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Wagons and Carts and Their Significance in Ancient Egypt

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Abstract

In ancient Egypt, the wheel was known since the Fifth Dynasty. About sixty wagons with four to eight wheels and only a few two-wheeled carts are attested. The first wheels appear on a scaling ladder and a siege tower in military contexts. The earliest wheeled vehicle is proven to have been in use in the Thirteenth Dynasty. Most carts and wagons date to the New Kingdom, the Third Intermediate Period, and Greco-Roman times, with the majority appearing in religious transport situations. A typological course of development is apparent from the wagon of Sobeknakht to those of Siamun, Petosiris, and Petubastis. In this article, the vehicles are viewed from technological and sociocultural viewpoints and are contextualized with regard to the invention and diffusion of the wheel.

During pharaonic times, the sledge was the usual mode of land transport in Egypt and was even preferred for extremely heavy loads. There were, however, also wheeled vehicles. Besides the well-attested chariot, which has been the chief focus of research relating to wheeled vehicles, a few carts and wagons are also documented.[1] In Mesopotamia, Europe, and the Caucasus, the first wheeled vehicles appear in the 4th millennium BCE, whereas the oldest wheel in Egypt is attested only in the 3rd millennium BCE. The following study focuses in detail on the individual wagons and carts known from ancient Egypt. Their development and contexts will be discussed, as well as their introduction. Moreover, the possibility that they had levels of meaning beyond their capacity as mundane transport vehicles will be analyzed, as will the possible reasons for their late and rare use with regard to the adoption of innovations.

Sources

There is iconographic, archaeological, and textual evidence for wagons and carts in ancient Egypt.[2] They are depicted in temples and tombs—as well as on coffins, mummy wrappings, and furniture—as drawings, reliefs, and even textile appliqué, and they are stamped on coins. In addition, three-dimensional evidence comes in the form of models made of terracotta or wood and metal. Only a few wagons and not a single cart survive as artifacts. Texts referring to wagons include the Gebel Barkal stela[3] and an expedition text from the Wadi Hammamat.[4]

Terminology

Because terms designating wheels and vehicles are often used differently in various publications, definitions used in this article will be given here. General features associated with wheels and wheeled vehicles will also be outlined.

In the present study, "means of transport" is understood as an object that transports loads of goods or objects, while "means of locomotion" refers to the movement (i.e., transportation) of people. Concerning types of wheeled vehicles, the classification of Littauer and Crouwel is applied: In civil contexts "carts" are equipped with two wheels, "wagons" with four or more.[5]

Two main categories of wheels are attested: disk and spoked. Disk wheels either consist of one element or are assembled from several components, sometimes with a crescent-shaped cavity in order to reduce the overall weight. Due to their solidity, they are used to move heavier loads. In the 4th millennium BCE, they are attested from the Rhine to the Indus River.[6] The disk wheel, however, is not designed for high speed: Because of its great weight, the inertia of its mass hinders movement, which means that more power is necessary to rotate it than a spoked wheel. Therefore, vehicles with disk wheels were usually drawn by oxen, which have greater pulling power than horses.[7] The spoked wheel is lighter than the disk wheel, as it consists of less material, and allows the carrying of relatively lighter weights. The advantage of the spoked wheels lies in the weight reduction of the wheel itself.

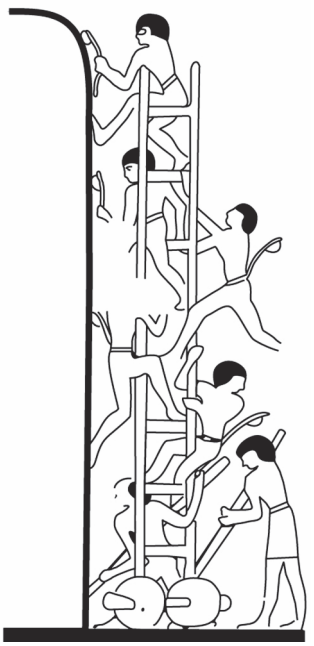

Figure 1: In the tomb of Kaemheset at Saqqara from Dynasty 5 a scaling ladder with two disk wheels is shown (© H. Köpp-Junk; drawing: A. Kireenko, after W. S. Smith, *A History of Egyptian Sculpture and Painting in the Old Kingdom* [Oxford: Oxford University Press, 1942], fig. 85).

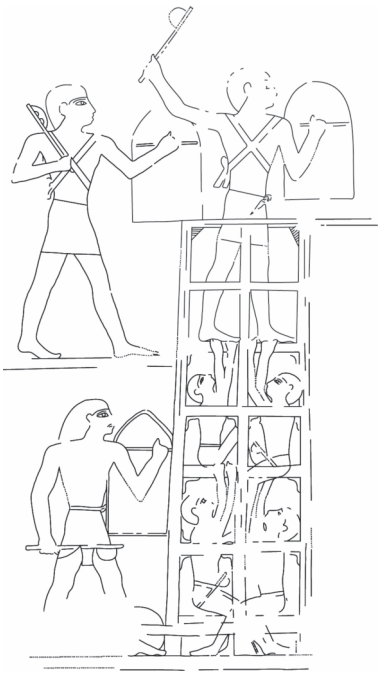

Figure 2: A siege tower with disk wheel is depicted in the tomb of Intef, dating to the Eleventh Dynasty (© H. Köpp-Junk; drawing: A. Kireenko, after B. Jaroš-Deckert, *Grabung im Asasif 1964–1970 V: Das Grab des* Jnj-jtj.f. *Die Wandmalereien der 11. Dynastie* [Mainz: Zabern, 1984], folding map 1).

In ancient Egypt, wheels were attached to carts, wagons, and chariots. A scaling ladder and a siege tower are shown mounted on wheels, as well. Presentation of some of the wheeled vehicles currently known will follow a brief outline of traffic in ancient Egypt.

Traffic and Transport—A Short Overview

For geographical reasons, the major traffic route in Egypt runs up- and downstream, the Nile River being an excellent artery,[8] usable all year round, accessible by anyone, and cost effective. Additionally, there were important traffic flows that branched off this major transit route, channeled through artificial canals and natural channels.[9] Egypt also featured a much more extended traffic system consisting of ramifying overland routes[10] next to the waterway, both being closely linked together. Roads, routes, and tracks were required within the Nile Valley for everyday movement and commercial purposes between settlements, harbors or mooring places, and other locations of economic import, such as quarries or temples.[11] The significance of these overland routes for domestic traffic and the economy cannot be underestimated.

Several modes of travel and transport were used for land traffic in ancient Egypt. Freight was transported by donkeys and by sledges,[12] carts, and wagons. Chariots[13] and carrying chairs transported passengers, and donkeys and horses were ridden.[14] Donkeys have been the classical pack animals since the First Dynasty at the latest.[15] Oxen were used for pulling sledges and plows from the Old Kingdom onward,[16] for wagons from the Thirteenth Dynasty, and for carts from the New Kingdom.[17] Very heavy loads and mass goods were easier to transport on the waterway than by sledges or donkeys; transport of lighter cargo was relatively uncomplicated overland. The choice of the transportation mode depended on the destination. If it was easier to reach on the waterway, this mode of travel was preferred because it is the least cost intensive and most easily accessible.[18]

The First Wheels

The earliest wheels attested in ancient Egypt are attached not to a transport vehicle but to war equipment. In the tomb of Kaemheset at Saqqara (Fifth Dynasty), a pair of wheels appears in a scene depicting a city assaulted with the help of a scaling ladder on two disk wheels (Fig. 1).[19] Both ends of the axle are clearly visible, but neither linchpins (which would prevent the wheels from sliding

from the axle) nor the connection between ladder and axle are apparent.

After a considerable gap in time, the wheel next appears in another martial context and, once more, in a wall painting—in this case, in the Theban tomb of Intef (Eleventh Dynasty)—that shows an attack on a city wall with the aid of a siege tower with disk wheel (Fig. 2).[20]

Carts and Wagons

From ancient Egypt, there is evidence for a few carts and about 60 wagons, some of which will be discussed below.[21] Unlike wagons, which appear with both disk and spoked wheels, carts are depicted only with the latter. In the case of wagons, there seems to be no chronological significance to the wheel type in the sense of disk wheels being replaced by spoked wheels as soon as the latter appear; even in later times, disk wheels are attached to wagons. Egyptian wagons are equipped with four, six, and sometimes even eight wheels. They will be presented in chronological order according to the number and style of their wheels, i.e., starting with wagons on four disk wheels, followed by those on four spoked wheels. Vehicles with unclear dating or wheel type will mentioned at the end of the section.

In the following, only Egyptian wheeled vehicles are analyzed. However, depictions of foreign carts and wagons are known from Egypt as well. For example, in the temple of Seti I at Abydos, four four-wheeled wagons with six-spoked wheels are shown in the army camp of the Hittites,[22] and at Medinet Habu, Anatolian carts on disk wheels are shown in the battle reliefs of Ramesses III.[23] Syrian carts with two-spoked wheels appear in the tomb of Nebamun in Thebes.[24]

Carts

The oldest Egyptian carts belong to the New Kingdom; there is no evidence for earlier ones, which is particularly striking since the earliest two-wheeled vehicle in Europe dates to the 4th millennium BCE.[25] In the tomb of Duauneheh (TT 125) from the Eighteenth Dynasty, more precisely the reign of Hatshepsut,[26] a cart with spoked wheels drawn by two oxen is shown as a mode of transport in a harvest scene (Fig. 3). The wheels have four spokes. The depiction of the body of the cart strongly suggests that it is constructed out of thin slats of wood. Cargo is not visible; the cart seems to be empty.

In the reliefs of the Ramesseum, more carts are depicted, appearing in the scenes of the battle of Kadesh (Fig. 4).[27] In contrast to the cart in the tomb of Duauneheh, their wheels have six spokes. The superstructures of the carts are box shaped, and the cargo is covered so that the transported material is unclear. Very similar carts with the same number of spokes are depicted in the reliefs of the temple of Abu Simbel (Fig. 5), again within scenes of the battle of Kadesh.[28]

From the Twenty-fifth Dynasty, a cart with eight spokes is attested in a chapel relief in Meroe (Fig. 6).[29] As for the previous carts, the axle is attached to the vehicle at the middle of the cart body. The load or the cart body is very high with a rounded top. The vehicle is shown freestanding (i.e., with neither livestock nor humans to pull it); therefore, it is unknown how it was moved. According to Dittmann[30] and to Porter and Moss,[31] the scene in which it appears is a funerary procession.

A different rendition of a vehicle appears in a drawing on an ostracon from the tomb of Huy, dating to the Eighteenth Dynasty (Fig. 7).[32] It is shown as seen from

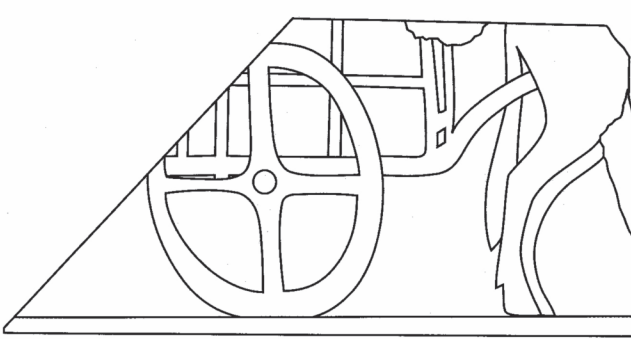

Figure 3: A scene from the tomb of Duauneheh at Thebes from the reign of Hatshepsut shows a cart with two spoked wheels (© H. Köpp-Junk; drawing: F. Junge, after W. Decker, "Der Wagen im Alten Ägypten," in W. Treue (ed.), *Achse, Rad und Wagen* [Göttingen: Vandenhoeck und Ruprecht, 1986], fig. 3).

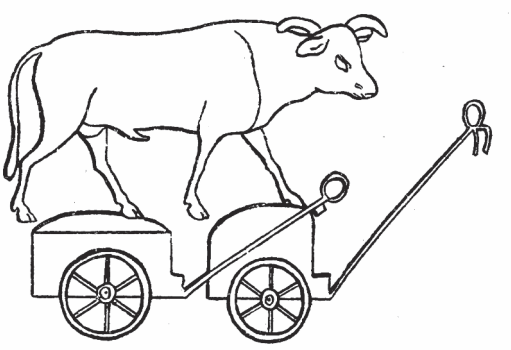

Figure 4: Two carts depicted in the Ramesseum (after A. Erman, *Ägypten und ägyptisches Leben im Altertum* [Tübingen: Laupp, 1887], 699).

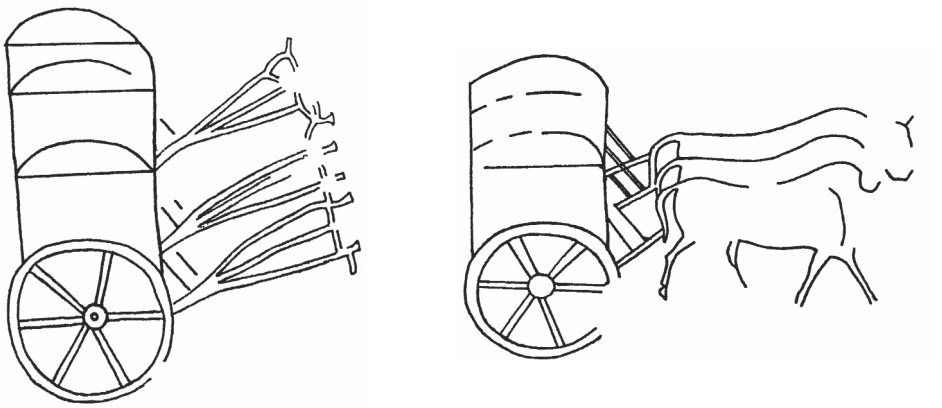

Figure 5: Transport carts in the temple of Abu Simbel within scenes of the battle of Kadesh (after C. Desroches-Noblecourt, S. Donadoni, and E. Edel, *Grand temple d'Abou Simbel. La bataille de Qadech* [Cairo: Centre de documentation et d'études sur l'ancienne Égypte, 1971], pl. 5 [detail]).

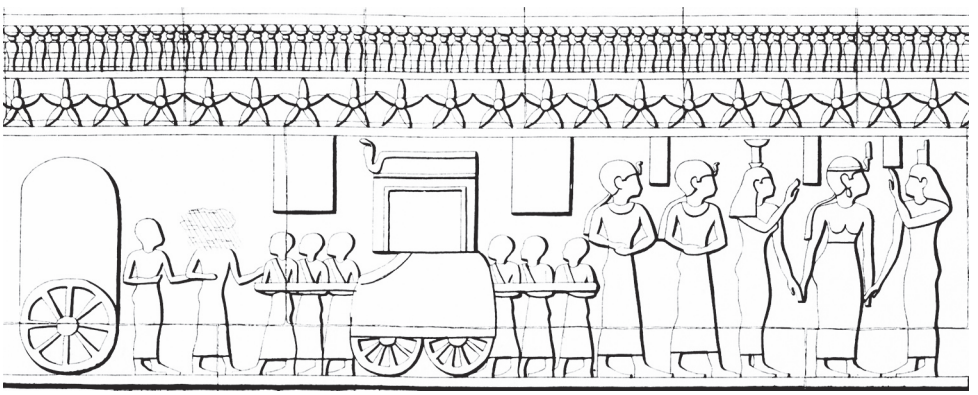

Figure 6: A cart and wagon depicted in Meroe (after C. R. Lepsius, *Denkmäler aus Aegypten und Aethiopien 10. Abtheilung 5: Aethiopische Denkmaeler* [Berlin: Hertz, 1970], pl. 41a [detail]).

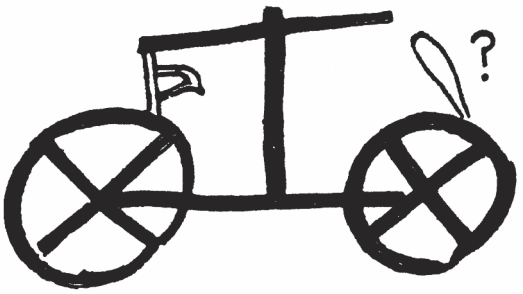

Figure 7: Drawing on an ostracon found in the tomb of Huy showing a two-wheeler in a bird's-eye view (after N. de Garis Davies and A. H. Gardiner, *The Tomb of Huy, the Viceroy of Nubia in the Reign of Tutankhamun* [London: Egypt Exploration Society, 1926], fig. 4).

Figure 8: Stela of Amenyseneb showing a wagon on disk wheels (© H. Köpp-Junk; drawing: A. Kireenko, after J. Bourriau, *Pharaohs and Mortals: Egyptian Art in the Middle Kingdom* [Cambridge: Cambridge University Press, 1988], 62 [photograph]).

above, not in the customary profile view. The two wheels have four spokes. Due to the sketchy depiction, no details are visible and it is, therefore, unclear whether this is a cart, a wagon, or a chariot. Davies and Gardiner labeled it a four-wheeler.[33] This might be confirmed by the fact that before Greco-Roman times Egyptian wagons are often shown in side view with only half of the actual number of wheels (see the detailed description of wagons to follow). But in the presentation here, with a simplified reproduction of one axle with two wheels and a draw bar seen from above, the vehicle highly resembles several rock drawings of carts and chariots, such as the one from Rio Oro (West Africa) from the 1st millennium BCE.[34] Likewise, the depiction is similar to rock carvings of two-wheelers of Fränarp[35] (Sweden) from the 2nd millennium BCE, those in Kivik[36] from the 16th century BCE, and from Berekej[37] (northeast Caucasus) from the third quarter of the 2nd millennium BCE, as well as rock drawings in Norrköping[38] (Üstergötland), Naquane[39] (Italy), Siberia,[40] and Libya.[41] Therefore, it seems likely that this is the schematized way of drawing a two-wheeled vehicle. By analogy, one might assume that the ostracon in the tomb of Huy likewise shows a two-wheeler.

IN SUMMARY, it can be stated that no depictions of carts with disk wheels are preserved from ancient Egypt. The spoked wheels of Egyptian carts have four to eight spokes. They are depicted in military and civil contexts and were used for both short- and long-distance travel. This last can be surmised from carts shown as part of the baggage train in the scenes of the battle of Kadesh, about 870 km north of Cairo, which suggests that they were used over long distances. They served as transport vehicles but not as a mode of locomotion for passengers.

WAGONS WITH FOUR DISK WHEELS

The earliest four-wheeled wagons with disk wheels date to the Second Intermediate Period. Two examples are currently known.

