accordingly interprets the multiplication of funerary objects as a means to accumulate their (lesser) effectiveness.<sup>42</sup> In this context, finds of pseudo-vessels in temples and tombs are most telling. These objects were made of wood, clay, or limestone and imitated in shape and painted decoration more precious stone vessels. But instead of being hollowed out, they remained symbols—solid, three-dimensional images of vessels. Despite their lack of function in the modern sense, they apparently allowed for a "magical, permanent supply of the associated content," quite comparable to the representations in the wall paintings that surrounded them.<sup>43</sup> Extraordinarily enough, some of these pseudo-vessels indeed imitate glass. They mostly show a dull blue color and are painted with threads, and sometimes they are inscribed with the name of a high-ranking member of the





**Fig. 3**  
 Pear-shaped pseudo-  
 alabastron with hieroglyphic  
 inscription, Thebes, Egypt,  
 New Kingdom, Eighteenth  
 Dynasty. Wood, painted;  
 height: 6 in. (15.3 cm).  
 London, The British Museum  
 (EA 35271). © The Trustees of  
 the British Museum.

Egyptian public.<sup>44</sup> One example, a pseudo-alabastron in the British Museum, is inscribed with the name of a wife of Amenhotep III, Queen Satamun (fig. 3). The shape of the vessel may be derived from alabaster vases, but its decoration is distinctly glass-like. Its flat top might be interpreted as a lid. All in all, the vessel is therefore very similar to a lidded blue glass alabastron of the same period, today in the Egyptian Museum in Turin (fig. 4).<sup>45</sup>

To interpret the hierarchy of stone, glass, and pseudo-vessels merely in terms of economic value, that is, as a social distinction concerning the ability to afford a certain material, might seem a very modern perspective. While economic historians continue to dispute the details, it seems clear that ancient Egypt was a noncommercial society, in that there were no price-making markets, but rather systems of redistribution.<sup>46</sup> Written sources as well as excavations testify to the crucial role that gifts played in Bronze Age diplomatic relations in the eastern Mediterranean.<sup>47</sup> Louise Steel points to the obligations involved in the exchange of gifts—to give, to receive, and to reciprocate—and finds these fundamentals fulfilled in the exchange between the Assyrian king and the pharaoh, who, after exchanging and accepting greeting gifts, address each other as “my brother.”<sup>48</sup> In Egypt, a form of ritualized gift exchange called *inw* that always involved the pharaoh had been established in the archaic period

**Fig. 4**  
Pear-shaped alabastron with lid, found in the tomb of Kha and his wife Merit, Deir el-Medina, Egypt, New Kingdom, Eighteenth Dynasty, reign of Amenhotep II. Blue glass, core-formed, combed threads; height: 4¾ in. (11 cm). Turin, Museo Egizio (S. 8480). Photo: public domain.



and continued to exist, with possible changes, into Ptolemaic times. *Inw* was only one category of many in this redistributive system but could involve a wide range of commodities, from crops to precious stones.<sup>49</sup> Egyptian sources commonly list the gifts made to the pharaoh, while other sources testify about items given by the pharaoh in exchange, which, in Akkadian, would be called *šulmana*.<sup>50</sup> According to Steel, “[s]tone vases were the ultimate gift presented by the pharaoh to a gifting partner during the Old Kingdom, as is exemplified by their exchange with the kings of Ebla and Byblos,” and “[o]bjects marked with the name of an Egyptian pharaoh were amongst the most highly prized of exchange gifts in the ancient Near East.”<sup>51</sup> Vessels made of stone and glass, especially when marked with a royal cartouche, must have been distributed as rare, inalienable gifts and were certainly not available on a free market. To possess such an object that had not been formally acquired as a gift may have been deemed as sacrilegious as looting.<sup>52</sup> In such a context, it seems plausible that pseudo-vessels were appropriate for certain levels in the social hierarchy not primarily because of their cheaper value but because the use of stone, and even of artificial stone, would not have been deemed appropriate.

The fact that both stone and glass were imitated in the pseudo-vessels strongly implies that on a spiritual level, glass ranked close to stone. That, however,

raises further, and difficult, questions: If glass had a spiritual context, what did this mean? How did Egyptians perceive glass? The written sources are not particularly helpful, with one possible exception: two terms denoting glassiness in the Hall of Annals in Karnak are accentuated, as it were, by the pharaoh's cartouche, and could thus be translated as "Menkheperre lapis lazuli" and "Menkheperre turquoise" (Menkheperre being the throne name of Thutmose III).<sup>53</sup> Why is the pharaoh's name placed next to these items but not to the others, such as the "true *hsbd*," which very likely denotes natural lapis lazuli? Andrew Shortland interprets the relation as (artificial) stones "belonging to Tuthmosis III," despite the other items clearly also being in his possession.<sup>54</sup> Schlick-Nolte considers that the pharaoh was so excited about the artificial material that he underscored its preciousness with his throne name.<sup>55</sup> I would speculate even further and suggest that the relation between the artificial stones and the pharaoh is not merely a matter of possession but rather of origin. If lapis lazuli was (consubstantially) divine, it seems quite unthinkable to attribute its artificial creation to ordinary craftsmen. Their role of *making* the stones may have been somewhat akin to the achievement of *finding* natural stones by mining prospectors. Much as the mountains and the respective deities were the true source of natural stones, the true origin of the artificial counterpart might have been seen as the pharaoh himself. The terms in the Hall of Annals could therefore possibly be read as lapis lazuli and turquoise "by Menkheperre." Given the pharaoh's own divine status, the glass may thus have been imbued with divinity after all, giving a role to glass in the tombs and temples not as a mere surrogate of stone but as the real matter itself.