On the stela found at Abydos belonging to Amenyseneb, who lived during the reign of King Khendjer of the Thirteenth Dynasty,[42] a harvest scene is shown in sunk relief. In one register, two oxen pull a loaded sledge (Fig. 8). The cargo appears as a rectangular object, probably some kind of container.[43] Under the runners forming the transport platform, small disk wheels are visible, but no linchpins are shown. The hauling rope is attached to the vehicle with the help of a loop fixed beneath the runner. The small diameter of the wheels implies that the wagon could be driven only on a well-constructed track, since small wheels do not compensate for surface irregularities as effectively as larger ones, making it more likely that the bottom of the wagon could scrape the ground. Moreover, for the production of smaller disk wheels younger trees could be used.[44]

THE SECOND four-wheeled wagon with disk wheels from the Second Intermediate Period is depicted in the Seventeenth Dynasty[45] tomb of Sobeknakht at Elkab[46] (Fig. 9). The deceased is shown in a catafalque, which stands on a barque placed on a flat platform in the shape of a sledge runner. The size of the circles under the sledge indicates that these are four disk wheels, even though no linchpins are visible. The depiction of the disk wheels suggests that the kind of wood used around the axle differed from that of the outer rim of the wheels.[47] The vehicle is drawn by a pair of oxen by means of a double rope attached to the axle. The connection of axle, wheel, and wagon is not visible. The transport scene features the combination of

sledge, barque, and wagon, with the wagon being the actual means of transportation.

Under the wagon, longitudinal objects are depicted, beginning under the back wheel (on the left) and continuing to the pictorial background on the right. This is the iconographic representation of a transport road; these consist of layers of mud with wooden cross beams, used to prevent the transport sledges from sinking into the soil. They are archaeologically documented in Lisht and Lahun.[48] Although the vehicle in Sobeknakht's tomb painting is a wagon, the purpose is the same: the planks prevent the wheels of the vehicle from sinking into the ground.

In front of the wagon, a person holding an arm-shaped censer and another who pours water from a vessel are depicted. For the movement of sledges, pouring a fluid in front of the runners to reduce friction is a common practice. This technique, known since at least the Old Kingdom,[49] is of particular value if the sledges move on a transport road as described above. In Sobeknakht's depiction, however, it seems more reasonable to interpret the pouring of liquid as associated with a libation for the deceased rather than a method of reducing friction. Libation and censing are the usual activities performed in front of the departed not only as a component of the rituals of the "opening of the mouth" and the "journey to Abydos"[50] but also in front of the deceased on the sledge.[51] This was also the case with the wagons depicted in the wall scenes of Petubastis's tomb (Fig. 25), which will be discussed below.

In the *Book of the Dead* of Maiherperi from the Eighteenth Dynasty,[52] a combination of small circles representing disk wheels and runners is depicted (Fig. 10). On the sledge is a barque with the deceased under a canopy. Two oxen pull the vehicle, with one end of the towing rope being attached to a wooden slat between their horns,[53] the other end drawn through a hole at the head of the runner.

The wagon of Sennedjem is not a two-dimensional representation but rather a full-size, actual artifact (Fig. 11). Discovered in the tomb of Sennedjem at Deir el-

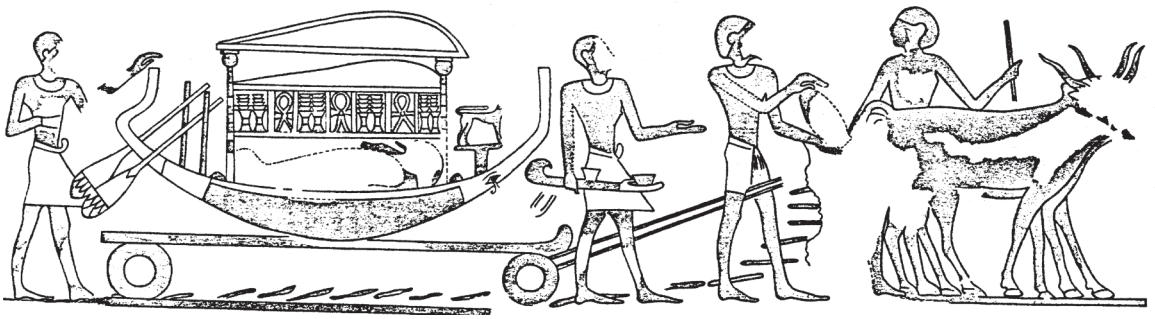

Figure 9: In the tomb of Sobeknakht in Elkab, a wagon with four disk wheels is represented. The base of the body of the wagon has the shape of a sledge runner (after J. J. Tylor and S. Clarke, *Wall Drawings and Monuments of El Kab 2: The tomb of Sebeknekht* [London: B. Quaritch, 1896], pl. 2).

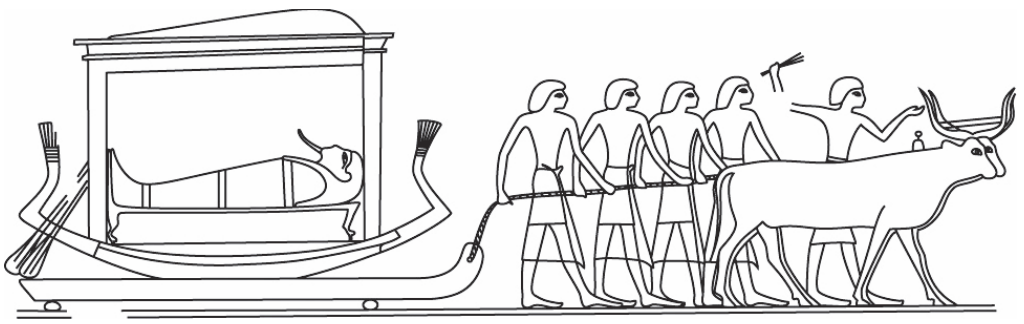

Figure 10: The wagon of Maiherperi is equipped with four small disk wheels (© H. Köpp-Junk; drawing: F. Junge, after M. Saleh, M. and H. Sourouzian, *Die Hauptwerke im ägyptischen Museum Kairo* [Mainz am Rhein: von Zabern, 1986], no. 142a).

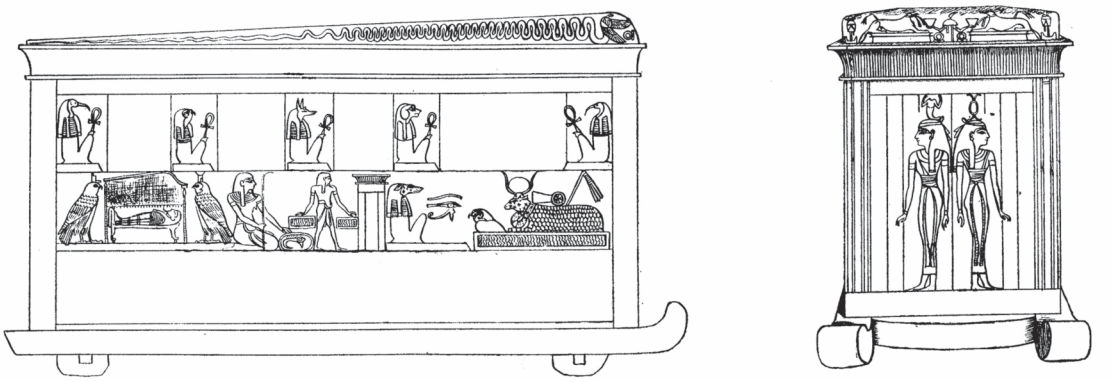

Figure 11: The sarcophagus of Sennedjem is equipped with runners and, originally, with four wheels and two axles, which are missing today. The oblong openings for the axle rods have rounded corners and a diameter of about 5 cm (after V. Schmidt, *Sarkofager, mumiekister, og mumiehylstre i det gamle Aegypten: typologisk atlas* [Copenhagen: Frimodt, 1919], 123, no. 625, 626).

Medineh and dating to the Nineteenth Dynasty;[54] it is in the shape of a painted wooden sarcophagus 2.58 m in length, equipped with runners and, formerly, with wheels as well. Circular grinding marks and deep scratches at four places on the runners indicate that wheels were previously affixed here.[55] By the shape and dimensions of the marks, one can conclude that the wheels had a diameter of 30 cm.[56] Due to the significant weight of the sarcophagus, it is more plausible that it had been fitted with disk rather than spoked wheels. The wheels abraded the red color painted on the runners. In some instances, the color ends before the area of abrasion begins; therefore, the runners were painted with the wheels already attached. The axles of the wagon, as well as the wheels, were lacking when the sarcophagus was discovered. A parallel for such removal is known, for example, from the vehicle found in the tomb of the "Lady of Vix" (Burgundy, France), dating to the late 5th century BCE.[57] It can be assumed that the wheel-and-axle systems were removed from the vehicle and used for another wagon, these functioning units being too valuable, expensive, and complex in production to leave in the tomb.

The four wheel suspensions are fixed slightly inward from the edges of each runner and are attached to the bottom of each runner with dowels. Every wheel suspension is slightly different in shape. The diameter of the openings for the axle rods is about 5 cm; they are of quadrangular shape with rounded corners. The lateral

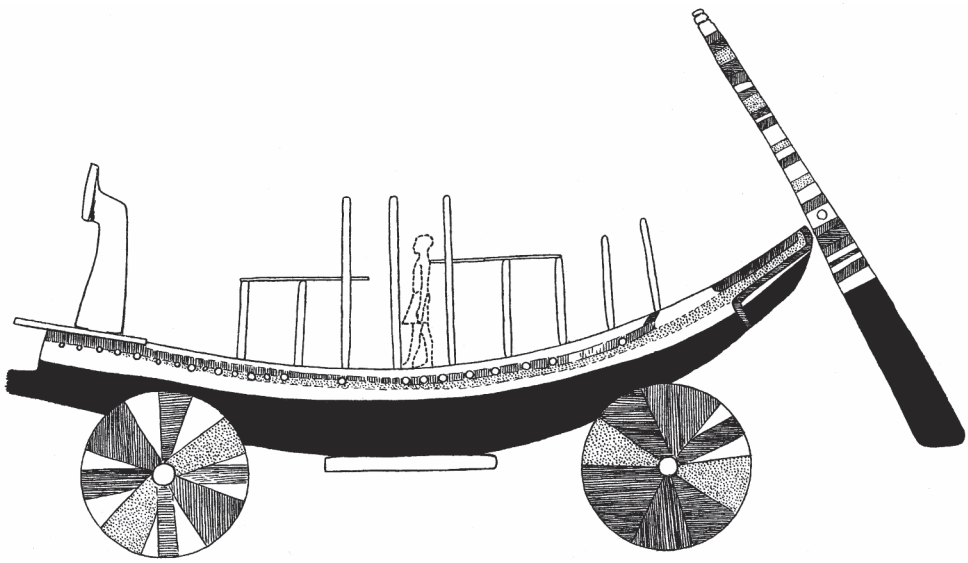

Figure 12: The Gurob barque with four painted disk wheels (after G. Brunton and R. Engelbach, *Gurob* [London: British School of Archaeology in Egypt, University College, 1927], pl. 52).

elements of the sarcophagus are embedded in the runners. The rounded top parts of the runners were fixed to the originally flat surface by dowels. In the front part of the runners, holes were drilled for the traction rope.[58]

Also from the Nineteenth Dynasty, a wooden model of a wagon is preserved.[59] Found in Gurob, which is situated at the entrance to the Fayum Oasis, it has a length of 40.5 cm (Fig. 12). The object consists of a barque with four painted disk wheels that exhibit traces of use and are, moreover, of different sizes, with two measuring 8.1 cm, the others 7.6–7.7 cm. The wheels, made of the wood of the sycomore fig, were not directly attached to the barque, but were originally installed on a wagon body that cannot be reconstructed from the remaining fragments. Wachsmann assumes that it was of an oblong shape.[60] The barque is equipped with a rudder, and remains of a cabin are preserved.

On the outer coffin of the priest of Amun Amenemope, a polychrome scene shows a funerary procession with the deceased under a catafalque transported by a wagon with four disk wheels.[61] The object dates to the Twenty-first[62] or early Twenty-second[63] Dynasty. The transport platform of the wagon has the shape of a sledge and is painted in red and black on a yellow background. Near the front, a rectangular structure[64] under the runner is of an unclear function and was maybe meant to stabilize the transport platform. The wagon is moved by five individuals; no draft animal is depicted. This was also the case with the wagon on the coffin of Ankhefenamun now in Helsinki, to be discussed below.[65] Interestingly, the towing rope is tied to the barque, not to the wagon. The disk wheels of the wagon, depicted as circles under the transport platform, are painted with 16 strokes, each in three alternating colors.[66] Under the wagon, Anubis is shown, which is very unusual; from time to time, the *tekenu* is depicted under a wagon between the wheels,[67] but only on this coffin is Anubis portrayed in this position. Again, the combination of wagon, sledge, and barque is depicted.

Fragments of the coffin of the high priest Ankhpakhered from the Twenty-second Dynasty (Fig. 13) show another wagon with disk wheels, this time drawn by a pair of oxen.[68] The wagon consists of a coffin with relatively large wheels. Whether the wheels were attached directly to the

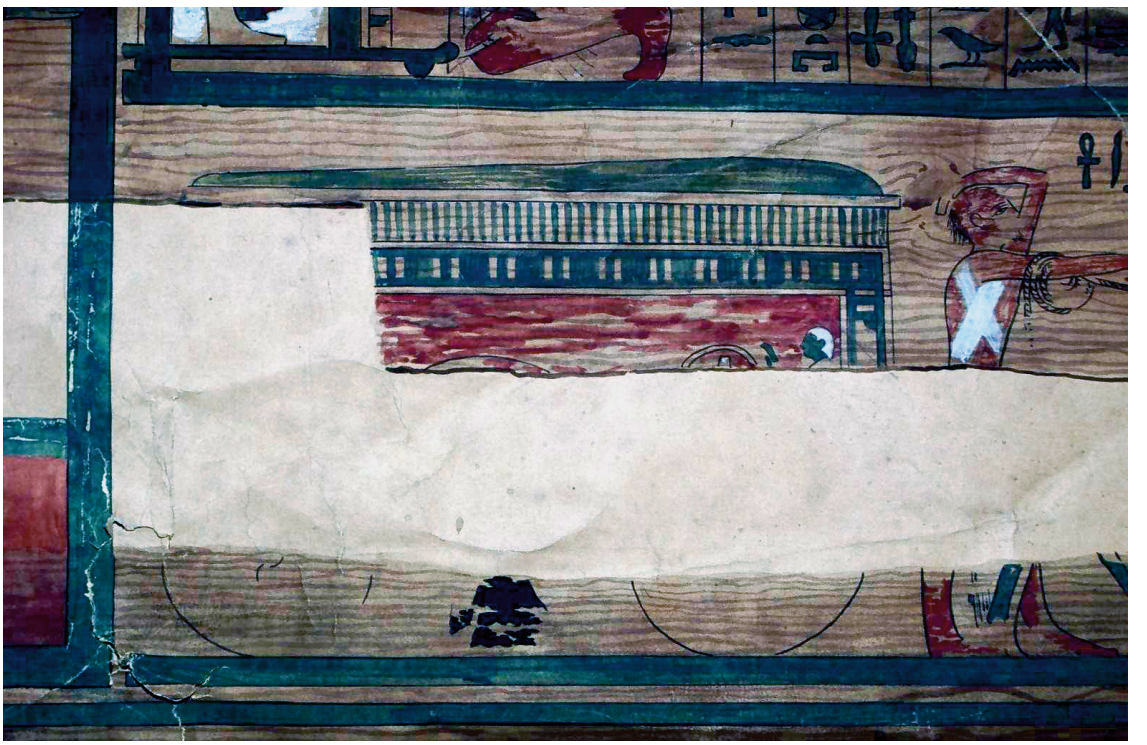

Figure 13: Wagon with disk wheels on the coffin of the high priest Ankhpakhered. On the left-hand side the linchpin is visible (ÄM 20132, © Ägyptisches Museum und Papyrussammlung, Staatliche Museen zu Berlin; courtesy of Ägyptisches Museum und Papyrussammlung, Staatliche Museen zu Berlin, Germany).

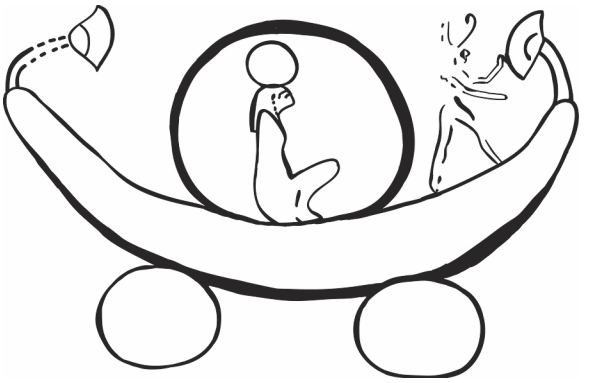

Figure 14: The barque on wheels on the London mummy shroud (© H. Köpp-Junk; drawing: A. Kireenko, after H. Köpp-Junk, *Reisen im Alten Ägypten. Reisekultur, Fortbewegungs- und Transportmittel in pharaonischer Zeit* [Wiesbaden: Harrassowitz, 2015a], pl. 9d).

Figure 15: Alexandrine drachma showing a barque wagon on disk wheels (© H. Köpp-Junk; drawing: A. Kireenko, after G. Dattari, *Monete Imperiali Greche. Numi Augg. Alexandrini. Catalogo della Collezione G. Dattari II* [Cairo: Tipografia dell'Instituto Francese d'Archeologia Orientale, 1901], pl. 27, no. 3557).

sarcophagus, as in Sennedjem's example, or to a transport platform cannot be determined due to loss in this area. On the left wheel, the remains of a linchpin are still visible. In front of the wagon, an individual directs the oxen.

On a linen burial cloth now in the British Museum,[69] two wagons are pictured. One is a solar barque on disk wheels (Fig. 14; the other, a wagon with spoked wheels, will be discussed below). The shroud is dated to either Greco-Roman times or the Roman Period.[70] The barque seems to be equipped with disk wheels with two of the four visible as usual, although the wheels do not seem to be circular, but rather of an oval shape. In extremely high magnification, it becomes clear due to paint residues that not two oval disk wheels are depicted but rather four, with the first and the third being in the viewing plane and the second and fourth in the background; therefore, it is a representation in perspective. This corresponds to the second wagon on the shroud, which has all four wheels visible as well. The barque with the sun disk is not represented standing on a transport platform as in the case of the wagon of Sobeknakht;[71] instead the wheels seem to be directly attached to it. Again, the construction details of axle, wheel, and barque are not recognizable. The barque is not pulled by draft animals but is displayed freestanding.

A similar barque wagon on disk wheels appears on an Alexandrine drachma[72] dating to the 2nd century CE, more precisely to year 15 of Marcus Aurelius (Fig. 15). On the barque, Osiris is depicted under a canopy. Again, all four wheels are visible. A horizontal feature with one end angled upward is depicted roughly at the height where the axle can be assumed. As with the previous barque, no transport platform or draft animals are displayed.

Quite remarkable are three terracotta models in the shape of ships, to which four wheels have been attached. All of them are hollow, with two cavities. While one of them is equipped with disk wheels, the others have spoked wheels; these latter two will be discussed below. The one with four disk wheels, dating to the Roman Period and found in the Fayum, has a length of 18.3 cm (Fig. 16). On the longitudinal sides a crosshatched area is visible. The disk wheels are shown as raised circles. In the middle of the disk wheels, the ends of the axles are depicted; the axle would have run through the vehicle below this crosshatched area. At the end of the ship corresponding to the cavities, the vehicle is rather flat, while the opposite end, the stern, is significantly higher. At the stern are depicted a rudder and a reclining individual, who might be interpreted as Harpocrates.[73]

Two 2nd or 1st century CE[74] pottery sherds with relief scenes now in the Benaki Museum in Athens[75] show barques with four disk wheels, of which only two are depicted. On each barque a naos is shown. The barques seem to be placed on a slim transport platform. Unlike other barques with disk wheels, which are shown freestanding, these relief sherds depict how the wagons were moved: on the right side they

Figure 16: Terracotta ship with four disk wheels (after P. Perdrizet, *Les terres cuites grecques d'Égypte de la Collection Fouquet* [Nancy: Berger-Levrault, 1921], 115–116 [300], pl. 32).

are pushed by an animal, and on the left they are pulled by several individuals. The latter detail appears on one sherd, while on the other only one foot of the pulling group remains.

IN ADDITION to the wagons with four disk wheels mentioned above, several more are of unclear date: another life-size example found in Medinet Madi in the Fayum oasis (fig. 17) and a depiction on an ibis mummy.

Besides the Medinet Madi wagon, most of the wagons are merely attested in depictions or as models. In addition to the wagon from Medinet Madi and that of Sennedjem (fig. 11), a single disk wheel is also known, now in the British Museum London. This probably derives from Deir el-Bahri and dates to the Second Intermediate Period or the Eighteenth Dynasty,[76] but it is unclear whether it was part of a wagon or a cart.

The wagon from Medinet Madi in the Fayum (Fig. 17) is most intriguing because it provides information concerning its construction.[77] Its exact date is uncertain; it might belong to the Middle Kingdom or to the Greco-Roman Period.[78] The wagon, found during the excavation of a Ptolemaic temple in Medinet Madi, consists of a frame made of sycomore wood, 2.09 m in length, with three crossbars of 1.23 m; the shape resembles that of an Egyptian sledge.[79] Each of the outer crossbars has two semicircular cavities that, due to their wear marks, can be identified as having been used for the attachment of the pulling rope. The middle crossbar thickens toward its center, where it features a round mortise 12 cm in depth. Several holes in the frame might have been used to fix the load.[80] Axles 1.70 m long were attached to the bottom of the outer crossbars by a metal bolt; this is the point of rotation for the axle.[81] Each axle is of a quadratic shape

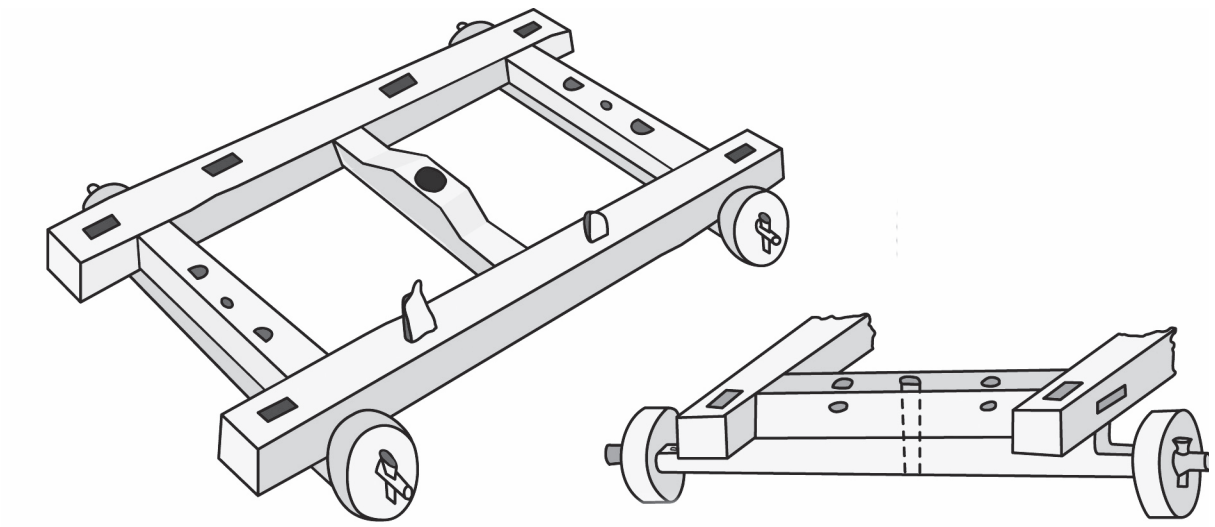

Figure 17: Life-size wagon found in Medinet Madi in the Fayum Oasis, equipped with four disk wheels and slightly movable axles (© H. Köpp-Junk; drawing: A. Kireenko, after K. H. Dittmann, "Der Segelwagen von Medinet Mâdi," *Mitteilungen des Deutschen Archäologischen Institutes Abteilung Kairo* 10 [1941]: figs. 1, 2).

with a round end section 6.5 cm in diameter. Four disk wheels, each with a diameter of 31 cm, were attached to these end sections. Wooden linchpins prevented the wheels from sliding from the axle. The axles were slightly movable, which offers a certain maneuverability. Without such movability, a change of direction would be possible only by driving in an extended half circle[82] or by dragging the vehicle over the ground into the desired direction with the help of draft animals. The latter requires an enormous effort and puts great stress on the vehicle.[83]

The wagon from Medinet Madi is, however, the only one from ancient Egypt presenting the technology necessary for this kind of efficient maneuverability. Due to the small diameter of the wheels, the distance from the ground was short; the vehicle could, therefore, be used only on well-constructed roads or tracks, or if the ground itself was geologically solid enough for use of this kind of wheeled vehicle. In the case of deep depressions in the road, the bottom of the vehicle would scrape the ground and the vehicle would get stuck. This would have been the same for the wagon depicted on the Amenyseneb stela (Fig. 8).[84]

TWO ARTFULLY wrapped ibis mummies from Saqqara are each decorated with textile appliqué images of a baboon sitting on a wheeled vehicle with two wheels visible. The baboon might be interpreted as a representation of the god Thoth. On one of these mummies, a vehicle with disk wheels carries a baboon with a sun disk on his head; the baboon squats on a rectangular podium, which is flanked by columns.[85] No dating is mentioned for it, but the second such mummy, which will be discussed under "Wagons with Four Spoked Wheels," probably belongs to the Greco-Roman Period,[86] and this one might as well, due to their similarity. The transport platform of the vehicle is shown as a slim plank that ends at the edges of the columns. The disk wheels are slightly indented beneath the ends of the transport platform and have a diameter of 2.5 cm.

SOME CONCLUSIONS can be drawn concerning wagons on four disk wheels just described. The wagon on the Amenyseneb stela is used as a mode of transportation within a harvesting scene,[87] and the wagon from Medinet Madi seems to be a mundane medium of transport as well. The other wagons appear in religious contexts, be it as a mode of transport for the sarcophagus or the barque, or as a part of the funerary equipment, as in the case of the model barque from Gurob. In many cases, one observes the combination of different means of transport that could each be its own mode: wagons as overland transport vehicles, sledges used for heavy load transport, and barques as watercraft: The wagons of Sobeknakht and of Maiherperi, for instance, show the grouping of barque, sledge, and wheels; those on Amenyseneb's and Sennedjem's stelae, sledge and wheel; and the Gurob model, the mummy linen now in London, and the Alexandrine drachma, the association of barque and wheel. Only the wagon from Medinet Madi presents no mixture of transportation means. The wagon painted on the coffin of Ankhpakhered is in such poor condition that a statement concerning this point cannot be made with any confidence.

SINCE THE circles under the runners of the Amenyseneb vehicle[88] (Fig. 8) and that of Maiherperi[89] (Fig. 10) could be identified as either disk wheels or transport rollers, the following points prove that they should be classified as the former. Neither in the scene showing the wagon of Maiherperi nor on the stela of Amenyseneb is a working team shown or mentioned in an accompanying text. The usual method of transport via rollers requires workers to take away the rollers after the sledge has passed over them and place them again in front of the vehicle. Moreover, it is notable that in both cases only two rollers are depicted. Arnold mentions an experiment undertaken in 1979 in which a stone block of 32 tons was dragged over oak rollers 40 cm in diameter; this showed that transport was possible only when four to six closely spaced rollers were simultaneously under the block.[90] Therefore, this experiment would indicate that the two circles under the vehicle on the stela of Amenyseneb are wheels and not rollers, especially since they are depicted at the front and rear of the vehicle, i.e., at the exact positions where one would expect wheels. Axles and linchpins are not visible, but the circles are clearly under the vehicle. These features likewise appear on the vehicle of Sobeknakht, dating to the Seventeenth Dynasty, which is without any doubt identifiable as a wagon with four wheels. Another line of evidence, although not of Egyptian origin, are pictograms from Uruk phase IV (Fig. 18), dating to the 4th millennium

Figure 18: Pictograms of the Uruk IV period from the 4th millennium BCE show sledges, some of which are equipped with wheels (© H. Köpp-Junk; drawing: P. Junk, after W. Nagel, *Der Mesopotamische Streitwagen und seine Entwicklung im ostmediterranen Bereich* [Berlin: Hessling, 1966], fig. 1a–b and M. A. Littauer and J. H. Crouwel, *Wheeled Vehicles and Ridden Animals in the Ancient Near East* [Leiden: Brill, 1979], fig. 1).

BCE, comparison to which would indicate that the vehicles on the Amenyseneb stela and the one of Maiherperi are wagons.[91] Four of them show sledges with runners; three are additionally equipped with two large rollers or disk wheels. Littauer and Crouwel refer to them as "sledge cars;"[92] therefore, it seems likely that the vehicles on the stela of Amenyseneb and in the *Book of the Dead* of Maiherperi are wagons as well. Moreover, the wagon of Sennedjem[93] (Fig. 11) supports the conclusion that these vehicles are wagons.

Wagons with Four Spoked Wheels

The oldest known wagon with four spoked wheels dates to the beginning of the Eighteenth Dynasty. Found in the tomb of Queen Ahhotep (Fig. 19),[94] this wagon model is made of wood and bronze and measures 20 cm in total length; the wheels have a diameter of 9.5 cm. The transport platform is a solid plank, 14.5 cm long and 5 cm wide. On each long side two bronze loops are attached; a fifth is fixed at one of the narrow sides. These were probably used to secure one of the queen's two model barques (either that of silver or that of gold) to the vehicle. This is the only wagon known from ancient Egypt equipped with such attachment devices. The one on a narrow side (presumably the front) might have been used to attach a hauling string, similar to the wagon in the tomb of Petosiris (Fig. 22),[95] which will be discussed below. The axles of Ahhotep's wagon are connected by struts 12.3 cm long and 0.4 cm thick. The bottom of the transport platform, made of sycomore wood, is positioned on the struts and the axles and is fixed by wooden pins and copper nails. Its four-spoked wheels are attached to the axles by linchpins.[96]

The wagon on the coffin of Ankhefenamun, now in Helsinki and dating to the Twenty-first Dynasty,[97] consists of a slim transport platform in the shape of a runner with four spoked wheels. The wagon transports a shrine in which the deceased lies beneath a baldachin. The scene exposes an uncommon feature: wheels that extend beyond the transport platform. Each wheel has eight spokes. No draft animals are present, but five individuals drag the wagon from left to right. This is also observed on the coffin of Amenemope,[98] dating to the same period. The towing rope runs to the bottom of the platform, where it is fixed. And, as on the coffin of Nesmut in the British Museum,[99] the *tekenu* lies under the wagon, between the wheels.

On the outside of the coffin of Djedmonthuiufankh now in Leiden,[100] a wagon with a very thin transport platform in the form of a sledge is shown. The object dates to the early Twenty-second Dynasty.[101] The wagon is moved from right to left by four individuals and two oxen by means of a traction rope, whose fixation is unusual. It falls down at a curious angle behind the person nearest to the vehicle and runs to the bottom of the runner, where it is wrapped several times around the runner and fixed with a loop. The other end of the rope runs over the backs of the oxen and disappears behind their withers. The oxen are decorated with ornamented blankets on their backs and a sun disk accompanied by plumes on their heads like those on the mummy bandage of Hetepimen (Fig. 27),[102]

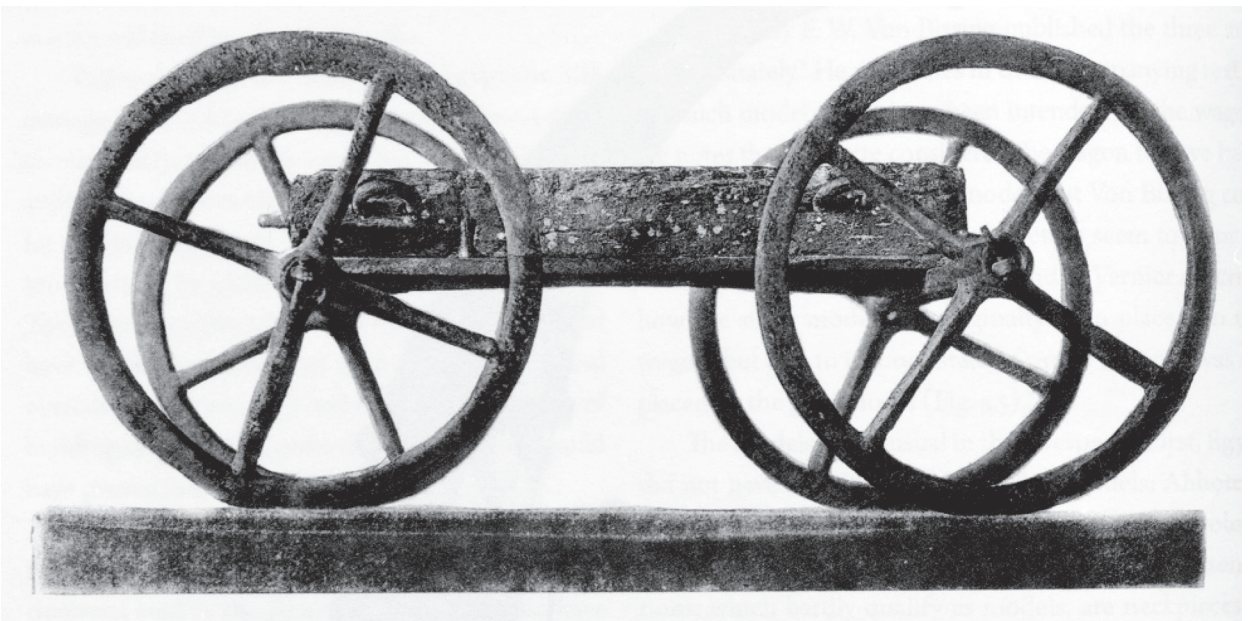

Figure 19: The wagon model of Queen Ahhotep with spoked wheels (after F. W. von Bissing, *Ein thebanischer Grabfund aus dem Anfang des Neuen Reiches* [Berlin: Duncker, 1900], pl. 10).

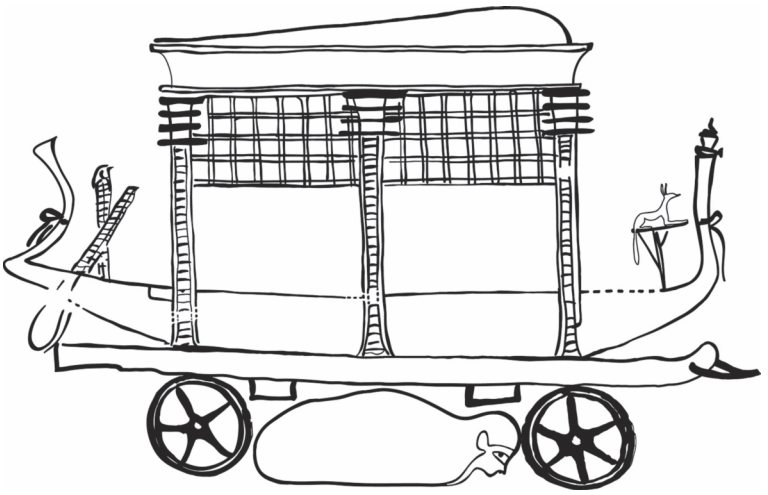

Figure 20: Wagon on the coffin of the priestess Djedmout, now in the Vatican Museum, with the *tekenu* lying beneath (© H. Köpp-Junk; drawing: A. Kireenko, after O. *Marucchi, Guide du Musée égyptien du Vatican* [Rome: Imprimerie polyglotte vaticane, 1927], fig. 11).

although the oxen in the Leiden scene additionally wear a necklace with the head of Hathor.[103] The wagon transports a barque with a catafalque covered by a baldachin. In contrast to most of the other scenes showing the transport of the deceased to the tomb, the departed is not visible here. The four wheels, represented by two circles beneath the transport platform, have eight spokes painted red and blue.[104] Shown in full, these wheels are placed under the transport platform without any physical means of connection to it being visible.

ANOTHER WAGON appears on the sarcophagus of the priestess Djedmut from the Twenty-second Dynasty, now in the Vatican Museum, transporting barque and shrine with the deceased in it (Fig. 20).[105] It lacks the additional baldachin often depicted in other examples.[106] Under the vehicle the *tekenu*[107] is pictured; besides this example, two other wagons are known with the *tekenu* beneath,[108] although in the other two cases the *tekenu* is wrapped in a cattle skin and not shown with a human face, its gaze directed upward, as is the case on the Vatican coffin. Usually the *tekenu* is illustrated being transported by a sledge,[109] while here it rests directly on the ground.

The wheels of the wagon are depicted as circles beneath the transport platform, with a varying number of spokes: the right one has six, the left one only five. Moreover, there seems to be around the wheel an additional wooden outer rim analogous to the attached wooden segments on the wheels of some Egyptian chariots (e.g., chariot A4 of Tutankhamun).[110] The wheels of the previously discussed Sobeknakht wagon from the Seventeenth Dynasty (Fig. 9)[111] are supposed to be made of two different kinds of wood as well, with one forming the outer rim and the other the inner disk.

The transport platform of the Djedmut wagon is represented as a sledge runner. Two rectangular objects protrude from the bottom of the platform between the wheels, perhaps intended as stabilizing beams for the individual components forming the wagon body.[112] A similar feature is observable in the wagon of Amenemope discussed above.[113] Five individuals and two oxen pull the vehicle by a hauling rope that passes through a hole in the runner. Again, three modes of transport are combined: sledge, wagon, and barque. The connection between wheels and transport platform is not portrayed.