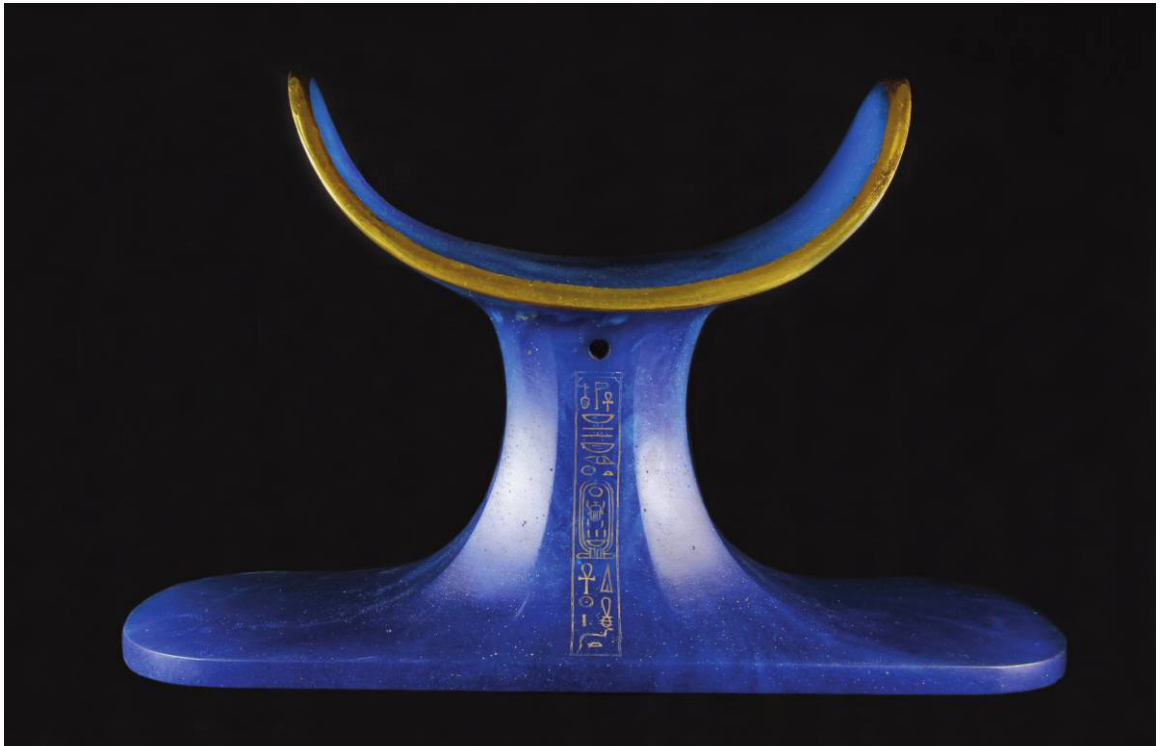
The pharaoh's cartouche appears not only in the context of glass in the Hall of Annals but also on some glass objects themselves; the above-mentioned turquoise-colored chalice bears the inscription "The Good God, Menkheperre, given life" (fig. 2). Marking an object with a royal name was of course not limited to glass, and there are several possible meanings behind the cartouche; in most cases, such as monumental buildings, boundary stelae, official documents, and storage vessels, the purpose must have been administrative and/or political in the first place.<sup>56</sup> According to Rachael Sparks, the formal nature is less clear with royal name scarabs, which in the Levant appear to have been rather widely distributed among the local population. Here, in funerary contexts, they seem to be "calling on the pharaoh in his role as a god, a power which could go well beyond his reign, as illustrated by the ubiquitous scarabs of Tuthmosis III."<sup>57</sup> As we have seen above, royal-name stone vessels, on the other hand, are a rare find in Levantine elite contexts, interpreted by Sparks as a visual symbol of an allegiance to Egypt.<sup>58</sup>

Interpreting a pharaoh's name cartouche on glass as a signature of divine creation sounds far-fetched, and indeed it may be. Yet a look at the glass inlays in the gold mask, sarcophagus, and throne of Tutankhamen, as well as at his blue glass headrests, gives the impression that there could be some truth to it. The two-part, turquoise-colored headrest was found in a side chamber of the pharaoh's tomb.<sup>59</sup> The origin of the second, lapis lazuli–blue headrest is not established as clearly (fig. 5).<sup>60</sup> With great likelihood it was found in the tomb as well but was appropriated by the excavator, Howard Carter, and later returned

to King Farouk of Egypt; thence it finally came to the Egyptian Museum in Cairo in 1960.<sup>61</sup> Both in size and in color these objects are culminations of ancient glass technology and demonstrate a very serious challenge to their natural models. Both have the pharaoh's name prominently incised (in the case of the turquoise-colored headrest, the incision is perplexingly clumsy), and it is tempting to interpret these not as the seals of the owner, but rather as signatures of the artist.

It has been noted that the quality of glass vessels in Egypt was most impressive during the periods of Thutmose III and Amenhotep II and declined somewhat thereafter. A far more drastic change, however, took place from the beginning of the thirteenth century, when Egypt was facing considerable political and economic upheaval. With few exceptions, such as the glass beakers found in the context of the Theban burial of Nesikhon (buried 974 BCE), the second wife of the high priest Pinodjem II, glass vanishes almost completely from archaeological finds.<sup>62</sup> The Nesikhon glass beakers are remarkable for their number as well as for their chemical properties, as they were not made with plant ash (the traditional component of early glass) but with a purer source of sodium, probably natron (which became the dominant technology in the later first millennium BCE and during the Roman period). Apparently glass production was facing fundamental changes just before or during the Ramesside period and all but ceased completely toward the end of the New Kingdom. Glass vanished not only from Egypt, however, but also from Mesopotamia.<sup>63</sup> The decline was followed by a gradual reemergence of glass-making from the ninth century BCE onward,

**Fig. 5**  
Headrest displaying a cartouche with the praenomen of Tutankhamen, Egypt, New Kingdom. Dark-blue glass, probably cast;  $6\frac{7}{8} \times 11\frac{1}{8} \times 4$  in. (17.5 × 28.3 × 10 cm). Cairo, Egyptian Museum (TR.2/3/60/1). Photo: Ch. Eckmann, RGZM.



not in Egypt, however, but in the large realms of the Assyrian and Achaemenid empires.

While it would certainly be profitable to study the traces of the meaning of glass across the various cultures that produced and made use of it during these periods, we will fast-forward to the Roman Empire, which saw the second most important glass-related technological revolution after the advent of glass-making itself: the invention of glassblowing.