IN ADDITION to the cart depicted in the Twenty-fifth Dynasty pyramid chapels of Meroe, a wagon with spoked wheels is shown in the same scene (Fig. 6).[114] Wheels with twelve spokes are half hidden by the body of the vehicle. The side elements of the wagon's superstructure curve slightly toward the top. In addition, there is a semicircular cut on the left-hand side. The wagon is not pulled by oxen, but rather by six individuals with the aid of a pole passing lengthwise through the wagon. Three of them are in the front of the wagon, the others behind it. Each wears over his shoulder something that might be a kind of sash or strap leading to the pole to make moving the vehicle easier. This is the only evidence for this unusual way to move a wagon. As mentioned above, the scene is interpreted as a funerary procession.[115]

LIKEWISE DATED to the Twenty-fifth Dynasty (reign of Taharqa) are the reliefs in the temple of Sanam, which show several different kinds of wagons (Fig. 21):[116] There are a wagon with six wheels and three depicted with four. A further vehicle might be a chariot.[117] The wheels of all of the wagons have six spokes. The bodies of the four-wheelers are rectangular and equipped with high side parts. It is unclear whether the draft animals should be identified as donkeys or horses.[118]

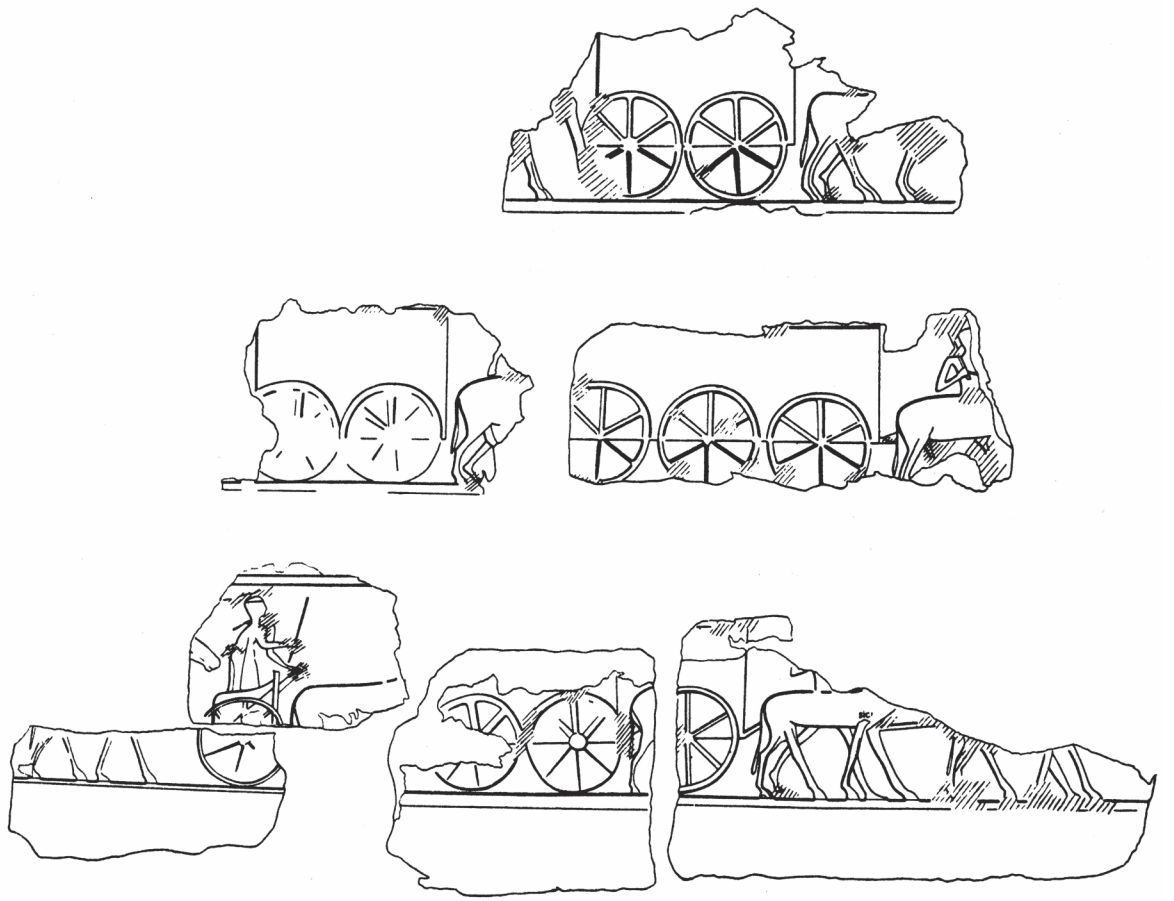

Figure 21: Wagons with four and six wheels in Sanam (after F. L. Griffith, "Oxford Excavations in Nubia," *Annals of Archaeology and Anthropology* 9 [1921–1922]: pl. 32).

In a painted raised relief in the tomb of Petosiris at Tuna el-Gebel,[119] dating to about 300 BCE, the earliest wagon with spokes featuring a curved profile is portrayed (Fig. 22). The wheels are provided with eight spokes, which are thinner toward the rim and broader in the middle, not straight as usual. They do not end in blossoms as do those on the wagon of Siamun (Fig. 24; to be analyzed below).[120] Although the left wheel is severely damaged, in contrast to some of the other depictions, which can be quite rough, this one is of excellent quality, being elaborated in painted relief. The wagon is dragged by three individuals with a rope attached to the vehicle by means of a metal loop, a practice used to draw sledges as well. A very flat barque is situated on a longitudinal object that might be interpreted as a flat transport platform with rounded ends. To explain it as carrying poles lying on the wagon body would be difficult, because the loop of the dragging rope is attached to it. Yet, the protruding ends are rounded and raised, while the middle part is flat, as represented in the relief.

Between the axles, a connecting beam of unclear significance is displayed; on the left-hand side it is depicted as being behind the wheel, on the right-hand side in front of the other wheel. Here, the outlines of the end of the beam are unclear; moreover, several depressions exist. The details (i.e., at one end behind and at the other in front of the wheel) are puzzling: It seems as if the beam is shown on the left from the outside and on the right from the inside, that is, displaying wheels number one and number three, with wheel two being hidden behind number one and number four not depicted at all. Another interpretation would be that the vehicle is a two-wheeler and we are looking at the axle.[121] But the transport of such a large load by cart would be difficult due to the unstable counterbalance. Moreover, the wagon is depicted in relief, while the mummy, which should be the most important object in this scene, is only painted; thus the focus moves to the wagon. Since on another wall of the tomb a turning

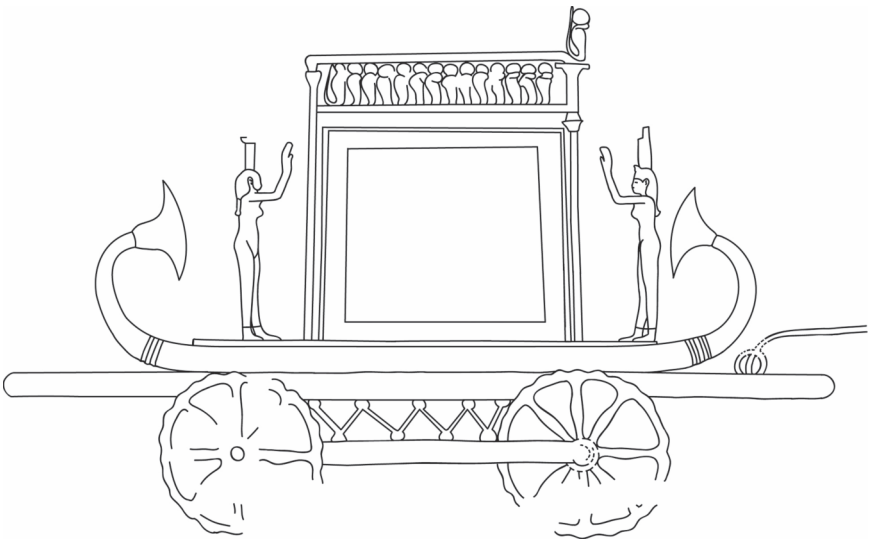

Figure 22: The wheels of the wagon of Petosiris have spokes with curved profiles (© H. Köpp-Junk; drawing: A. Kireenko, after Köpp-Junk 2015a, 145, pl. 10c).

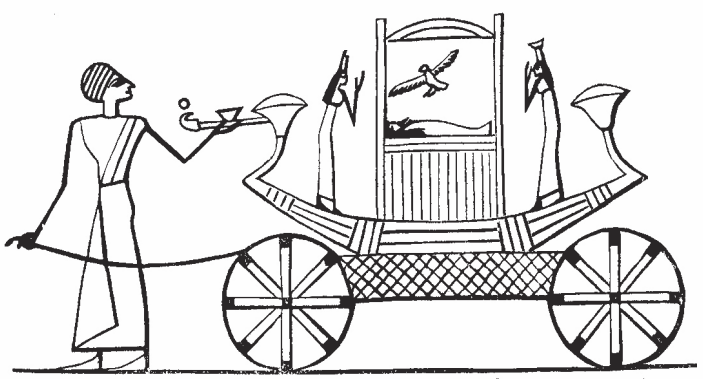

Figure 23: Wagon of the priest Hor: The wheels have eight bicolored spokes (after J. G. Wilkinson, *A Popular Account of the Ancient Egyptians I* [London: Murray, 1854], 384, fig. 337).

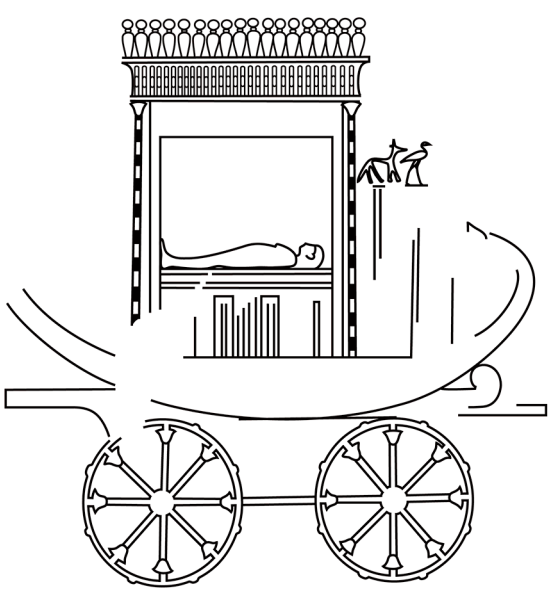

Figure 24: Four-wheeled wagon from the tomb of Siamun in the Siwa Oasis from the 1st century BCE (© H. Köpp-Junk; reconstruction drawing combining A. Fakhry, *Siwa Oasis* [Cairo: The American University in Cairo Press, 1973], fig. 74 and K. Lembke, "Aus der Oase des Sonnengottes—Das Grab des Siamun in Siwa," in P. C. Bol, G. Kaminski, and C. Maderna [eds.], *Fremdheit—Eigenheit: Ägypten, Griechenland und Rom. Austausch und Verständnis* [Stuttgart: Scheufele, 2004], fig. 9a).

lathe is depicted, the wagon scene might be intended to highlight crafting skills through the construction of a wagon and therefore show its most important features, such as the combination of wheels and axle and the turned spokes.[122]

Thus, the representational style either is incomprehensible to present viewers or might be a mere misunderstanding by the artisan,[123] who perhaps was unfamiliar with wagons and their "usual" representation. Maybe the inconsistent depiction is caused by the fact that the artist was of Greek instead of Egyptian origin and was thus unfamiliar with the typical Egyptian modes of depicting complex objects.[124] However, the beam might be interpreted technically, as one of two balks connecting the two axles with each other and functioning as a base support that fixes the distance between the axles and stabilizes the substructure of the vehicle body.

A zigzag design is portrayed between the balk and the longitudinal object. This might be either decoration on the outer part of the wagon body, a covering forming the wagon's body, or a kind of suspension system.

The wheels have a cog-like outer surface. This might hint that nails with large heads are attached to the outer rim of the wheel in order to minimize the wear of the tread.[125] This technique is known from the archaeological remains of wheels found in Kish and Susa dating to the 3rd millennium BCE, featuring nails on the thread close to each other.[126]

THE WAGON of the priest Hor is pictured on his linen mummy bandage no. 1, in the context of the vignette to spell 1 of the *Book of the Dead* (Fig. 23).[127] It dates from the end of the 3rd or the beginning of the 2nd century BCE. The wheels have eight spokes; they are straight and bicolored, with the ends of the spokes painted black. The wagon, which transports a barque with the deceased under a canopy, is pulled by one person. How the towing rope was attached to the wagon is not visible, since the rope ends at the outer rim of the left wheel. Similar to the wagon from the tomb of Petosiris (Fig. 22), a zigzag design appears between the axles and under the barque. Again it might be interpreted as a kind of wickerwork or covering of the vehicle's body or as a suspension construction.

THE FOUR-WHEELED wagon from the tomb of Siamun at Jabal al-Mawta (Siwa Oasis) dates to the 1st century BCE.[128] Today the depiction is severely damaged. A reconstruction combining the excavation results of Fakhry and Lembke[129] (Fig. 24) reveals that the combination of barque, sledge, and wagon is again apparent, as in the wagon scene in the tomb of Sobeknakht,[130] about 1,500 years older. Having a flat platform, Siamun's wagon serves as a transport vehicle for a shrine on a barque. Its wheels have eight spokes decorated with stylized blossoms toward the rim and a bumpy outer surface, indicating that nails with large heads were driven into the rim to reduce wear, as on the wagon of Petosiris (Fig. 22).

IN THE tomb of Petubastis in the Dakhla Oasis, dating from the 1st century CE, two four-wheeled wagons with spoked wheels appear; one is located on the east wall,[131] the other one on the north. The first (Fig. 25) has a flat transport platform and is drawn by four individuals.[132] The wheels have eight spokes. The wagon serves as a mode of transport for a shrine with the deceased lying on a lion bier and canopic jars beneath it. Only in this tomb are the latter depicted on the wagon, and they appear likewise on the east and the north walls. The towing rope is attached to a stake positioned on the front part of the transport platform. The transport platform and the wheel rims are painted red, spokes and hubs green, and the pulling rope and the stake black. The same colors are chosen for the corresponding elements of the wagon on the north wall. A person holding an arm-shaped censer and another person pouring fluid in front of the deceased are depicted in front of the vehicle. The same composition appears in the wagon scene in the tomb of Sobeknakht (Fig. 9). Contrary to most other depictions of wagons, all four wheels are visible but of different sizes. Again, it is a representation in perspective.

THE WAGON on the north wall of Petubastis's tomb at Dakhla[133] is also equipped with a flat transport platform. Unlike the other in this tomb, this one features a mismatch:

Figure 25: Wagon depicted on the east wall in the tomb of Petubastis (© H. Köpp-Junk; drawing: F. Junge, after J. Osing, J. 1982. "Die Gräber des Petubastis und Petosiris," in A. Fakhry [ed.], *Denkmäler der Oase Dachla* [Mainz am Rhein: von Zabern, 1982], pl. 22).

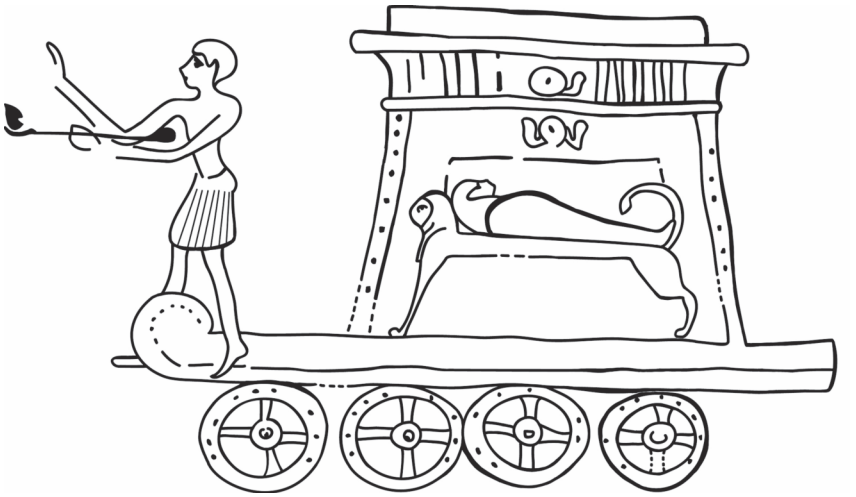

Figure 26: Four-wheeled wagon on the London mummy shroud with a representation in perspective (© H. Köpp-Junk; drawing: A. Kireenko, after Köpp-Junk 2015a, pl. 10e).

Two of the wheels have eight spokes, the others seven. Those with eight are a little bit bigger than the others, showing a representation in perspective. The wagon is drawn by only three individuals and, moreover, in the opposite direction of the other in this tomb. Again, the deceased is placed on a lion bier with canopic jars beneath it. This time, the lion bier is covered by a baldachin with a semicircular roof. A person in front of the baldachin pours a libation; another person moving in front of the wagon censes and performs libations.

The transport platform is thinner than that of the other wagon in this tomb. The fixing of the towing rope is not easily identifiable; it seems to be fastened to a small protrusion. Both wagons share a simplified representation, reduced to the basic elements of the vehicle: The transport platform is a simple red line, equipped with four wheels in the form of unequally sized circles, some of them seeming to hover over the ground. The connection between transport platform and wheels is unclear.

On the rear of the temple of Kom Ombo, a graffito of a four-wheeled wagon, dating to the second third of the 2nd century CE, is depicted.[134] The wagon transports a crocodile mummy. The upper part of the left side of the wagon is missing. On the right-hand side, a protruding transport platform is visible. The wheels have eight spokes, wider toward the rim and thinner toward the hub. The axles are attached to the transport platform by axle mounts. Between the wheels is depicted a crossing structure that might be interpreted as tension struts to stabilize the axle mounts. At the crossing point, they are attached to the bottom of the transport platform by five parallel stripes, presumably wrappings of a rope. On the right of the transport platform is a rectangular object that could be understood as a continuation of the outlining of the crocodile mummy or as a wagon part of unknown function. On the left, next to the wheel, the rest of another object is displayed. Because of the destruction in this sector, it is not evident whether this tassel-like object belongs to the crocodile or whether it is a part of the wagon, such as a dirt scraper. How the wagon was moved is not shown, since no individuals or animals appear to pull the vehicle.

As mentioned above, three terracotta models of wagons in the form of boats on wheels are known. The model with four disk wheels has already been described;[135] the other two have spoked wheels. All have two hollows in their upper surface. The wheels of the model now in Berlin have eight spokes. This small model of 17.5 cm dates to Greco-Roman times. One end of the boat is higher than the other.[136] (The third model, in the collection of the Louvre, will be discussed below.)

One of the wagons on the already discussed mummy shroud in London (Fig. 14) has spoked wheels (Fig. 26).[137] As mentioned above, the dating is variously given as Greco-Roman times[138] and the Roman Period.[139] All four of its four-spoked wheels are visible. The middle two wheels overlap each other a little bit, indicating that a perspective view is shown again, with the first and third wheel from left being in the foreground, the second and fourth in the background. Like the barque, the wagon is pictured freestanding. The transport platform has the shape of a sledge with a small protrusion at the front of the runner. As was the case with the wagons in the tomb of Petubastis, the transport platform seems to hover above the wheels, so that no technical details are visible. On the platform is a baldachin with a cavetto cornice and a torus molding, under which the deceased lies on a lion bier.

The Greco-Roman linen mummy bandage of Hetepimen (Fig. 27), in the Louvre,[140] features a vignette from the *Book of the Dead* showing a roughly depicted wagon equipped

with four wheels. The side view shows four wheels; the outer ones seem to be smaller than those in the middle, but the fact that the image is sketchily drawn on fabric might account for this. The number of their spokes differs, with the second from the right having only seven and the rest of them eight. The spokes present a star pattern and taper sharply from nave to rim. Each nave is marked with a red dot. The wagon is pulled by seven individuals and two oxen, which wear blankets on their backs and double plumes flanking a sun disk between their horns. The oxen shown in the wagon scene of Djedmonthuiufankh, now in Leiden (mentioned above), are likewise adorned.[141] On the flat, rectangular transport platform is a barque with the deceased under a baldachin decorated with a cavetto cornice, torus molding, and uraeus frieze, flanked by Isis and Nephthys. The bottom of the front part of the transport platform features a triangular structure of unclear function; it might be associated with the fixing of the pulling rope.

THE THIRD terracotta model, in the Louvre and 18 cm in length, is equipped with four six-spoked wheels. On one side of the ship a rudder appears; the stern rises higher than the bow. The wheels are attached to the lower part of the hull. The object is dated to the Roman Period.[142]

A DEPICTION of a wagon with four spoked wheels on a bier, found in tomb 20 in Dush in the Kharga Oasis, displays a slim transport platform with rounded ends. A barque with animal heads on each end (the so-called *Henu*-barque) is depicted on it.[143] Under the transport platform is the usual shrine belonging to the *Henu*-barque, which normally functioned as the resting place for the barque on a sledge and/or carrying poles.[144] In this scene in Dush, no poles or sledge runners are shown. On the barque lies the deceased under a circular canopy, crowned by a falcon. The wheels have four spokes without ornamentation; technical specifications such as the connection between transport platform and wheels or wheels and axle are not depicted. The vehicle dates to Roman times.

ONE EXAMPLE belonging to this group of wagons with four spoked wheels is of unclear date: a textile appliqué decoration on an ibis mummy. Similar to the example featuring a disk-wheeled wagon described previously, this mummy was found in Saqqara and can probably be dated to Greco-Roman times.[145] The god Thoth is represented as a baboon sitting in a shrine on a slim transport platform with two spoked wheels and a base line beneath it.[146] According to the drawing published by Boutantin,[147] the left wheel has six spokes, the other eight.

FOUR-WHEELED wagons with unspecified wheel types remain to be discussed.

On the coffin of Nesmut,[148] chantress of Amun, a wagon is depicted with its wheel type not clearly visible. The representation consists of a drawing that might be interpreted either as spoked wheels with four open blossoms forming the spokes or as disk wheels[149] with this floral design painted on it. Moreover, this depiction of the wheels is uncommon, since they are only partly shown. The left one is designed as a semicircle including a half-visible hub and axle end; the whole hub and the axle end of the right one are shown and, therefore, a greater part of the whole wheel. This is similar to the four-wheeled wagon in Meroe, where only the lower part of the wheels is pictured (Fig. 6). Nesmut's vehicle can be dated to the Twenty-first[150] and early Twenty-second[151] Dynasties. The vehicle transports a flat barque with a shrine containing the deceased and covered by a baldachin. It is dragged from left to right by five individuals and a pair of oxen with a towing rope attached by means of a hole through the top of the runner that forms the transport platform. As likewise appears on the coffin of Ankhefenamun now in Helsinki,[152] the *tekenu* covered by a bicolored cattle skin lies below the wagon, between the wheels.

ANOTHER EXAMPLE of a wagon with an ambiguous wheel type appears on an Alexandrine drachma from the reign of Trajan (53–117 CE).[153] A barque with four wheels is shown; two of them are visible. Due to the rough

Figure 27: On the linen mummy bandage of Hetepimen a wagon with spoked wheels is portrayed (© H. Köpp-Junk; drawing: A. Kireenko, after M. Étienne, *Les Portes du Ciel, Visions du monde dans l'Égypte ancienne. Exhibition catalogue Musée du Louvre, 6 mars—29 juin 2009* [Paris: Somogy, 2009], object no. 95).

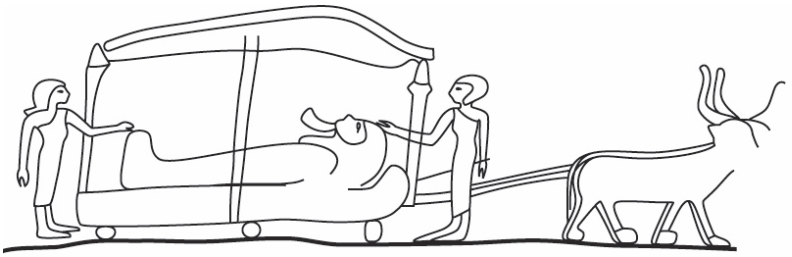

Figure 28: A wagon with six small disk wheels is roughly depicted on a mummy bandage now in the Dartmouth College Museum (© H. Köpp-Junk; drawing: A. Kireenko, after R. A. Caminos, "Fragments of the Book of the Dated on Linen and Papyrus." *Journal of Egyptian Archaeology* 56 [1970]: 120, pl. 53).

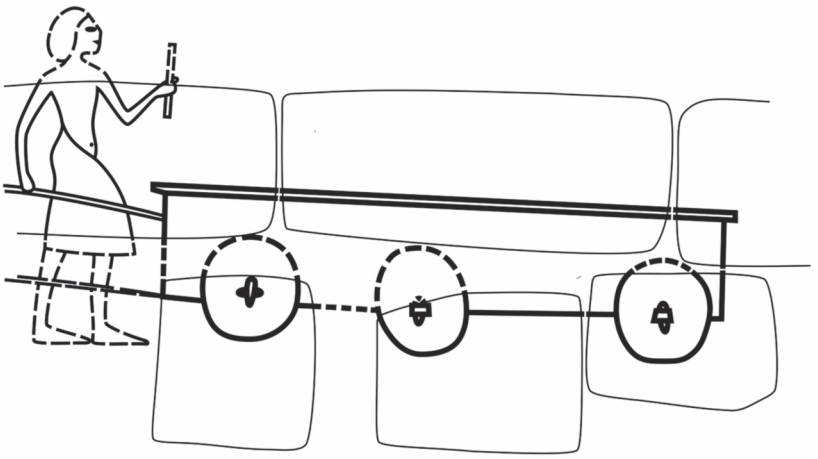

Figure 29: One of the four wagons with six disk wheels from the reliefs of the *talatat* blocks of the temple of Amenhotep IV/Akhenaten, Eighteenth Dynasty (© H. Köpp-Junk; drawing: F. Junge, after D. B. Redford, *The Akhenaten Temple Project II:* Rwd-mnw, *Foreigners and Inscriptions* [Warminster: Aris & Phillips, 1988], pl. 31).

depiction, it is not possible to determine whether disk or spoked wheels are represented. Each wheel is shown in relief as a round, slender "rim" with a dot in the middle; spoked wheels might perhaps be meant, but no individual spokes are visible. The barque, with a baldachin, seems to be positioned on a platform that might be interpreted as carrying poles. Under the barque seems to be a vehicle body, but due to the extremely small size of the coin and the manner of stamping, it cannot be identified with any certainty.

Overall, wagons with four spoked wheels are mostly depicted in a religious context, often in funerary processions; only for the terracotta models and the Sanam wagons are the surrounding contexts unclear. The spoke-wheeled wagons of Petosiris, of Siamun, of Petubastis, on the linen mummy bandage of the priest Hor, and on the London mummy cloth[154] resemble each other very much, although they cover a long period of time, from 300 BCE to the 1st century CE.

Wagons with six disk wheels

On a mummy bandage now in the Dartmouth College Museum, a wagon with six small disk wheels is roughly depicted (Fig. 28).[155] It is dated between the end of the Seventeenth and the middle of the Nineteenth Dynasty. The transport platform has the shape of a robust sledge with a baldachin over it, covering the sarcophagus. The disk wheels are as small as those on the wagons of Amenyseneb (Fig. 8) and Maiherperi (Fig. 10). Axles and linchpins are not visible. Pulled by two oxen, the towing rope is fixed to the runner, with the exact method being unclear due to the sketchy nature of the representation.

From the reliefs of the Karnak *talatat* blocks, four wagons with six disk wheels have been reconstructed (Fig. 29).[156] The disk wheels are fixed to the rectangular ends of the axles by linchpins. The vehicle bodies are box-shaped. The wagons serve as a mode of transportation for festively decorated bovines. Redford supposes that they are being brought to the temple for slaughter and that they had been so fattened as to be unable to walk alone and, therefore, required transport by wagons.[157] The wagons are pulled by groups of between 9 to 15 individuals. The outward appearances of the wagons are not identical. Some have a rectangular vehicle body, others are slightly curved. One is decorated with a kind of cavetto cornice. The depiction of how the hauling rope is fixed to the wagon varies as well, sometimes attached to the upper part of the box, sometimes the lower.

Regarding wagons with six disk wheels, the following points are noteworthy: The wagon on the Dartmouth College Museum mummy bandage is of a style completely different from those on the *talatat* blocks. The size of the disk wheels is distinctive as well, since those on the bandage are quite small, whereas those from the temple of Amenhotep IV/Akhenaten are larger. Moreover, the former is drawn by oxen, the latter by individuals. Because the Dartmouth College Museum example shows the transport of the deceased to the tomb, the scene clearly presents a funerary context. The four wagons on the *talatat* blocks, however, depict the movement of decorated cattle, which is, potentially, a mundane transport situation; however, the interpretation of Redford, who argues that they were brought to the temple for slaughtering,[158] suggests a religious occasion.

Wagons with six spoked wheels

The six-wheeled wagon in the Sanam temple (Fig. 21),[159] appearing in the same scene as the four-wheelers described above, dates to the Twenty-fifth Dynasty, more precisely the reign of Taharqa. The wheels have six spokes; the vehicle body is rectangular and box-shaped with high side bars. As mentioned previously, the draft animals of the wagon might be horses or donkeys.

The papyrus of Hornedjitef[160] from the 1st century BCE (Louvre Museum) shows a six-wheeled vehicle as a part of the funerary procession. Four individuals pull the wagon from right to left. The wagon box narrows slightly toward the wheels and has vertical lines reminiscent of a cavetto cornice. The towing rope leads to the middle of it, but it is not clear how it was fixed at that point. Above it is a narrow object with rounded ends that might be interpreted as the very top of the wagon chassis or as carrying poles. Above it is a flat barque with a canopy, flanked by two goddesses. The deceased lies on a pedestal inside the baldachin. The three visible wheels, each drawn with three circles, have six spokes. These three circles can be interpreted as the outer rim of the wheel, a stabilizing second one in the middle, and the third one as the hub. This is the only wagon known from ancient Egypt with this special type of wheel. In principle, the wagon looks quite similar to that of Petosiris (Fig. 22) and others appearing in funerary processions and are equipped with a flat barque and baldachin, but all of these others have four wheels instead of six.

As is the case with wagons with six disk wheels, those with six spoked wheels do not resemble each other stylistically. The one depicted in the Sanam temple has a high wagon box, whereas the chassis of the one now in the Louvre is of a completely different shape. While the Louvre example appears in a funerary and, therefore, religious context, the circumstances in which the wagon with six spoked wheels in Sanam appears are unclear but seem to be rather profane.

Wagons with eight disk wheels

About 15 limestone reliefs, each about 20 by 32 cm in size, show the Apis bull on a wagon.[161] Five are now in the Egyptian Museum, Cairo,[162] while there is one each in Berlin,[163] Cambridge,[164] Hildesheim[165] (Fig. 30), Leiden,[166] and the Louvre Museum,[167] with an unfinished example in Leipzig,[168] two in the Saqqara magazine of the Supreme Council of Antiquities,[169] and two in uncertain locations.[170] Two of them come from Kom el-Fakhry, having been "found south-east of the temple of Ptah" in 1941;[171] others are supposed to be from Mit Rahina,[172] more precisely from the embalming house of the Apis bull.[173] A provenience of the Memphite area is assumed for all of them.[174] The dating of the reliefs varies between the Twenty-sixth Dynasty,[175] the Ptolemaic Period,[176] and Greco-Roman times,[177] and is discussed in detail by Boutantin,[178] who suggests a date between the 1st century BCE and the 1st century CE.[179]

All but one of these wagons resemble each other in regard to style and design: One of the Cairo examples[180] differs a little bit, being quite rough, with the relief having sharper edges than on the others. The wheels of the Berlin example are missing, but it is obvious that the object belongs to the same type as the others. On some, traces of red color remain.[181] Despite these minor differences, all picture the same object: a freestanding wagon carrying the Apis bull, depicted on a relief slab with no surrounding scene. A flat barque with the Apis bull in a catafalque wearing a sun disk between the horns is shown being transported aboard a massive wagon with disk wheels. The vehicle body is rectangular and extends to the axles. It has a protruding transport platform. Often, the linchpins are visible. The wagons differ in other details as well: On one of the wagons from Kom el-Fakhry[182] the uraeus frieze on the baldachin is lacking; moreover, some kind of "buckles" are visible above the wheels, maybe functioning as dirt scrapers to prevent dirt, mud, or the like from fouling and blocking the wheels. Depicted on the right and the left of the upper vehicle body of one of the Cairo reliefs[183] are four elongated objects that do not appear on the other examples. The most reasonable interpretation is that these are poles on which the barque was placed for carrying during the cult event. For six of the discussed examples, the line of sight of the Apis bull (and hence probably the direction of travel) is to the right, and for at least eight others to the left. At least six show Isis and Nephthys flanking the baldachins. No scene shows how the wagon was moved.

Eight wheels on the wagons might seem strange and calls for further discussion. The wagons are depicted in side view, and four disk wheels are visible. Before the Greco-Roman Period, illustrations showed only half the number of the actual wheels. In Greco-Roman times, however, the total number of wheels is often pictured, often using differing distances among them and diverse sizes to present the illusion of perspective, namely that one pair of wheels is farther from the viewer. However, since these features do not appear in the scenes of the Apis

Figure 30: One of the wagons transporting the Apis bull (© Roemer- und Pelizaeus-Museum Hildesheim, Inv.-No. PM 1876, photograph: archive, courtesy of the Roemer- und Pelizaeus-Museum Hildesheim, Germany).

wagons, it can be argued that a representation in perspective was not intended. This would imply that, as in the depiction of the Siamun wagon (Fig. 24), half of the wheels are shown and that the total number of wheels is eight. This is supported by the fact that the load is obviously very heavy and the vehicle itself is massive. Moreover, the body of the vehicle appears long enough to necessitate the use of four axles: If only two axles were present to support the obviously heavy load, it would be unfavorably distributed and the floor of the vehicle might begin to sag. Together with the fact that in Greco-Roman times transport wagons equipped with even twelve wheels are known,[184] it seems justifiable to conclude that the Apis wagons had eight wheels.

THESE EIGHT-WHEELED wagons appear in a religious context, the transport of the Apis bull. Although there are minor differences among them, such as direction of movement or traces of paint, the wagons clearly belong to the same type of vehicle.

ANALYSIS OF EGYPTIAN CARTS AND WAGONS

Wheel and wagon were not invented in Egypt, but were adopted from outside. This is not the place to discuss the origins of wheeled vehicles in detail[185] or from where the idea "wheeled transport vehicle" came, since both are comprehensive research topics on their own. Therefore, the following will focus on the analysis of carts and wagons attested in Egypt.[186]

As demonstrated above, the individual examples derive from a variety of sources very different from each other: paintings and reliefs on tomb or temple walls, coffins and mummy shrouds, models made of wood and metal, actual wagons, and impressions on coins. Iconographic sources especially are often very rough and consequently difficult to compare, so the following conclusions have to be stated with the utmost caution.

ALL OF the known carts and wagons have in common the fact that they were used as a means of transport but not as a mode of locomotion for passengers (as were, for example, European medieval travel carriages[187]). In the

iconographic evidence, Egyptian carts are always drawn by oxen. The same applies to wagons in almost all the cases as well; equines—whether horses, donkeys, or mules—as draft animals can be seen only in the Sanam temple. While in earlier times the oxen are not decorated, those that draw the Twenty-second Dynasty wagon of Djedmonthuiufankh and those on the Greco-Roman mummy bandage of Hetepimen (Fig. 27) have blankets on their backs and a sun disk flanked by two plumes on their heads.

Some wagons are moved by men instead of draft animals, or by a team of both with individuals guiding the animals. The wagon depicted in Meroe (Fig. 6) is moved by six people with the help of a pole instead of a towing rope, which is usually used as a traction device. The fixing points on the vehicles are different. In the case of the wagon of Amenyseneb (Fig. 8), the pull rope runs through a loop fixed beneath the runner, although more often it is attached to a loop above it. On the wagon of Djedmonthuiufankh,[188] the pull rope is wrapped around the runner itself. The wagon of Sobeknakht (Fig. 9) is the only example drawn with a double rope; it is not attached to the runner but seems to encircle the front axle. The wagon of Amenemope[189] is unique as well regarding the towing rope, since it is attached to the barque and not the wagon. The direction of motion of the wagons transporting the deceased varies.

The first wheel in Egypt was a disk wheel, attached to a scaling ladder and not to a vehicle in the narrower sense. No tripartite disk wheels or those with mass-reducing cavities are known from ancient Egypt. The disk wheels on the wagon of Sobeknakht are interpreted as consisting of two different kinds of wood.

Spoked wheels are attested on carts and wagons since the New Kingdom. On carts, the number of spokes varies between four and eight. While the earliest cart, from the Eighteenth Dynasty tomb of Duauneheh (Fig. 3), has four spokes, those depicted in the battle of Kadesh[190] have six, the cart in Meroe even eight (Fig. 6). This seems to indicate an increase in the number of spokes over the course of time, but the group of known carts is, of course, too small to form any reliable conclusions from this apparent pattern.

Regarding wagons, the number of spokes lies between four and twelve. The Eighteenth Dynasty Ahhotep model (Fig. 19), the oldest wagon with spokes, has four spokes, but the wagon from the mummy shroud in London from Greco-Roman times has four as well (Fig. 26).[191] Most of the wagons with spoked wheels, especially those from the Third Intermediate Period and Greco-Roman times, have eight spokes, but there is no chronological order in the sense that the number of spokes increases: In the Twenty-first and Twenty-second Dynasties three have eight-spoked wheels, whereas the three Twenty-fifth Dynasty Sanam wagons (Fig. 21) have six-spoked, and their contemporary at Meroe has twelve-spoked (Fig. 6). The wagon of Hornedjitef[192] from the 1st century BCE and one of the wheeled terracotta models dating to Roman times[193] have again six spokes, while the late two-dimensional representaitons of wagons of Petosiris, Hor, Siamun, and Petubastis, the terracotta model in Berlin,[194] and the wagon in Kom Ombo have eight.

Considering the chariot, the oldest specimen, dating to the beginning of the Eighteenth Dynasty and now in the Museum in Florence,[195] has four spokes; it is contemporaneous with the wagon of Ahhotep, whose wheels have four spokes too. The cart from the tomb of Duauneheh, dating likewise to the Eighteenth Dynasty (a little later than Ahhotep's), is also equipped with four spokes.