## **The Spirit of Rome**

Rome offers a much wider variety of written sources on glass than earlier periods of ancient history. Still, we gain but snippets of information, drawn from remarks on the side. The closest thing to a treatise on glass-making would be the *Naturalis historia* by Pliny the Elder of about 77 CE. In book 36, he compiled the knowledge that was accessible to him about glass. This account includes the famous story of the accidental invention of glass-making by the Phoenicians on the shores of the river Belus, in today's Israel.<sup>64</sup>

Pliny is among the earliest authors to address the history and making of glass.<sup>65</sup> This was an extraordinary shift from mythology and magic toward historical facts, which reflects a mentality and a form of curiosity that seems familiar to us today. However, to read Pliny as if he were a modern author can lead to misunderstandings. A certain uneasiness with his writings in general can be traced back as far as the Renaissance; it may have to do with his deliberate aim of informing a wider public on practical subjects that hitherto had scarcely been the subject of literature, and hence with the paucity of technical terms in Latin that were available to him.<sup>66</sup> His regrettably short remark on the forming of glass is a good example: he says that after the melt “the glass is either being shaped by blowing, rubbed on a lathe [or with a chisel], or embossed like silver.”<sup>67</sup>

While the first technique, glassblowing, is reasonable enough, the second is not very clear, and the third seems utterly impossible. There are a number of differing translations of the second technique (*torno teritur*), such as “shaped on a wheel” and “machined on a lathe.”<sup>68</sup> It may be an allusion to the forming of glass on a device that is related to a potter's wheel, that is, the technique that some scholars suggest for the making of a variety of non-blown vessels.<sup>69</sup> Pliny seems to have been tempted by alliterations (*flatu figuratur, torno teritur*), favoring stylishness over clarity. *Terere* means “to rub,” and *tornus* is normally identified as a turner's wheel or a lathe—but it could also be translated as a chisel, a tool for the lathe or wheel. Whatever the accepted translation of these two words, it would be misleading to assume that Pliny was striving for a description of glass-making techniques that was accurate in our modern sense.

The point may become clearer when looking at the third Plinian technique, *argenti modo caelatur*. This is explicit enough: glass, embossed (or perhaps chiseled or chased) like silver. Since it is impossible to shape glass using the same methods as silver, it has been suggested that Pliny simply got it wrong and was

possibly misguided by somebody who did not want to make the glassmakers' secrets public.<sup>70</sup> On the basis of a remark by Clasina Isings, E. Marianne Stern identified this third glass technique with the making of mold-blown glass, which inside and out looks as if it has been embossed.<sup>71</sup> While the identification with mold-blowing seems very acceptable, I doubt that Pliny thought this to have been achieved with a hammer. After all, not only does mold-blown glass look like chased silver, but one could even claim that glass can be "chased" with the force of breath—so why not call it that? Rather than inventing a new term for a technique that was still rather new in Pliny's time, and which he would have had to explain to the reader in more detail, he draws on a vocabulary that a Roman citizen could immediately understand.

Again, Pliny's remark on glass-making techniques is very short, and it cannot have aimed beyond anything but giving a very basic idea: glass can be blown, and it can be shaped similarly to wood, pottery, and silver. In just one sentence, Pliny presents glass to us as a material of outstanding technical versatility. A contemporary reader of Pliny must have reacted to this text quite differently. Raising and carving sounded familiar enough—but blowing? While to us *flatu figuratur* instantly evokes images of glassmakers with their pipes, this was the only one of the three techniques that may have come as a complete novelty and had no correspondence in other materials.

Pliny was not the only author who remarked on glass "worked in relief." A few decades later, Marcus Valerius Martialis (Martial) referred in one of his epigrams to "plebeian cups chased of fearless glass."<sup>72</sup> The term used by Martial, *toreuma*, is borrowed from Greek, τόρευμα, "embossed work," or "work in relief." In Greek, this term was closely related to metalwork, as in τορευτικός, the "skilled metalworker" (hence, the art of metalworking can be called, somewhat old-fashionedly, *Toreutik* in German). In Latin, that distinction was not as clear, however, and the terms were thus applicable to relief and sculpture made of various materials.<sup>73</sup> A related term reappears in Clement of Alexandria's *Paedagogus* of about 200 CE, which refers to τορευτῶν . . . ὑέλφ, literally "glass of those who work in relief."<sup>74</sup> This remark is worth looking at more closely in the context of the meaning of glass, as it offers, at first sight at least, a highly critical view.

Clement of Alexandria (d. 210–15 CE), one of the Church Fathers and therefore an influential voice in medieval culture, seems not to have been particularly captivated by the beauty of the glass of his time. In his *Paedagogus* (*The Instructor*), he fulminates against costly vessels of gold and silver and those decorated with precious stones, and continues: "The elaborate vanity, too, of vessels in glass chased, more apt to break on account of the art, teaching us to fear while we drink, is to be banished from our well-ordered constitution." Clement may have been acquainted with a proverb by Martial from his *Apophoreta*: "You break crystal cups in your anxiety to avoid breaking them; hands too careless, and too anxious, are equally destructive."<sup>75</sup> Martial refers to rock crystal, and Clement to glass—that is, to a comparatively ordinary material. Perhaps Clement had in mind the indented beakers that were popular in ancient Rome over a longer period of time: these indeed look as if they were embossed from

a sheet of metal, paper-thin and light as a feather, neither luxurious nor rare, yet nevertheless each and every one a tour de force of glassblowing skills (see fig. 6).<sup>76</sup> Even if “chased glass” should mean more elaborate vessels, the context with gold, silver, and precious stones is remarkable. Here, glass is being counted among the most prominent materials of luxury and vanity: nobility through condemnation.