While six-spoked wheels are already attested in Eighteenth Dynasty chariot depictions (i.e., in the reigns of Thutmose III and Amenhotep II), and in the life-size specimens found in the tomb of Tutankhamun,[196] they appear on carts only in the Nineteenth Dynasty, in scenes of the battle of Kadesh at Abu Simbel and the Ramesseum (Figs. 4–5).[197] The oldest wagons with six-spoked wheels are those from the Sanam temple, dating to the Twenty-fifth Dynasty. Therefore, there is a delay of more than 700 years between images of six-spoked chariots and those of wagons with the same number of spokes.

Wheels with eight spokes prevail on wagons but are seldom documented on chariots. According to Hofmann, chariot wheels with six spokes have the most favorable breaking strength; thus these prevailed on chariots for constructional reasons. Moreover, the manufacture of wheels with eight spokes was much more complex.[198] Nevertheless, in the Eighteenth Dynasty, four and even eight spokes can be observed on chariots; six spokes, however, prevailed since the reign of Akhenaten.[199]

Information on the construction of wheels for wagons or carts is rare, but the construction of chariot wheels is known. These have a diameter of 0.88–1.0 m. The spokes are often made of two pieces of elm wood of about 1 m in length, which were bent in a V-shape with an angle of 60° and fixed together. Through this construction technique they were more solid than those made of one piece.[200] Nevertheless, the wheels of the chariot now in Florence have one-piece spokes 2.8 cm wide and a tread of only 2 cm.[201] It can be assumed that thicker spokes were necessary for transport wagons and carts because of the greater load they had to carry, but no actual specimen survives from ancient Egypt to verify this.

The possibility of mutual influence between the wheels and other constructional features of chariots and those of wagons and carts cannot be excluded. Nevertheless, one has to keep in mind that these various vehicles had different scopes of application and, therefore, varying optimal ratios between weight and stability. While wagons and carts served as mode of transportation and were, therefore, solidly constructed, the Egyptian chariot was used for high-speed locomotion and was, thus, very light. The weight of the Florence chariot is 24 kg;[202] for wagons on spoked wheels, weight data is hard to find[203] and not available for an Egyptian example at all, since wagons on

spoked wheels are only attested by the Ahhotep model or two-dimensional iconographic sources. However, for least a vague idea of the difference in weight between an Egyptian chariot and a transport vehicle, the replica of a European Neolithic wagon on four disk wheels can be mentioned: It weighs 259 kg, half of which is its wheels.[204]

There is no trend in Egypt that wagons with spoked wheels supplanted those with disk wheels. The wheel type is, thus, of no chronological significance, since disk wheels were still in use in the Third Intermediate Period and Greco-Roman times. From a practical point of view, the deciding factor for the choice between a wagon with spoked wheels and one with disk wheels is the weight of the load to be transported and the quality of the road or the surface of the track.

MOREOVER, THERE is no chronological development concerning the number of wheels. Vehicles with four wheels appear first in the Thirteenth Dynasty with that of Amenyseneb (Fig. 8). Those with six wheels appear in the Seventeenth-to-Nineteenth Dynasty Dartmouth College example (Fig. 28), and in the Eighteenth Dynasty on the *talatat* blocks (Fig. 29), but these do not supersede the four-wheelers, which remained in use during these periods. The same applies to vehicles with eight wheels; again, those with four and six wheels were still in use. Therefore, the number of wheels is no dating criterion but depends on the size of the vehicle and the load.

Regardless of the type of wheel, protection measures for the outer rim of the wheel are seldom attested. The outer rim of the wheels of the wagons of Petosiris in Tuna el-Gebel, dating to 300 BCE (Fig. 22),[205] and the one of Siamun in Siwa from the 1st century BCE[206] (Fig. 24) seem to be protected by nails. Tires of wood[207] or leather[208] to protect the tread—as is known from chariots—are not attested with certainty on Egyptian carts and wagons. Only for the wheels of the wagon of the Twenty-second Dynasty priestess Djedmut (Fig. 20)[209] can it be argued that something like that might be depicted.

CONCERNING THE chassis, one of the oldest carts (that depicted in the Eighteenth Dynasty tomb of Duauneheh; Fig. 3[210]) is built of narrow wooden boards. This construction technique is attested only in this case and does not occur in wagons or even chariots. The box-shaped chassis of the carts depicted in the battle of Kadesh (Figs. 4–5) do not show an inner structure, so that their construction is unclear beyond that they were of a rectangular shape and had high side panels. A similar statement could be made about the cart depicted at Meroe (Fig. 6), although the side panels in this case are even higher.

The chassis of a wagon is of a different design. It might consist of a chassis in the proper sense, as a flat transport platform, or in the shape of runners (= three types). The wagons from the time of Amenhotep IV/Akhenaten (Fig. 29), as well as those in the temple of Sanam (Fig. 21), have rectangular wagon boxes with high side panels. Most of the other wagons have no vehicle body in the usual sense, but a long, protruding, and flat transport platform instead. Often, but not always, it has the shape of a sledge runner platform instead. It is noteworthy that they appear on only wagons, not carts. Some kind of wickerwork is observable on the wagon of Petosiris (Fig. 22) and Hor (Fig. 23), reminiscent of the leather network that formed the standing platform of the crew on Egyptian chariots.[211]

In general, if a sledge is depicted as a transport vehicle on its own in ancient Egypt, it is usually shown in side view; depictions from the top—as in the tomb of Senet in Thebes from the Twelfth Dynasty[212]— are very rare. Not a single wagon scene, however, shows two runners in a bird's-eye view. The basic question concerning these flat, runner-shaped transport platforms is how they were constructed. They might consist of either two runners with a continuous surface between them or two runners with several crossbeams in the style of the sledges preserved in their original form and size, such as the one from Dahshur.[213] More than two runners, connected with crossbeams or with a continuous surface, are possible. Moreover, they sometimes could be constructed in the shape of a Native American toboggan (Fig. 31), designed again with a continuous surface and a high front part. Transport platforms without runners might likewise consist of two longitudinal beams with crossbars such as those of the Medinet Madi wagon (Fig. 17); again, more than two beams are possible. Instead of crossbars, a solid surface could connect them. Conclusions regarding these various modes of construction cannot be made due to the great gap in time between Amenyseneb's wagon of the Thirteenth Dynasty and those from Greco-Roman times; one style of construction might apply to one individual vehicle and another to the next.

Rectangular beams are observable on the wagons depicted on the sarcophagus of the priestess Djedmut in the Vatican Museum (Fig. 20) and that of Amenemope in the British Museum.[214] These could be interpreted as stabilizing planks to strengthen the construction of the transport platform. Although these wagons show the combination of boat, sledge, and wagon, they demonstrate that the sledge is an integral part of the vehicle and not usable separately as a sledge; the rectangular objects beneath the runner render them unsuited for being drawn over the ground.[215]

REFERRING TO vehicle type, especially concerning wagons, it should be noted that nearly all of them are unique pieces. Exceptions are, for example, the Apis wagons, the wagons in the Sanam temple, and those on the *talatat* blocks. Some of them can be grouped into types, others (e.g., the Kom Ombo wagon) not. Thus, although the wheeled vehicles of Egypt are individual items, some classification can be made:

Figure 31: North American toboggan, drawn by dogs (after an historic engraving).

Type	Description
I:	military equipment on two wheels (scaling ladder and siege tower; Figs. 1–2).
II:	the transport carts of Abu Simbel and the Ramesseum (Figs. 4–5).
III:	barques on wheels (Fig. 14).
IV:	four-wheelers with a transport platform and a baldachin:
IVa:	with an additional depiction of a barque (Figs. 9, 22, 24);
IVb:	without a barque (Figs. 25, 26).
V:	sledge wagons (Fig. 11).
VI:	Apis wagons (Fig. 30).

As stated above, these different types do not develop from each other. Several of these various kinds of vehicles are attested at the same time, without eclipsing one another.

As a matter of principal, however, two kinds of wheeled objects should be differentiated. One involves objects with wheels directly attached, such as not only the scaling ladder and the siege tower but also the sledge wagon of Sennedjem, because the wheels are an integral part of it. This group is summed up by the formula:

{(load + wheels)}

The second kind adds a transportation platform to the this "object on wheels" system, allowing the transport of a freely selectable load:

{load + (transport platform + wheels)}

Thus, the invention of the wheel in itself was not the revolutionary innovation,[216] but rather the combination of wheels with a transport platform, which offers the possibility of transporting a variety of products and loads.

In Egypt, the well-known transport vehicle "sledge" that had existed since the First Dynasty was enhanced to create the new vehicle "wagon" by the addition of the innovation of the "wheel." The same applies to the barques on wheels (for example, that shown on the mummy shroud in London): again, wheels were added to watercraft that had been in use since the 6th millennium BCE at the latest.[217] Therefore, the Egyptian wagon and its body were not a completely new construction but rather an extension already existing objects.

With regard to the occurrence sequence of objects on wheels in Egypt, the following chronological order is observable:

- Fifth Dynasty: scaling ladder (tomb of Kaemheset, Fig. 1);
- Eleventh Dynasty: siege tower (tomb of Intef, Fig. 2);
- Thirteenth Dynasty: first four-wheeled wagon, equipped with disk wheels (stela of Amenyseneb Fig. 8);
- Seventeenth Dynasty: earliest chariots (see below);
- Eighteenth Dynasty: earliest four-wheeled wagon with spoked wheels (tomb of Ahhotep, Fig. 19); earliest carts on spoked wheels (tomb of Duauneheh, Fig. 3), as well as the oldest six-wheeled wagons on disk wheels (those from the *talatat* blocks, Figs. 28–29);
- Twenty-fifth Dynasty: earliest six-wheeled wagons on spoked wheels;
- 1st century BCE to 1st century CE: wagons with eight disk wheels transporting the Apis bull (Fig. 30).

The first objects on wheels are the scaling ladder and siege tower. There are no transitional forms between those

and the first "real" vehicle, the wagon. Technically it was a massive technological leap from the first use of the wheel combined with the scaling ladder to the complex system "wagon," such as the one in the tomb of Sobeknakht, since three techniques had to be joined together:

> *the principle of rotation*, i.e., the turning of a wheel on an axis;
> *the combination of a transport platform with wheels and axis*;
> *a traction system* transposing the tractive power of animals or individuals into action.[218]

Therefore, it can be suggested that predecessors of the Sobeknakht wagon existed, but they are not yet documented.

According to the ancient Egyptian chronological sequence, the first observed vehicle in the narrower sense (i.e., a wheel combined with a transport platform) is a wagon, which is attested earlier in ancient Egypt than the chariot. An influence of the chariot on carts and wagons is not apparent, but, of course, the possibility cannot be excluded—maybe in the sense that carts and wagons paved the way for the introduction of the chariot by demonstrating the feasibility of traffic with wheeled vehicles, even if on a restricted scale (see below). However, the introduction of the chariot seems to have no impact on the frequency of the use of wagons, since the apparent number of wagons seems to be limited until the end of the New Kingdom and begins to increase only in the Third Intermediate Period.

Thus, there is no consecutive development line from chariot to wagon. Furthermore, there is no clearly identifiable development from wagon to chariot, due to their different areas of application, as discussed above. In general, it is noteworthy that wheeled vehicles with two[219] and four wheels[220] are attested since their first appearance in the 4th millennium BCE, both serving as transport vehicles. But a vehicle serving military purposes, such as a chariot, needs to fulfill criteria different from those of a vehicle used for transport of objects or goods. Therefore, war vehicles branched off into an evolutionary line of their own. The initial models of war cars and battle wagons[221] were equipped with four wheels, as on the Standard of Ur now in the British Museum, dating to the mid-3rd millennium BCE.[222]

Both types of vehicles (i.e., transport vehicle and chariot) were adopted by Egypt from outside sources, each at various times, with the first wagon being attested in the Thirteenth Dynasty and the earliest evidence for the chariot in the Seventeenth. No four-wheeled chariots are documented in Egypt; the oldest chariot found as an actual artifact, as well as the first depictions, show the Egyptian chariot already in its classical form as a light two-wheeler drawn by two horses.

Concerning Egyptian carts and wagons, a development from one type of vehicle to another is also not observable, nor is a developmental line from a massive vehicle to a lighter one. In addition, due to the often very rough depiction of carts and wagons, technical development concerning the wheel construction or the connection of axle, wheel, and chassis is unascertainable.

The number of wagon depictions with four wheels exceeds those of wagons with six or eight. The total number of depicted wagons increases in the Third Intermediate Period and even more in Greco-Roman times. A noteworthy resemblance exists between the wagons from the tomb of Sobeknakht and that of Siamun, especially since both show the combination of wagon, sledge, and barque. This hints at the fact that the forms of wagons of the Greco-Roman Period are not foreign imports but can be traced directly back to Egyptian predecessors.[223]

Carts and Wagons—More than Mundane Transport Vehicles?

The contexts in which wagons and carts appear need to be considered more closely. Again, the subsequent remarks are based on the relatively sparse evidence presented above, which extensively relates to areas of social and economic life: A majority of evidence comes from temples, tombs, and burial equipment.

Regarding the local context in which they were found, they are documented along the Nile at, for example, Saqqara, Memphis, Elkab, Tuna el-Gebel, Abydos, Thebes, Abu Simbel, Sanam, Meroe, and the Fayum, the Siwa, Dakhla, and Kharga Oases. Of course this does not imply that they were or could be used in these places, but for the oases, free from the effects of the annual Nile flood, the preconditions for wheeled vehicles were better than in the Nile Valley. Nevertheless, the wagons are often shown transporting the deceased; since the cemeteries lay outside the inundation area, wagons could be used when suitable tracks existed to drive to and from the tombs. Maybe for times when they were not in use there were special stations for their parking similar to those known for royal messengers on chariots.[224]

Besides funerary processions, carts and wagons were used as mundane modes of transport, as an expedition text[225] from the Wadi Hammamat, dating to the time of Ramesses IV, shows. There, oxen drawing vehicles designated as *ʿgr.t* are mentioned for the transport of the workers' supplies. The wagon on the stela of Amenyseneb[226] is depicted in a harvest scene, as is the cart in the tomb of Duauneheh,[227] a context in which wheeled vehicles from the 4th and 3rd millennium BCE in Europe, the Near East, and the Caucasus rarely appear.[228]

Moreover, wheeled vehicles are attested in particular areas of usage, such as warfare and religious contexts. The scaling ladder and the siege tower occur in scenes of warfare as military devices. Several carts are depicted in the scenes of the battle of Kadesh as transport vehicles.[229] The Gebel Barkal stela of Thutmose III mentions that wagons were used as mundane means of transport in the military context for the transport of dismantled ships.[230]

However, the majority of wagons are shown in funerary

contexts transporting the deceased or in religious settings associated with certain gods, such as Thoth and the Apis bull. Besides the iconographic sources stated above, there is also textual evidence, since a four-wheeled wagon was used for the transport of the statue of the god in Herodotus's description of a festival in Papremis in the 5th century BCE.[231] Interestingly, except for the one in the Meroe temple (Fig. 6), carts do not appear in religious contexts in ancient Egypt, but their appearances in the iconography is of course very restricted, so this omission might be a mere coincidence.

Thus, carts and wagons share the same functional aspect in these contexts: they serve as mundane transport vehicles. The question arises as to whether they have further importance beyond this status. Due to the fact that the evidence for carts and wagons is of a very different nature and that they are attested in diverse contexts, their symbolic significance cannot be generalized. They might even have several layers of meaning that we would today interpret differently from what was originally meant, since connotative codes can be lost over the course of time.[232]

Even so, to answer this question, a closer look at the contexts in which wagons appear should be taken. The significant number of scenes showing the movement of the deceased by wagon seems to be particularly noteworthy in this regard. Nevertheless, there is much more iconographic evidence for sledges transporting the mummy than for wagons; wagons still appear as rare exceptions. The explanation is that wagons represent a new and innovative vehicle, while the customarily used sledge, frequently attested since the First Dynasty, embodies tradition and a reliable and stable mode of transport that had proved itself for more than a thousand years.

When one analyzes wagons found as artifacts, models, or depictions on tomb walls of the upper class and the pharaoh, some facts are noticeable. No full-size wagons have been found as burial objects in elite tombs or in a royal burial, a practice known from the Hallstatt and La Tène periods in Europe,[233] where these vehicles are attested in male and female burials.[234] Although models of boats are frequently documented from Predynastic times onward (see below), only two wagon models have been discovered: one from Thebes, belonging to Queen Ahhotep, the other from tomb no. 611 at Gurob.

Moreover, wagons are attested in wall paintings of elite tombs but not royal. The decoration program of the latter differs very much from that of the elite, since in royal burials the focus rests on religious scenes and texts, in which the usual means of transportation are watercraft; the representation of a sledge in the tomb of Tutankhamun is an exception.[235] The same applies to the carrying chair: While palanquins, carried by individuals or even donkeys, appear now and then on the walls of the elite tombs in the Old and Middle Kingdoms,[236] they are not portrayed in the contemporaneous wall scenes of the royal pyramids, in which attention is drawn again to ritual texts. Similarly, there is no depiction of the pharaoh in a chariot in the painted wall scenes of royal tombs, although these vehicles are frequently represented on the walls of elite tombs. The reason lies in the fact that different conditions apply to the elite and the king; contrary to the documentation of secular prestige in elite tombs, religious texts and scenes from the *Amduat*, for instance, constitute the main decoration scheme for the royal burials, with boats being the most important mode of transportation.[237] Therefore, depictions of boats and sledges as well as carrying chairs, wagons, and chariots appear on the tomb walls of the upper class, while in royal tombs the traditional means of transport predominate. Hence, members of the elite decorate their tombs with innovations, whereas the king, the maintainer of Maat, represents tradition and heritage, implying a chronological depth and eternity. In this context, however, the terms "innovation" and "tradition" are not antonyms, with tradition being connoted negatively, but rather innovation represents, in this case, present and future, while tradition is the appreciation of cultural heritage.

Especially concerning the wagon, tradition and innovation complement each other: The transport platform is often in the shape of a runner; other wagons consist of barques equipped with wheels. Therefore, the innovational vehicle, the wagon, is based on the traditional vehicles of sledge and ship.

In connection with this fact, another aspect should be taken into account. The religious connotations of watercraft are evident, since they served as a means of transport to the tomb and even in the afterlife. They have been of highly religious significance since the earliest times,[238] being attested as burial equipment such as models of boats or ships,[239] as objects (e.g., pottery vessels) with ships or boats painted on them,[240] and as wall paintings and reliefs within tombs. Royal burials were equipped with full-sized boats and ships beginning with the First Dynasty,[241] and with models[242] of ships and boats instead from the New Kingdom onward.[243] This religious connotation is also recognizable in sledges,[244] which were frequently used in funerary contexts. Since wagons are often combined with barques and sledges, with runners being an integral part of wagons and, in their capacity as the transport vehicle of the deceased, they too might imply a certain religious connotation, albeit perhaps to a lesser extent than boats and ships. This aspect is not observable for carts, which do not appear as a transport vehicle of the deceased.