The history of the invention of glassblowing still is not very clear. There is a protohistory in the shape of partly blown glass tubes of the first century BCE that have been found in Jerusalem.<sup>77</sup> It is questionable, however, whether there were direct links to the “real” advent of glassblowing, the mold-blown vessels of the first century CE, which in any case show few technological ties to their predecessors.<sup>78</sup> Glassblowing seems to have developed and spread gradually throughout the first century CE—a technological revolution, of which the Roman literature takes surprisingly little notice. Apart from Pliny’s short remarks, glassblowing is mentioned very sporadically. One such source is a sentence that Seneca wrote in his *Moral Letters to Lucilius* of 64 CE. In translation,



**Fig. 6**  
Beaker with indented sides, Roman Empire, mid-1st to 3rd century CE. Pale-blue glass, blown; 4 × 2 $\frac{5}{8}$  in. (10.1 × 6.6 cm). Düsseldorf, Kunstpalast, Glasmuseum Hentrich, formerly collection Lückger (P 1949-68). Photo: Kunstpalast.

it sounds perfectly ordinary: “I should like to show Posidonius some glass-blower who by his breath moulds the glass into manifold shapes which could scarcely be fashioned by the most skilful hand.” The letter that this quote is taken from discusses the thoughts of the Greek philosopher Poseidonius. Seneca agrees with him that in an early stage of mankind, the wise were the rulers (“only the best was allowed to be the most powerful”). But he disagrees with Poseidonius’s assumption that philosophy had also invented the skills necessary for daily life and that philosophers only later withdrew from the various creative arts. Following Diogenes, Seneca states that wise people had taught contentment with less, not burdening life with inessential things, and he gives examples of inventions that, despite their great achievements, did not require the wisdom of a philosopher’s mind. His dominant example is the invention of glassblowing, apparently because it is such a recent invention that his addressee, Lucilius, can clearly see that this discovery has “been made since we men have ceased to discover wisdom.”<sup>79</sup>

Seneca’s statement—“shapes that could hardly be accomplished even by the most diligent hands”—clearly shows his admiration for the blown glass products of his time. But the truly amazing aspect of this quote lies in the word that Seneca uses for breath. He could have used *suspirium*, *ventus*, or, like Pliny, an idiom such as *flatu figuratur*. But he chose *spiritus*.

“Air” (Greek ἀήρ) is a central element of early Greek thinking. According to Anaximenes of Miletus, who lived in the sixth century BCE, air is the basic element, or principle, from which through constant movement the denser (earth, water) and lighter elements (fire) originate.<sup>80</sup> Air is also the substance that humans inhale and breathe out, thus becoming life per se, and as such a means of communication with the world. Nose and mouth are close to the brain, the lungs neighbor the heart, and everything is interconnected, with air as the crucial transmitter. When the glassmaker shapes a glass with his *spiritus*, then, more is meant than merely a pneumatic force. To shape his glass, the glassmaker uses the same tools, as it were, as the philosopher does to express his thoughts. Seneca deliberately chose this example to counter the arguments of Poseidonius: the tools are the same, but the glassblower does not produce a philosophical thought.

Glass-making was a craft, and as such, following Marcus Tullius Cicero’s judgment on the crafts in his *De officiis* of 44 BCE, it should be considered a sordid and vulgar undertaking.<sup>81</sup> And yet it seems that there was something special about the making of glass, perhaps the purity of the material and the fascination with glassblowing, which lifted this art, slightly at least, above the “ordinary” crafts. Throughout history, visiting glassworks in order to watch glassblowers at their work was an accepted, noble pastime. A particularly beautiful rendering of this admiration is expressed in a poem on glass-making in the so-called Papyrus Oxyrhynchus of the third century CE: “As it tasted the heat of the fire, the crystal was softened by the strokes of Hephaistos. . . . [H]e (the glassmaker) blew in from his mouth a quick breath, like a man essaying the art of the flute.”<sup>82</sup>



## The Club of Hercules

Admiration for the making of glass, its difference from other materials, while at the same time playing with its imitative qualities seems characteristic of the Roman attitude toward glass. It may become apparent by looking more closely at a well-known type of Roman drinking vessel, commonly referred to as a lotus or almond beaker (see fig. 7). It was very common in the second half of the first century CE, especially during the Flavian period (69–96 CE).<sup>83</sup> The Near Eastern “main group” consists of large beakers like the one in the Kunstpalast, Düsseldorf, Glasmuseum Hentrich (inv. no. P 1966-329), while the variety of the (smaller) vessels in the West seems to have been considerably wider.<sup>84</sup> In the 1970s, Clasina Isings, in an exchange with E. Marianne Stern, suggested identifying the almond-shaped bosses as knots or snags on tree trunks and thus interpreting these beakers as renditions of a section of the wooden club of Hercules (see fig. 8).<sup>85</sup> The striking arguments for this identification—in particular the comparisons to a club-shaped glass bottle with a similar pattern in the



**Fig. 7**  
Beaker, Roman Empire,  
1st century CE. Amber-  
colored glass, mold-blown;  
8 1/4 × 4 1/8 in. (20.7 × 10.3 cm).  
Düsseldorf, Kunstpalast,  
Glasmuseum Hentrich, gift of  
Helmut Hentrich (P 1966-329).  
Photo: Kunstpalast.

**Fig. 8**  
Detail of fig. 7.



Landesmuseum, Stuttgart, to the clubs on a marble altar dedicated to Hercules in 81 CE in the Museo Capitolino, Rome (fig. 9), and to a silver drinking horn from Numidia in the Musée National Cirta, Constantine, Algeria—have been extensively discussed by Stern and need not be repeated here. Stern also suggests that “[d]rinking from a vessel evoking the presence of Hercules and his legendary prowess in drinking was an appropriate way to ward off evil during a drinking bout when one was particularly vulnerable.”<sup>86</sup> While this seems a perfectly good reason to drink from Hercules’s club, there might be even more meaning involved in using these glass beakers.

At first sight it may seem absurd to represent the club of Hercules, the utmost symbol of strength and power, in a material that is proverbially fragile. But this is not the only ambiguity of these beakers, another being the aforementioned play with its feigned production technique: we are faced with a glass that pretends to be embossed like silver in order to represent wood. The Romans were

**Fig. 9**  
Altar dedicated to  
Hercules in 81 CE,  
Roman Empire.  
Marble. Rome, Museo  
Capitolino, Sala del  
Galata (MC 1962/S).  
Photo: author.



well-acquainted with myths about the twelve labors, but also about Hercules's penchant for bacchanalian carousals, which he sometimes crashed uninvited. This is the other side of the hero and demigod, whose fate and character become manifest between heroic deeds and helpless inebriety. While drunk, he cannot control his strength and accidentally slays other guests; at the banquet of King Admetus, however, he instantly sobers up when he hears that the host's wife, Alcestis, has to be rescued from the underworld.<sup>87</sup> In the fifth century BCE, the Greek author Panyassis of Halicarnassus invites a stranger to eat and to drink merrily, which, like fighting, he sees as a virtue. Pleasure and fighting, rest and exploits, form the two poles in life, for which Hercules is the mythic example.<sup>88</sup> The glass beaker in the shape of Hercules's club thus represents the might and virtue of the hero but warns at the same time of the overwhelming force of alcohol. This hollow club may be fragile, but it smites the one who makes too much use of it.