FURTHERMORE, A possible prestigious connotation of carts and wagons should be considered.[245] Several of the following observations should, of course, be viewed with caution, due to the scarce evidence. If one assumes that the small number of records in archaeological and iconographic sources reflects how widespread they were in ancient times, only a small number of wagons existed in Egypt. This implies that people had rather limited access to them, giving these objects a special attraction. Furthermore, their possession distinguished the owner from the crowd. Although no costs are attested for wagons

and carts in Egypt up to the end of the New Kingdom,[246] there are some for draft and other work animals. The price for an adult bovine in the Ramesside period was between 100 and 141 *deben*, while costs for a donkey ranged between 25 and 40 *deben*.[247] The monthly income of a member of the tomb-worker community at Deir el-Medina was 25–30 *deben*;[248] therefore, the price of a donkey corresponds to their monthly salary, while four incomes were necessary for an ox. Since for a wagon two oxen as draft animals were necessary, the pricing structure begins with wagons as the means of transport with the highest costs, followed by the oxen. The cheapest was the donkey.[249] Using a wagon to transport the deceased to the tomb or, at least, depicting such an event in one's tomb shows the tomb owner belonging to a social class able to afford the higher costs. It can be assumed that wagons were considered luxury vehicles, as they were rarely seen and very expensive to purchase and maintain, since not only the vehicle but also the draft animals had to be bought as well. Carts as well as wagons meet the criteria for prestigious objects: they are rare, expensive, and accessible only to a few. Whereas wagons were used (or at least depicted) by the elite for transportation of the deceased to the tomb, carts were not.

Basically, a transport vehicle is "nothing special" unless it appears in particular contexts. The question raised above can be answered positively: Besides functioning as mundane freight vehicles, carts and wagons were prestigious objects. Wagons were used in religious contexts, especially for transporting a god or the sarcophagus to the tomb. In this capacity they combine the innovation of the wheel with the traditional modes of transport—sledge and ship—making possible a religious connotation. All in all, wagons seem to have played a more important role as a transport vehicle for the deceased than for the living. Both carts and wagons, seldom depicted or mentioned until the end of the New Kingdom, give the impression of being less important within the Egyptian traffic system.

Reflections on the Delayed Introduction of the Wheel in Egypt

Regarding the introduction of the wheel in Egypt, there is no clear evidence from Egypt itself where the idea came from. Carts and wagons are attested in the 4th millennium BCE in several regions of the rest of the world, including the Near East,[250] Europe,[251] and the Caucasus,[252] with no coherent contact line being traceable among them.[253] Whether the idea of the wheel arose in only one region or in different areas (i.e., polycentric vs. monocentric approaches) remains under discussion.[254] Burmeister assumes that carts and wagons were not the diffusion medium of the wheel on their own; he supposes that they were predominantly used in local traffic rather than for long-distance transport because of their restricted maneuverability and high dependence on roads and ways.[255] However, wagons were used for long-distance travel in ancient Egypt, as the text of the stela shows.[256] Nevertheless, their use in Egypt took place with a clear delay in comparison to other parts of the world. Due to the extensive traveling activity of Egyptian society,[257] the possible places from which the idea of wheeled vehicles, or even the necessary hardware in the form of actual wagons or carts, might have entered Egypt are numerous. A more detailed analysis of this lies beyond the scope of this study,[258] so merely a short overview will be given here.

In older research[259] and sometimes even in recent literature, it is stated that the Hyksos introduced the chariot into Egypt. But there is no explicit evidence that the Egyptians adopted the innovation of the chariot from the Hyksos. The presumably earliest textual evidence for the chariot appears in the Seventeenth Dynasty, on the second stela of Kamose, which mentions the chariot on the side of the Hyksos,[260] and in the slightly later biography of Ahmose, son of Abana, which states that the Egyptian ruler rode a chariot.[261] Depictions in the complex of King Ahmose at Abydos show the first Egyptian chariots.[262] There have as of yet been no archaeological finds or depictions of Hyksos chariots, and evidence for horse and chariot are rare even in their capital Tell el-Dab'a.[263] Considering these sources, it can be stated only that the Hyksos and the Egyptians used the chariot contemporaneously in their battles against each other.[264] It can be assumed that the chariot was introduced from western Asia,[265] the Near East,[266] or Canaan,[267] maybe even bypassing the Hyksos in the eastern delta, with the Mediterranean Sea as a traffic channel or via the Wadi Hammamat and the Red Sea.[268] Moreover, there is no evidence at all that the Hyksos introduced the four-wheeled wagon or transport cart to Egypt. Yet again, there are no archaeological finds or textual sources suggesting that the Hyksos used four- or two-wheelers for transport at all. All in all, the source for the idea of the wheel in Egypt cannot be identified, except that it must have come from the north or east of Egypt—perhaps the Near East—since no wheeled vehicles are attested in the south (i.e., Nubia) before they were known in Egypt.

Regarding the date of the appearance of the wheel in Egypt, it should be noted that the illustrations of the first wheel in the Fifth Dynasty in the tomb of Kaemheset[269] and the wagon in the Thirteenth Dynasty stela of Amenyseneb[270] are not necessarily coeval with the arrival of the innovation "wheel" or "wagon." Either idea might have come to Egypt long before the Fifth or Thirteenth Dynasty and not been put to use until long after its introduction. The wheel might have been known and used before the Fifth Dynasty without surviving evidence, but this is, of course, unknown. The Twelfth Dynasty Mit Rahina inscription (reign of Amenemhat II) might hint at spoked wheels and axles coming to Egypt as booty,[271] while the next spoked wheels are not attested until the Seventeenth and Eighteenth Dynasties. At the very least, the spoked wheel was used when its field of application seemed reasonable.

STILL SUPPOSING that the scarce evidence of wheeled vehicles reflects restricted use, the question remains of how to explain this phenomenon. In general, the technical requirements necessary for the introduction of wheeled vehicles are the principle of rotation (e.g., wooden rollers, spindle whorls, "potter's wheel, the cylinder seal as well as doors rotating around door-socket stones"[272]), animal traction, and the combination of a transport platform with wheels and axis.[273] In Egypt, spindle whorls[274] and cylinder seals[275] are attested since the Predynastic Period, the door-socket system since the First Dynasty,[276] and wooden rollers since the Fifth Dynasty.[277] The "traction and vehicle" system was known in Egypt since, at the latest, the Old Kingdom, in the context of plows and sledges in particular, with the latter being the optimal transport solution for the Egyptian geomorphological conditions. Therefore, it is the *combination* of wheel, axle, and transport, rather than any one if these elements, that was unknown before the first wheeled vehicles.

A new innovation is not necessarily better than an older solution, and it is moreover not applicable everywhere. Other requirements are often necessary for the adoption of an innovation: access to the necessary material(s), technical know-how, artisans to work with the material, "a social need," and a "suitable social or economic context."[278] The construction material of the Medinet Madi wagon is sycomore wood, one of Egypt's domestic flora. Lack of technical skills or restricted mobility should be excluded as factors, given the high quality of Egyptian craftsmanship and the intensive Egyptian travel activity mentioned previously. Additionally, conservatism or even fear of change can be excluded as factors in the delay of adaptation when one considers the very rapid introduction of horse and chariot.[279]

Therefore, the "need" and "suitable social or economic context" of the wheel deserve further attention, since the reasons for the delay are probably due to a combination of practical and sociological aspects. The practical aspects are the climatic and geomorphological conditions in Egypt, especially the annual Nile flood and the desert. On sandy ground, friction increases and is up to 30 times higher than on more solid terrain.[280] Especially fine, soft sand results in the wheel sinking into the ground and consequently the vehicle getting stuck or bumped beneath and maybe even damaged.[281]

Furthermore, carts and wagons have a high wheel load; that is, the load that weighs upon the wheel is high and the frictional resistance, especially in soft sand, is high as well. In the case of a wagon, the mass of the vehicle together with the transport load is transmitted by the four wheels to the subsoil; i.e., every wheel has to carry one quarter of the total weight. Based on a hypothetical total weight of 600 kg for an entire vehicle, this would mean 150 kg for every wheel. Thus a lot of power is necessary to move carts and wagons, especially on sandy or wet ground. Use of heavy carts and wagons is therefore problematic on soft desert soil or across country with very uneven and rugged ground.

Another hindrance was the annual inundation; wheels would sink into the resulting moist ground, which was, on the other hand, perfectly suited for sledges, which facilitated heavy-load transport without the danger of broken axles. Furthermore, the inundation constrained the building of a large-scale road network, which would have been very useful for carts and wagons, and restricted the course of the tracks to the top of the irrigation dikes within the inundation area. Nevertheless, there is a controversial discussion about the "trafficability" of the fertile land. According to Bagnall, the intersections of its irrigation canals and dikes made use of vehicles more difficult.[282] However, Adams argues for the feasibility of wheeled vehicles on the artificial banks associated with the irrigation system, although often tracks were not usable.[283] He mentions a letter from Oxyrhynchos, dating to the 2nd or 3rd century BCE, that states that roads are not passable because of the inundation.[284] A 3rd century BCE text from the Zenon archive refers to flooded roads as well.[285]

The building of canals and dikes are closely linked, since the material of every dug canal was piled up, with the overland track running on these embankments. To make these tracks usable for vehicular traffic, some essential requirements must be met. It is necessary, in particular, that these tracks be wide enough: The axles of the Medinet Madi wagon are 170 cm long,[286] and for chariots the distances between the wheels vary from 1.54 m to 1.80 m.[287] Moreover, the surface of the track is important. There are archaeological finds of neither the dikes[288] nor, obviously, of tracks on them; therefore, one must suppose that they were perhaps not paved, but this is, of course, merely an assumption. To renew pavement yearly after the inundation would require considerable effort.[289] If the tracks were not paved, the ground could be smoothed, since the dikes are piled-up soil. A vehicle moving back and forth along the soft surface of such a dike would create ruts similar to those seen on unpaved country lanes of modern times. If these ruts are of any depth, vehicles scrape the ground. Moreover, if the ruts were caused by vehicles with a certain distance between the wheels, vehicles with different dimensions would have problems following the track.

The restricted maneuverability of early carts and wagons has already been mentioned, and the degree of the steerability of Egyptian wagons is unclear. Only the Medinet Madi wagon offers a certain degree of maneuverability; without such adaptations a large turning circle of even 24.8–69.7 m would be necessary,[290] which could create difficulties atop a dike.

Therefore, the use of wheeled vehicles within the fertile land seems to be possible, although maybe only during a restricted period when it was not underwater. Although grain transport via land is attested throughout the year, an accumulation in the period "after the harvest and before the flood" can be stated.[291] Probably the use of tracks within the inundation area cannot be generalized and would have depended on their layout; wheeled vehicles might have been used even during inundation if the tracks

on the dikes were high enough to stand out of the water, were solid, and were sufficiently dry to be suitable for wheeled traffic. A seasonal restriction in the area of the fertile land would not be unique, as the same applies to medieval Europe, where unpaved tracks were accessible by wheeled vehicles only in the dry season. Otherwise, the surface was soaked by rain and snow, leading to ruts that made the wheeled traffic difficult. The traffic situation improved, according to Burmeister, in the modern era with the development of an efficient road network.[292]

BEYOND THE flood area, several types of roads and ways, artificially constructed and suitable for the use of wagons and carts, are known from ancient Egypt, in the desert and within settlements. The most intense level of construction is observable in streets paved with granite or sandstone slabs, basalt, or even petrified wood (Fig. 32).[293] Other drivable tracks were ways without pavement, but with a firm underground. They were constructed by leveling irregularities and depressions to create an even, solid surface. Often the residual material is piled alongside the track, so that it is visible over long distances (Fig. 33).[294] Moreover, wheeled traffic is even possible without roads and ways where the ground is solid enough with a flat surface and only a small quantity of vegetation.[295]

As evidenced by the Gebel Barkal stela[296] and the expedition text from the Wadi Hammamat,[297] wagons were used for long-distance travels. The same applies for the carts used in the battle of Kadesh, 870 km north of Cairo.[298] Obviously, wheeled traffic was possible on these routes.

DESPITE SAND and inundation, it can thus be assumed that wheeled vehicles could be used in ancient Egypt, even if they were restricted to a special period and depended on suitable ground. Therefore, Egypt's geomorphological conditions need not have been the main reason for the delay in the use of wheeled vehicles there. Other aspects are much more important since, apart from these practical features, the success or failure of an innovation is determined by a variety of requirements[299] that might not have existed in Egypt before the Greco-Roman Period.[300]

Adoption of an innovation takes place over five stages: knowledge, persuasion, decision, implementation, and confirmation. For a successful adoption, a critical mass must be reached.[301] The amount of iconographic and textual sources for wagons increases significantly only in the Greco-Roman Period; there was no extensive need for wagons before this time, although they seem to have been objects of prestige for earlier elite, who used the wagon, for example, in religious contexts. Partridge argues that "there was no real use for carts and wagons," arguing that priority was given to water transport and that the distances to reach a water route were short.[302] Bagnall has the same point of view, referring moreover to the high costs of wheeled transport.[303]

A potential widespread use of wheeled vehicles would be located in the working area of the agriculture sector, situated to a large extent in the zone of cultivated land. Moreover, this would imply their use by the lower class, although wagons were, as already mentioned, too expensive and, consequently, not of interest to them. Thus, this lower social class preferred the classic mode of transport for daily work, i.e., the donkey.[304] Because of the shape of their hooves, donkeys have a very good foothold on uneven, hilly, and sandy ground.[305] They are, thus, in contrast to carts and wagons, independent from a road network and could be used with flexibility everywhere. Moreover, their humble requirements are comparatively cheap in contrast to those of other transport animals or vehicles. Donkeys have to be watered only every second or third day. Horses, on the other hand, must be watered daily and place large demands on fodder.[306] This is why donkeys have been the typical pack animals throughout the Egyptian history since no later than the First Dynasty. Another important factor is that people were familiar with how to work with donkeys.

The transport capacity of a donkey lies at a maximum of about 150 kg,[307] and this only for a short time and distance. The *British Army Manual* of 1923 specifies 50 kg,[308] but this smaller carrying capacity was, however, sufficient for daily use. For the transport capacities of wagons or carts no data are available up to the end of the New Kingdom, but depictions show them transporting large loads such as shrines with the deceased and bovines. Roman sources mention 1200 lbs for a transport wagon.[309] For the Hallstatt wagon from Hochdorf, 150 kg are assumed.[310] Maybe the high carrying capacity of wagons as well as their economic advantage had been noticed, but it can be assumed that carts and wagons were not considered beneficial enough for daily use when compared to the multiple advantages of a donkey, especially with regard to the enormous costs of purchase, maintenance, and repairs for carts and wagons in contrast to those of donkeys.

Therefore, the reason for the late use of carts and wagons in Egypt can be seen in the fact that the critical mass for adoption was not achieved before Greco-Roman times. There was no need for wagons; the economic as well as the social contexts were not appropriate. It was not a conscious non-acceptance of wheeled transport vehicles or a possible fear of innovation, but rather the innovation was simply not suitable for the major part of the population. It can be concluded that the delay was caused by a combination of the different factors stated above, such as the geomorphologic and, maybe even more so, the cultural aspects. A form of work organization that has been proven for hundreds of years and the established use of the donkey, with which one could go practically any-where, were regarded as more advantageous than the high costs of carts and wagons and their dependence on roads, ways, and suitable tracks.

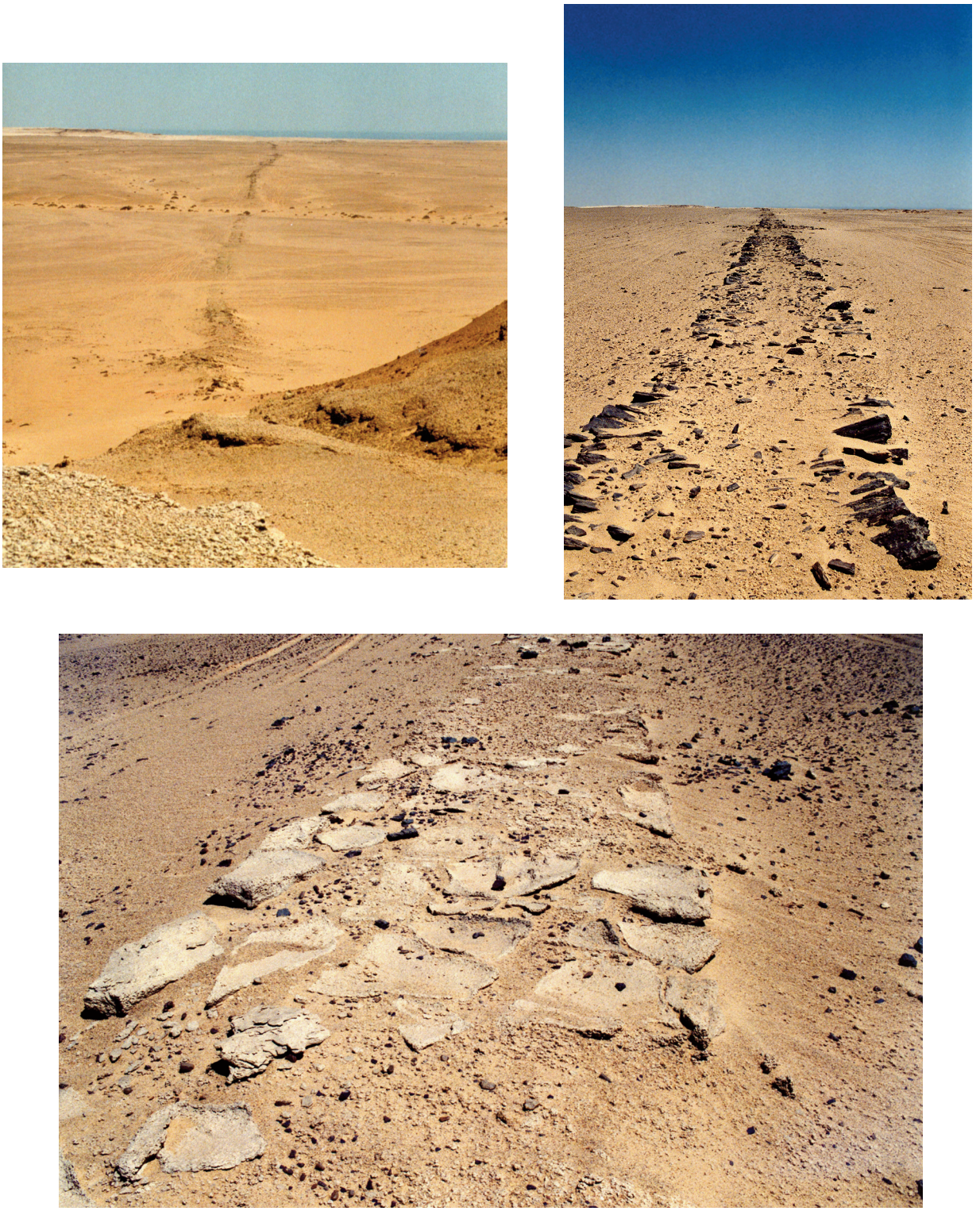

Figure 32: The Widan el-Faras road, dating to the Old Kingdom, leads through the desert to the Lake Moeris. It is still visible over 12 km and paved, for example, with petrified wood (upper right) and sandstone slabs (bottom) (photographs by H. Köpp-Junk).