## **Conclusion**

“One has to treat old sagas gently; they resemble withered roses: they easily lose their leaves when you get to grips with them.”<sup>89</sup> The Swedish author Selma Lagerlöf had much experience with tales of old, which she skillfully embedded in her own novels. Hunting for sources on glass through more than 1,500 years may indeed cause considerable loss and little resurrection. Rather than offering facts, what remains is a feeling that glass in ancient times had more to transmit than merely being useful or decorative.

Early glass seems to have been regarded as stone, with its own vigor, character, and personality, with its shine and color agreeable both to men and to gods, and thus potentially imbued with magical powers. Materials ranked very high in the Near East, so much so that stones, with their divine origin, could be worshipped as an embodiment of the gods. The making of glass was highly ritualized in Mesopotamia, and its recording in cuneiform recipe collections demonstrates that it formed part of knowledge, *nēmequ*, in the general sense of that era.<sup>90</sup> Nature and culture were not divided yet, and the difference between natural minerals and artificial glass could not have been perceived as fundamental. Rather, glass seems to have tied the spheres of the natural world of stones and the human microcosm firmly together. While there are no written sources on the making of glass in Egypt, the pharaoh's cartouche may perhaps mean more than simple ownership, and thus indicate a divine origin even of those artificial materials that we today consider mere imitations.

Greek and Roman civilization did away with Near Eastern litholatry, which Sallust ridiculed as “the notion of madmen.”<sup>91</sup> On the basis of the distinctions of Greek philosophy, several levels of knowledge and craft emerged. Plotinus distinguishes crafts that imitate nature—such as painting and sculpture—from those that consider proportion in general—such as music.<sup>92</sup> The imitation of nature in glass-making shed its magical and religious contexts and turned into a matter of *technē*, a craft that can be learned. Nevertheless, the making of glass batches that imitate minerals, the process of making perfect shapes merely by

the force of breath, and the range of materials that could be imitated by glass did not fail to deeply fascinate Roman witnesses. The appreciation of glass became openly ambivalent, albeit on a high level: glass would have to be considered the most valuable material of all, to be praised above gold and silver, were it not breakable, and thus *vilis*—ordinary and worthless.<sup>93</sup>

■

### Dedo von Kerssenbrock-Krosigk

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Epigraph Martin Heidegger, “The Origin of the Work of Art,” in *Basic Writings*, ed. David Farrell Krell (London: Routledge, 1999), 139–212, at 150. “Was uns als natürlich vorkommt, ist vermutlich nur das Gewöhnliche einer langen Gewohnheit, die das Ungewöhnliche, dem sie entsprungen, vergessen hat. Jenes Ungewöhnliche hat jedoch einst als ein Befremdendes den Menschen angefallen und hat das Denken zum Erstaunen gebracht.” Martin Heidegger, “Der Ursprung des Kunstwerkes” (1935/36), in *Holzwege* (Frankfurt am Main: Vittorio Klostermann, 1950), 1–74, at 9.

1 Birgit [Schlick-]Nolte, *Die Glasgefäße im alten Ägypten*, Münchner Ägyptologische Studien 14 (Berlin: Bruno Hessling, 1968). For examples of contributions by E. Marianne Stern, see “Roman Glassblowing in a Cultural Context,” *American Journal of Archaeology* 103, no. 3 (1999): 441–84; “Ancient Glass in a Philological Context,” *Mnemosyne* 60 (2007): 341–406; “*Audacis plebeia torumata vitri*: A Glassblower’s Look at Martial 14.94,” *Mnemosyne* 65, no. 1 (2012): 80–93. See also Marco Beretta, *The Alchemy of Glass: Counterfeit, Imitation, and Transmutation in Ancient Glassmaking* (Sagamore Beach, MA: Watson Publishing International, 2009).

2 See, for example, Albert Ilg, “Geschichte des Glases in kunstindustrieller Hinsicht: Von den ältesten Zeiten bis zum Ende des 18. Jahrhunderts,” in *Die Glasindustrie, ihre Geschichte, gegenwärtige Entwicklung und Statistik*, by Ludwig Lobmeyr, Albert Ilg, and Wendelin Boeheim (Stuttgart: W. Spemann, 1874), 1–144; Édouard Garnier, *Histoire de la verrerie et de l’émaillerie* (Tours: Alfred Mame et fils, 1886).

3 I especially thank Peter N. Miller, who had suggested such a lecture to me back in 2012 and did not lose his patience through the years.

4 A. Leo Oppenheim, ed., *Glass and Glassmaking in Ancient Mesopotamia: An Edition of the Cuneiform Texts Which Contain Instructions for Glassmakers; With a Catalogue of Surviving Objects*, Monographs 3 (1970; repr. Corning, NY: Corning Museum of Glass Press, 1988), 18–21.

5 Peter Roger Stuart Moorey, *Ancient Mesopotamian Materials and Industries: The Archaeological Evidence* (Oxford: Clarendon Press, 1994), 167–93; Axel von Saldern, *Antikes Glas*, Handbuch der Archäologie. Im Rahmen des Handbuchs der Altertumswissenschaft (Munich: C. H. Beck, 2004), 5–24, 51–65; Andrew J. Shortland, *Lapis Lazuli from the Kiln: Glass and Glassmaking in the Late Bronze Age*, Studies in Archaeological Sciences 2 (Leuven: Leuven University Press, 2012); Julian Henderson, *Ancient Glass: An Interdisciplinary Exploration* (Cambridge: Cambridge University Press, 2013). See also the plan of future research tasks for glass archaeologists in Thilo Rehren and Ian C. Freestone, “Ancient Glass: From Kaleidoscope to Crystal Ball,” *Journal of Archaeological Science* 56 (2015): 233–41.

6 Moorey, *Ancient Mesopotamian Materials and Industries*, 191–92.

7 Kimiyoshi Matsumura, “The Glass Bottle and Pendant from Büklükale and Their Dating,” in “Aspects of Late Bronze Age Glass in the Mediterranean: Proceedings of JIAA Late Bronze Age Glass Workshop Held at 27th–28th September, 2014 in Kaman, Turkey,” ed. Julian Henderson and Kimiyoshi Matsumura, special issue, *Anatolian Archaeological Studies* 21 (2018): 11–29, pls. 3–6.

8 Moorey, *Ancient Mesopotamian Materials and Industries*, 193, 213.

9 Béatrice André-Salvini, “L’idéologie des pierres en Mésopotamie,” in *Cornaline et pierres précieuses: La Méditerranée, de l’Antiquité à l’Islam. Actes du colloque*, ed. Annie Caubet (Paris: Musée du Louvre, 1999), 373–400, at 376.

10 The textual tradition of *Gilgamesh* is still fragmentary and remains to be completed. I made use of the German translation by Stefan M. Maul, *Das Gilgamesch-Epos*, 3rd ed. (Munich: Beck, 2006).

11 Some centuries passed before these stones were considered semiprecious and replaced in value by diamond, emerald, and ruby. Peter Roger Stuart Moorey, “Blue Stones in the Ancient Near East: Turquoise and Lapis-Lazuli,” in Caubet, *Cornaline et pierres précieuses*, 175–88, at 177–78.

- 12 Jan J. A. van Dijk, *Lugal ud me-lám-bi nir-ál: Le récit épique et didactique des travaux de Ninurta, du déluge et de la nouvelle création*, 2 vols. (Leiden: Brill, 1983). For the English translation, see “Ninurta’s Exploits: A *Šir-sud* (?) to Ninurta,” The Electronic Text Corpus of Sumerian Literature, Faculty of Oriental Studies, University of Oxford, 2006, <http://etcsl.orinst.ox.ac.uk/cgi-bin/etcsl.cgi?text=t.1.6.2#>.
- 13 Shortland, *Lapis Lazuli from the Kiln*, 44–46.
- 14 “Ninurta’s Exploits,” lines 411–15.
- 15 Krisztián Simkó, “Überlegungen zu den symbolischen Rollen der Steine in Mesopotamien,” *Altorientalische Forschungen* 41, no. 1 (2014): 112–24.
- 16 “Ninurta’s Exploits,” lines 528–53.
- 17 *Ibid.*, line 645.
- 18 Irene J. Winter, “The Aesthetic Value of Lapis Lazuli in Mesopotamia,” in Caubet, *Cornaline et pierres précieuses*, 43–58, at 49.
- 19 *Ibid.*, 46.
- 20 Moorey, “Blue Stones,” 180.
- 21 André-Salvini “L’idéologie des pierres,” 376.
- 22 *Ibid.*, 377, 377n11.
- 23 Eleanor Robson, “Technology in Society: Three Textual Case Studies from Late Bronze Age Mesopotamia,” in *The Social Context of Technological Change*, ed. Andrew J. Shortland (Oxford: Oxbow Books, 2001), 39–57, at 53.
- 24 Oppenheim, *Glass and Glassmaking*; Shortland, *Lapis Lazuli from the Kiln*, 121–26.
- 25 Quoted in Oppenheim, *Glass and Glassmaking*, 32–33.
- 26 *Ibid.*, 33.
- 27 Wayne Horowitz, “Two *Abnu šikinšu* Fragments and Related Matters,” in *Zeitschrift für Assyriologie und Vorderasiatische Archäologie* 82, no. 1 (1992): 112–22, at 115.
- 28 Erica Reiner, *Astral Magic in Babylonia*, Transactions of the American Philosophical Society, n.s., 85, no. 4 (Philadelphia: American Philosophical Society, 1995), 126.
- 29 Moorey, *Ancient Mesopotamian Materials and Industries*, 90; Shortland, *Lapis Lazuli from the Kiln*, 140–41.
- 30 Oppenheim, *Glass and Glassmaking*, 45 (§13), 78. See also Paul T. Nicholson, “‘Stone . . . That Flows’: Faience and Glass as Man-Made Stones in Egypt,” *Journal of Glass Studies* 54 (2012): 11–23, at 22.
- 31 Nolte, *Die Glasgefäße im alten Ägypten*, 17.
- 32 Shortland, *Lapis Lazuli from the Kiln*, 141–44, 147–52; Nolte, *Die Glasgefäße im alten Ägypten*, 9–10; Moorey, *Ancient Mesopotamian Materials and Industries*, 195–96 (on the problematic identification of glass in the Amarna letters).
- 33 Nolte, *Die Glasgefäße im alten Ägypten*, 6–10 (with a critical overview of glass-related Egyptian terms). See also Nicholson, “Stone . . . That Flows.”
- 34 Nolte, *Die Glasgefäße im alten Ägypten*, 10.
- 35 *Ibid.*, 48, no. 8, and pl. I, 7.
- 36 *Ibid.*, 10–12.
- 37 *Ibid.*, 36–39; Saldern, *Antikes Glas*, 34–35.
- 38 Sydney Aufrère’s 1988 dissertation was published as *L’univers minéral dans la pensée égyptienne*, 2 vols. (Cairo: Institut Français d’Archéologie Orientale du Caire, 1991).
- 39 Sydney Aufrère, “L’univers minéral dans la pensée égyptienne: Essai de synthèse et perspectives,” *Archéo-Nil*, no. 7 (October 1997): 113–44.
- 40 “Propriété des dieux, métaux et minéraux précieux sont partie intégrante des dieux s’ils ne sont les dieux eux-mêmes.” *Ibid.*, 123.
- 41 “[L]e minéral et le métal ont leur propre principe d’action dans la mesure où ils sont consubstantiels au divin.” *Ibid.*, 117.
- 42 “Le choix du matériaux n’est pas sans exprimer le désir de se rattacher à l’univers de la suggestion et à celui de l’analogie. . . . Le matériau joue *un* rôle, joue *son* rôle parmi les éléments de la nature, collectivement ou en tant qu’entité individuelle, expression d’un tout potentiel—L’ensemble de la production de lapis-lazuli par exemple. Un *Ersatz* de même apparence, de même couleur, représente un substitut partout où l’on ne peut recourir, pour des raisons de coût, à un matériau naturel. Bien entendu, le *mana* du matériau naturel est plus recherché que son *Ersatz*, d’où la multiplication d’objets funéraires efficients évoquant des situations d’analogie comme dans les textes funéraires. Cependant, la *thnt* multicolore, fritte autoglaçurante de haute qualité [i.e., faience], sert de substitut efficace, car elle est à l’image de la divine Hathor, dame des minéraux et de toutes les apparences.” *Ibid.*, 119–20.
- 43 See three pseudo-vessels, Eighteenth Dynasty Egypt, in the Pelizaeus-Museum, Hildesheim.
- Regine Schulz, in *Ägyptens Aufstieg zur Weltmacht*, ed. Eva and Arne Eggebrecht (Mainz: Philipp von Zabern, 1987), 317–18, nos. 267–69.
- 44 See four pseudo-vessels in the Egyptian Museum in Cairo and one in the British Museum, London.
- Nolte, *Die Glasgefäße im alten Ägypten*, 14, 151, nos. 1–5, and pl. XXXV, nos. 18–22.
- 45 *Ibid.*, 67, no. 1, and pl. VI, 1.
- 46 Edward Bleiberg, *The Official Gift in Ancient Egypt* (Norman: University of Oklahoma Press, 1996), 6.

- 47 Louise Steel, *Materiality and Consumption in the Bronze Age Mediterranean* (London: Taylor and Francis, 2013), 91–121.
- 48 *Ibid.*, 92–94. In the above-mentioned Amarna letters, various rulers present themselves to the pharaoh as “your servant.” Shortland, *Lapis Lazuli from the Kiln*, 148–49.
- 49 Bleiberg, *Official Gift*, 93–96.
- 50 *Ibid.*, 99.
- 51 Steel, *Materiality and Consumption*, 100.
- 52 Steel suggests that relevant archaeological finds in the Near East are related to the looting of Middle Kingdom tombs during the Second Intermediate Period and the Eighteenth Dynasty in Egypt. *Ibid.*, 105.
- 53 Nicholson, “Stone . . . That Flows,” 17.
- 54 Shortland, *Lapis Lazuli from the Kiln*, 143.
- 55 Birgit Schlick-Nolte and Rosemarie Lierke, “From Silica to Glass: On the Track of the Ancient Glass Artisan,” in *Reflections on Ancient Glass from the Borowski Collection: Bible Lands Museum Jerusalem*, ed. Robert Steven Bianchi (Mainz: Philipp von Zabern, 2002), 11–40, at 20.
- 56 Rachael T. Sparks, “Egyptian Stone Vessels and the Politics of Exchange (2617–1070 BC),” in *Ancient Perspectives on Egypt*, ed. Roger Matthews and Cornelia Roemer (London: UCL Press, 2003), 39–56, at 43–46.
- 57 *Ibid.*, 44.
- 58 *Ibid.*, 45; Steel, *Materiality and Consumption*, 100.
- 59 Katja Broschat, Thilo Rehren, and Christian Eckmann, “Makelloes Flickwerk: Die gläsernen Kopfstützen des Tutanchamun und anderes,” *Restaurierung und Archäologie* 9 (2016): 1–24.
- 60 I am much indebted to Katja Broschat, RGZM, for making this image available.
- 61 Broschat, Rehren, and Eckmann, “Makelloes Flickwerk,” 3–4.
- 62 Birgit Schlick-Nolte and Rainer Werthmann, “Glass Vessels from the Burial of Nesikhons,” *Journal of Glass Studies* 45 (2003): 11–34. See also Shortland, *Lapis Lazuli from the Kiln*, 170–73.
- 63 Moorey, *Ancient Mesopotamian Materials and Industries*, 198.
- 64 Pliny, *Naturalis historia* (77 AD). 36, 65 (26).
- 65 Strabo, *Geography*, book 16, chapter 2, section 25, is about a generation earlier. See John Brown, *The Lebanon and Phoenicia: Ancient Texts Illustrating Their Physical Geography and Native Industries*, vol. 1, *The Physical Setting and the Forest*, Centennial Publications (Beirut: American University of Beirut, 1969), 104–5.
- 66 John F. Healey, *Pliny the Elder on Science and Technology* (Oxford: Oxford University Press, 1999), 78–79. Healey dismisses “recent critics’ unjustified and less than constructive observations about Pliny’s language and style” as merely continuing “the prejudices of early scholars.”
- 67 “[A]liud flatu figuratur, aliud torno teritur, aliud argenti modo caelatur.” Pliny, *Naturalis historia*, 36.193 (66).
- 68 Brown, *Physical Setting*, 108–9.
- 69 Rudolf Penkert, “Nach zwei Jahrtausenden wieder Rippenschalen im Kölner Raum. Beitrag zur Forschung: Antike Glasmachertechniken,” in *Porzellan + Glas: Organ des Bundesverbandes für den Gedeckten Tisch, Hausrat und Wohnkultur* 63, no. 12 (1963): 48–49; Rosemarie Lierke, *Antike Glasiöferei: Ein vergessenes Kapitel der Glasgeschichte*, Zaberns Bildbände zur Archäologie (Mainz: Philipp von Zabern, 1999).
- 70 Stern, “Audacis plebeia toreumata vitri” (2012), 85. Jan-Pieter Löbbing follows the same interpretation. “Offene Glasgefäße der frühen römischen Kaiserzeit: Untersuchungen zu Vorbildern und Imitationen in der Keramik und Toreutik,” *Kölner Jahrbuch* 48 (2015): 19–42, at 24.
- 71 Stern, “Audacis plebeia toreumata vitri” (2012), 85; Clasina Isings, *Roman Glass from Dated Finds*, *Archaeologica Traiectina* 2 (Groningen-Djakarta: J. B. Wolters, 1957), 45.
- 72 “Nos sumus audacis plebeia toreumata vitri / Nostra neque ardentis gemma feritur aqua.” Marcus Valerius Martialis, “Calices audaces,” in *Apophoreta* (AD 84), book 14, epigram 94. Translation by Stern: “We are plebeian cups chased of fearless glass, And our jewels are hurt not even by burning water.” See “Audacis plebeia toreumata vitri” (2012) for an interpretation of this epigram; the translation is on p. 81.
- 73 Henry George Liddell and Robert Scott, *A Greek-English Lexicon* (Oxford: Clarendon Press, 1940), <http://www.perseus.tufts.edu/hopper/text?doc=Perseus:text:1999.04.0057>.
- 74 Clement of Alexandria, *Paedagogus*, book 2, chapter 3, 35, 3. Translation by Alexander Roberts and James Donaldson, *The Ante-Nicene Fathers: Translations of the Writings of the Fathers down to A.D. 325*, vol. 2, *Fathers of the Second Century*, revised by A. Cleveland Coxe (Grand Rapids, MI: Wm. B. Eerdmans, 2001), 247.
- 75 “Frangere dum metuis, franges crystallina: peccant / Securæ nimium sollicitæque manus.” Martialis, *Crystallina*, in *Apophoreta* (AD 84), book 14, epigram 111. For the English translation, see “Martial, Epigrams: Book 14; Mainly from Bohn’s Classical Library (1897),” Early Church Fathers, adapted by Roger Pearse, 2008, [http://www.tertullian.org/fathers/martial\\_epigrams\\_book14.htm](http://www.tertullian.org/fathers/martial_epigrams_book14.htm).
- 76 See David Whitehouse, *Roman Glass in the Corning Museum of Glass*, vol. 1 (Corning, NY: Corning Museum of Glass, 1997), 111–14, nos. 169–74.

- 77** Yael Israeli, "The Invention of Blowing," in *Roman Glass: Two Centuries of Art and Invention*, ed. Martine Newby and Kenneth Painter, The Society of Antiquaries of London Occasional Papers 13 (London: Society of Antiquaries, 1991), 46–55.
- 78** Jonathan D. Prior, "The Impact of Glassblowing on the Early Roman Glass Industry (circa 50 B.C.–A.D. 79)" (PhD diss., Durham University, 2015), <http://etheses.dur.ac.uk/11186/>.
- 79** "Cuperem Posidonio aliquem vitrearium ostendere, qui spiritu vitrum in habitus plurimos format qui vix diligenti manu effingerentur." Lucius Aeneas Seneca, *Epistulae morales ad Lucilium* (64 CE), letter 90. For the English translation, see Seneca, *Epistles*, vol. 2, *Epistles 66–92*, trans. Richard M. Gummere, Loeb Classical Library 76 (Cambridge, MA: Harvard University Press, 1920), [https://en.wikisource.org/wiki/Moral\\_letters\\_to\\_Lucilius/Letter\\_90](https://en.wikisource.org/wiki/Moral_letters_to_Lucilius/Letter_90). Cf. Beretta, *The Alchemy of Glass*, 61–64.
- 80** Marielene Putscher, *Pneuma, Spiritus, Geist: Vorstellungen vom Lebensantrieb in ihren geschichtlichen Wandlungen* (Wiesbaden: Franz Steiner, 1973), 122–34.
- 81** "Opificesque omnes in sordida arte versantur; nec enim quicquam ingenuum habere potest officina" (And all mechanics are engaged in vulgar trades; for no workshop can have anything liberal about it). Marcus Tullius Cicero, *De officiis*, trans. Walter Miller (Cambridge, MA: Harvard University Press, 1913), book 1, 150 (42).
- 82** Stern, "Ancient Glass," 350–53, quoting and translating the (fragmentary) poem in the Papyrus Oxyrhynchus 3536 (Sackler Library, Oxford). See also E. Marianne Stern, "Glass and Rock Crystal: A Multifaceted Relationship," *Journal of Roman Archaeology* 10 (1997): 192–206, at 206.
- 83** E. Marianne Stern, *Roman Mold-Blown Glass: The First through Sixth Centuries* (Rome: L'Erma di Bretschneider and Toledo Museum of Art, 1995), 103–10; Saldern, *Antikes Glas*, 273–76; Löbbing, "Offene Glasgefäße der frühen römischen Kaiserzeit," 23–24.
- 84** Saldern, *Antikes Glas*, 274–75.
- 85** E. Marianne Stern, "Audacis plebeia toreumata vitri: Souffler de verre dans des moules," in *D'Ennion au Val Saint-Lambert: Le verre soufflé-moulé; Actes des 23e Rencontres de l'Association française pour l'Archéologie du Verre*, ed. Chantal Fontaine-Hodiamont, Scientia Artis 5 (Brussels: Institut royal du Patrimoine artistique, 2010), 25–37, at 35–36; Stern, *Roman Mold-Blown Glass*, 104–5.
- 86** Stern, "Audacis plebeia toreumata vitri" (2012), 89; Stern, "Audacis plebeia toreumata vitri" (2010), 36.
- 87** Simone R. Wolf, *Herakles beim Gelage: Eine motiv- und bedeutungsgeschichtliche Untersuchung des Bildes in der archaisch-frühklassischen Vasenmalerei*, Arbeiten zur Archäologie (Cologne: Böhlau, 1993), 160.
- 88** *Ibid.*, 170–71.
- 89** "Man får fara fram varsamt med de gamla sägnerna, de äro som äldriga rosor, de tappa lätt bladen, när man kommer dem för nära inpå livet." Selma Lagerlöf, *Gösta Berlings saga* (Stockholm: Frithiof Hellberg, 1891), part 2, chapter 4.
- 90** Eduardo A. Escobar, "Babylonian Knowledge and the Challenge of History," *SIFK blog*, University of Chicago, Stevanovich Institute on the Formation of Knowledge, September 8, 2017, <http://sifk.uchicago.edu/news/babylonian-knowledge-and-the-challenge-of-history/>.
- 91** Saturninius Secundus Salustius or Flavius Sallustius, *On Gods and the World* (4th century CE), chapter 4, trans. Gilbert Murray, quoted in Aufrère "L'univers minéral," 135.
- 92** Plotinus, *Enneads*, V.9, discussed in Richard Parry, "Episteme and Techne," in *The Stanford Encyclopedia of Philosophy*, ed. Edward N. Zalta (2003, modified 2014), <https://plato.stanford.edu/archives/fall2014/entries/episteme-techne/>.
- 93** See, for example, the *cena Trimalchionis*, described by Petronius, *Satyricon liber fragmenta* (end of the 1st century CE), book 3, 50.7–51.6; cf. Stern, "Audacis plebeia toreumata vitri" (2012), 82.