Figure 33: A modern track leading through the desert between Dahshur and Saqqara. The surface is smoothed; irregularities and depressions are leveled to create a plain surface. The residual material is piled alongside the track, so that it is visible over long distances. Tracks in ancient Egypt may have had a similar appearance. (photograph by H. Köpp-Junk).

Conclusion

The wheel is attested since the Fifth Dynasty in Egypt. Carts and wagons are very seldom documented and, to judge from iconographic sources, were only used as a mode of transport, not for passengers. The first transport vehicle is a four-wheeled wagon, while carts with two wheels are attested later. Both are drawn by oxen or men, not by horses or donkeys. Wagons were used as a mode of transport in harvest scenes and military settings, as well as religious contexts, especially when moving the coffin with the deceased to the tomb. They were prestigious vehicles, delivering innovation combined with tradition.

Six different types can be distinguished from each other. The construction of the wagon base cannot be generalized and seems to have varied greatly among the individual wagons presented in the sources. Often it is flat and has the shape of a sledge runner, but the Medinet Madi wagon consists of a wooden frame without the appearance of runners. From time to time, a chassis with side elements of different heights is observable. Wheeled vehicles with disk wheels appear earlier than those with spoked. Some wagons from the Greco-Roman Period are depicted in a perspectival presentation.

All in all, not the invention of the wheel but rather the combination of wheel, axle, and transport platform was the most important factor in the development of wheeled vehicles. Although several technical preconditions of the wheeled vehicle were known relatively early, neither this system nor the wheel itself was invented in Egypt; they came from outside, either as an idea, such as an image, or as hardware in the form of an actual cart or a wagon. Egyptian sources do not indicate from where the wheel or the transport vehicle was imported. There is no evidence that the Hyksos functioned as intermediaries in this regard. Since wheeled vehicles were known much earlier in the Near East and not other regions adjacent to Egypt's borders, one might assume that they came from there. Due to climatic, geomorphological, and in particular cultural reasons, carts and wagons appear in Egypt much later than in other parts of the world, including Europe, the Caucasus and the Near East. Moreover, they held a minor position within the ancient Egyptian traffic system, because donkeys were preferred for daily use and transport sledges for the transportation of heavy loads, as these were immune to the risk of mechanical failure such as broken axles.

Abbreviations

PM Porter, B., and R. Moss, *Topographical Bibliography of Ancient Egyptian Hieroglyphic Texts, Reliefs, and Paintings I–VII* (Oxford: Clarendon, 1926–1951).

Urk. *Urkunden des Ägyptischen Altertums. Abteilung I–VIII* (Leipzig, Berlin: Hinrichs, 1903–1988).

[1] This essay is an elaborate analysis of a topic I dealt

with in my PhD dissertation, submitted in 2006 to the Department of Egyptology, Georg-August-Universität Göttingen, and published in 2015 (H. Köpp-Junk, *Reisen im Alten Ägypten. Reisekultur, Fortbewegungs- und Transportmittel in pharaonischer Zeit* [Wiesbaden: Harrassowitz, 2015a]). I am grateful to the editor, Dr. Pearce Paul Creasman, for the opportunity to present my research results in this volume. Moreover, I am indebted to Prof. Dr. Svend Hansen, Director of the Eurasia-Department of the German Archaeological Institute in Berlin and head of the TOPOI research project "Digital Atlas of Innovations;" to Dr. Florian Klimscha, Eurasia Department of the German Archaeological Institute/ Excellence-Cluster TOPOI; to Prof. Dr. Christof Schuler, first director of the Commission for Ancient History and Epigraphy of the German Archaeological Institute and head of the research cluster 2 "Innovations: technological, social" of the German Archaeological Institute; as well as to my colleagues of the plenary meeting of the research cluster 2 "Innovations: technological, social" in Berlin, 11.–12. November 2015 for discussion and valuable comments. Further, I am most obliged to Prof. Dr. Torsten Mattern and Dr. Rosemarie Cordie (both of the University of Trier, Classical Archaeology) for the many helpful discussions. I also extend my thanks to Friederike Junge (M.A., Egyptology, University of Wien), Alexandra Kireenko (BA, Egyptology, University of Trier), and Dipl. Ing. (FH) Peter Junk (Freudenburg) for the drawings of the wagons and carts, as well as to Dr. Mary Ownby (University of Arizona, Tucson), Manon Schutz (M.A., University of Oxford), and Samuel Butterick (University of Trier) for reading a previous version of this article.

2 For more details about wagons, carts, and chariots, as well as their use as a mode of transport and locomotion relating to travel and mobility in ancient Egypt, see Köpp-Junk 2015a.

3 *Urk.* IV 1232, 1–6; G. A. Reisner and M. B. Reisner, "Inscribed Monuments from Gebel Barkal," *Zeitschrift für Ägyptische Sprache* 69 (1933): 28–29.

4 J. Couyat and P. Montet, *Les inscriptions hiéroglyphiques et hiératiques du Ouâdi Hammâmât* (Cairo: Institut français d'archéologie orientale, 1912), 38, no. 12, lines 19–21.

5 M. A. Littauer and J. H. Crouwel, *Wheeled Vehicles and Ridden Animals in the Ancient Near East* (Leiden: Brill, 1979), 4, 7; S. Burmeister, "Rad und Wagen. Eine folgenreiche Erfindung," in Badisches Landesmuseum Karlsruhe (ed.), *Jungsteinzeit im Umbruch. Die Michelsberger Kultur und Mitteleuropa vor 6.000 Jahren*, (Darmstadt: Primus, 2010a), 224. In this study all vehicles with four or more wheels were subsumed under wagons, including barques on wheels.

6 S. Piggott, *Wagon, Chariot and Carriage: Symbol and Status in the History of Transport* (London: Thames and Hudson, 1992), 18; S. Burmeister, "Neolithische und bronzezeitliche Moorfunde aus den Niederlanden, Nordwestdeutschland und Dänemark," in M. Fansa (ed.), *Rad und Wagen. Der Ursprung einer Innovation im Vorderen Orient und Europa* (Mainz am Rhein: von Zabern, 2004), 332, figs. 1, 5, 10, 11.

7 Concerning oxen, horses, and transport vehicles in detail, see Köpp-Junk 2015a, 107, 109, 117, 160, 166, 171. The draft capacity of horses only developed its full potential with the aid of a horse collar, which was not used in these early times.

8 H. Goedicke, "Harkhuf's Travels," *Journal of Near Eastern Studies* 40 (1981): 4; R. S. Bagnall, "The Camel, the Wagon and the Donkey," *Bulletin of the American Society of Papyrologists* 22 (1985): 5; R. Partridge, *Transport in Ancient Egypt* (London: The Rubicon Press, 1996), 76, 82.

9 Natural canals are the branches of the Nile as the Bahr Yusef. "Whereas the Nile channel averages 800–1,000 m in width and 10–12 m in depth, the Bahr Yusef is typically 100 m wide and 4 m deep. The Sohagiya canal, which diverges at Sohag, and the now-defunct Bahguriya canal, diverging near Nag Hammadi, had similar properties ca. 1800 A.D." (K. W. Butzer, *Early Hydraulic Civilization in Egypt: A Study in Cultural Ecology* [Chicago: University of Chicago Press, 1976]: 16–17). On natural and artificial canals in Egypt, see also the inscriptions of Nekhebu from the Old Kingdom (*Urk*. I 220, 14–16; *Urk.* I 221, 6–8) and of Weni (*Urk.* I 108, 13), as well as the studies of Schenkel: W. Schenkel, "Kanal," in W. Helck and E. Otto (eds.), *Lexikon der Ägyptologie I* (Wiesbaden: Harrassowitz, 1975), 775–782; W. Schenkel, *Bewässerungsrevolution im Alten Ägypten* (Mainz: von Zabern, 1978).

10 On traffic routes overland, be it in the desert or in the area of the cultivated land, see for example Partridge 1996, 79–82, fig. 64; J. P. Graeff, *Die Straßen Ägyptens*, PhD dissertation (Universität Hamburg; Berlin: dissertation.de, 2005); H. Riemer and F. Förster (eds.), *Desert Road Archaeology in Ancient Egypt and Beyond* (Köln: Heinrich-Barth-Institut, 2013); Köpp-Junk 2015a, 37–80. For later times see for example R. S. Bagnall, *Egypt in Late Antiquity* (Princeton: Princeton University Press, 1993), 19–20; C. Adams, *Land Transport in Roman Egypt: A Study of Economics and Administration in a Roman Province* (Oxford: Oxford University Press, 2007), 21–26, 30–33, 36–42, 44–46, 68, 255. Concerning construction roads and ramps see D. D. Klemm, R. Klemm, and L. Stelaci, "Die pharaonischen Steinbrüche des silifizierten Sandsteines in Ägypten und die Herkunft der Memnon-Kolosse," *Mitteilungen des Deutschen*

Archäologischen Instituts Kairo 40 (1984): 207–220; D. D. Klemm and R. Klemm, *Steine und Steinbrüche im Alten Ägypten* (Berlin: Springer, 1992); D. Arnold, *Building in Egypt: Pharaonic Stone Masonry* (Oxford: Oxford University Press, 1991), 79–107.

11 The tracks within the flood area were closely related to the irrigation canals; when the latter were dug out, the material was piled up along their sides with the routes proceeding along the tops of the resulting embankments (Partridge 1996, 79); see also below.

12 The earliest sledges date to the First Dynasty at the latest (see for example Egyptian Museum Cairo, JE 70114; W. Helck, *Untersuchungen zur Thinitenzeit* [Wiesbaden: Harrassowitz, 1987], 159, 160; J. Kahl, *Das System der ägyptischen Hieroglyphenschrift in der 0.–3. Dynastie* [Wiesbaden: Harrassowitz, 1994], 761, u9). Egyptian sledges mostly consist of two long wooden beams forming the runners, with two, three, or more cross struts between them. Another mode of construction is to build them with a continuous surface between the runners. In both variants, the front parts of the runners have rounded front ends that curve upward. Egyptian sledges are very often shown in religious scenes for the transport of the coffin or other elements of the burial equipment on their way to the tomb. Depictions of profane use are rather rare (D. Arnold, *The South Cemeteries of Lisht III: The Oyramid Complex of Senwosret I* [New York: The Metropolitan Museum of Art, 1992], pl. 72–73; S. Clarke and R. Engelbach, *Ancient Egyptian Construction and Architecture* [New York: Dover Publications, 1990; reprint of 1930], 85, 89–90, 102, 110, fig. 39, 79, 84–85, 107; P. P. Creasman and N. Doyle, "Overland Boat Transportation during the Pharaonic Period: Archaeology and Iconography," *Journal of Ancient Egyptian Interconnections* 2.3 [2010]: 15–23, 26–29, nn. 51, 56, 59, 60, 70, 93, 99, 104, 110, figs. 3, 10–12; Arnold 1991, 275–280, 289 n. 127, figs. 3.5, 6.35–6.41; Köpp-Junk 2015a, 118–132). For the two obelisks of Hatshepsut, transported on a sledge, see B. Landström, *Die Schiffe der Pharaonen* (München: Bertelsmann, 1974), 128–133; Clarke and Engelbach 1990, 89–90, figs. 39, 84, 85; Arnold 1991, 60–62, 279, table 3.1, fig. 6.40). At least three sledges are known as artifacts: for example, the sledge found in Dahshur, now in the Egyptian Museum Cairo, CG 4928 J. de Morgan, *Fouilles à Dahchour Mars-Juin 1894* [Wien: Holzhausen, 1895], fig. 204; Arnold 1991, fig. 6.35; Creasman and Doyle 2010, n. 60). In 1998 a smaller sledge was exhibited opposite this object in the Egyptian Museum, Cairo (Köpp-Junk 2015a, 122, pl. 6c).

13 The Egyptian chariot was not used for the transport of loads, but it was a mode of locomotion for people; therefore, it is not discussed in this article in detail. On Egyptian chariots, see for example Littauer and Crouwel 1979, 74–98; M. A. Littauer and J. H. Crouwel, *Chariots and Related Equipment from the Tomb of Tut'ankhamun* (Oxford: Griffith Institute, 1985); A. Herold, *Streitwagentechnologie in der Ramses-Stadt: Bronze an Pferd und Wagen* (Mainz am Rhein: von Zabern, 1999); A. Herold, "Funde und Funktionen—Streitwagentechnologie im Alten Ägypten," in M. Fansa (ed.), *Rad und Wagen. Der Ursprung einer Innovation im Vorderen Orient und Europa* (Mainz am Rhein: von Zabern, 2004), 123–142; Köpp-Junk 2015a, 188–209. For the use of chariots in civil context, see H. Köpp-Junk, "Chariots as a Mode of Locomotion in Civil Context," in A. J. Veldmeijer and S. Ikram (eds.), *Chasing Chariots: Proceedings of the First International Chariot Conference (Cairo 2012)* (Leiden: Sidestone Press, 2013a): 131–142; for a late chariot in the Museum August Kestner in Hannover, see H. Köpp-Junk and Chr. E. Loeben, "Plaque avec représentations: char et hiéroglyphes," in *L'art du contour—Le dessin dans l'Égypte ancienne*, catalogue édité sous la direction de Guillemette Andreu-Lanoe (Paris: Louvre, 2013), 174–175; for women in chariots, see H. Köpp, "Weibliche Mobilität: Frauen in Sänften und auf Streitwagen," in C. Peust (ed.), *Miscellanea in honorem Wolfhart Westendorf* (Göttingen: Seminar für Ägyptologie und Koptologie der Universität, 2008), 34–44; H. Köpp-Junk, "Ikonographische und textliche Belege für Frauen auf Streitwagen in der Amarnazeit," in C. Huyeng and A. Finger (eds.), *Amarna in the 21st Century* (Norderstedt: BoD—Books on Demand GmbH, 2015b), 102–149.

14 For further details on modes of transport and locomotion up to the end of the New Kingdom in Egypt, see Köpp-Junk 2015a.

15 See Kahl 1994, 486, e13.

16 Plows on their own are known in ancient Egypt since the Second Dynasty (L. Störk, "Pflug," in W. Helck, and W. Westendorf [eds.], *Lexikon der Ägyptologie I* [Wiesbaden: Harrassowitz, 1982], col. 1013; C. M. Firth and J. Quibell, *The Step Pyramid II* [Cairo: Institut français d'archéologie orientale, 1935], pl. 89,3; A. Scharff, *Archäologische Beiträge zur Frage der Entstehung der Hieroglyphenschrift* [München: Verlag der Bayerischen Akademie der Wissenschaften, 1942], 42) while the combination of plow and oxen appears later.

17 Köpp-Junk 2015a, 108–109.

18 For detail on the choice of the travel route and the cost ratio between water travel and that overland, see Köpp-Junk 2015a, 25–29.

19 Quibell, J. E. and A. G. K. Hayter, *Teti Pyramid, North Side* (Cairo: Institut français d'archéologie orientale, 1927), frontispiece, 25; H. Senk, "Zur Darstellung der

Sturmleiter in der Belagerungsszene des Kaemhesit," *Annales du Service des antiquités de l'Égypte* 54 (1957): 207–211, fig. 1; A. R. Schulman, "The Battle Scenes of the Middle Kingdom," *Journal of the Society for the Study of Egyptian Antiquities* 12 (1982): note 23; Clarke and Engelbach 1990, 88, fig. 83; Köpp-Junk 2015a, 137–138, table 5, fig. 49, pl. 8d. For the dating to the Fifth Dynasty, see A. McFarlane, *Mastabas at Saqqara: Kaiemheset, Kaipunesut, Kaiemsenu, Sehetepu and Others* (Oxford: Aris and Phillips, 2004), 23.

20 D. Arnold and J. Settgast, "Erster Vorbericht über die vom Deutschen Archäologischen Institut Kairo im Asassif unternommenen Arbeiten (1. und 2. Kampagne)" *Mitteilungen des Deutschen Archäologischen Institutes Abteilung Kairo* 20 (1965): 47–61, fig. 2; B. Jaroš-Deckert, *Grabung im Asasif 1964–1970 V: Das Grab des* Jnj-jtj.f. *Die Wandmalereien der 11. Dynastie* (Mainz am Rhein: von Zabern, 1984), folding map 1; Köpp-Junk 2015a, 138, table 5, fig. 50.

21 The following list of wheeled vehicles does not claim to be complete. Especially in Greco-Roman times, the evidence increases significantly. For textual evidence of later times, see for example Bagnall 1985, 1–6; Adams 2007, 28–29, 65–69, 213, 265, 274, 283. Often, it is not possible to classify the terms mentioned in the texts under a specific category referring to the number or type of wheels or to the type of vehicle. A detailed analysis of changes in the Egyptian transport system based on textual and iconographic evidence including wagons, camels, donkeys, etc. is in preparation by the author.

22 E. Naville, *Détails relevés dans les ruines de quelques temples égyptiens: Abydos, Behbeit-el-Hagher* (Paris: Geuthner, 1930), pl. 17.

23 B. Kemp, *Ancient Egypt: Anatomy of a Civilization* (London: Routledge, 1991), fig. 79.

24 TT 17, dating to the Eighteenth Dynasty; T. Säve-Söderbergh, *Four Eighteenth Dynasty Tombs* (Oxford: Griffith Institute, 1957), pl. 23.

25 The evidence consists of tracks of a cart found in Flintbek, Germany (B. Zich, "Die Ausgrabungen chronisch gefährdeter Hügelgräber der Stein- und Bronzezeit in Flintbek, Kreis Rendsburg/ Eckernförde," *Offa—Berichte und Mitteilungen zur Urgeschichte, Frühgeschichte und Mittelalterarchäologie* 49/50 (1992–1993): 25–26, figs. 8, 10). The cart was dragged by men instead of oxen (S. Burmeister, "Transport im 3. Jahrtausend v. Chr. Waren die Wagen ein geeignetes Transportmittel im Überlandverkehr?" in S. Hansen, A. Hauptmann, I. Motzenbäcker, and E.Pernicka [eds.], *Von Majkop bis Trialeti. Gewinnung und Verbreitung von Metallen und Obsidian in Kaukasien im 4.–2. Jt. v. Chr.* Beiträge des Internationalen Symposiums in Berlin vom 1.–3. Juni 2006 [Bonn: Habelt, 2010b], 224).

26 W. C. Hayes, *The Scepter of Egypt II: The Hyksos Period and the New Kingdom* (New York: Harper, 1959), 164, fig. 90; W. Decker, W. 1986. "Der Wagen im Alten Ägypten," in W. Treue (ed.), *Achse, Rad und Wagen* (Göttingen: Vandenhoeck und Ruprecht, 1986), 54, fig. 3; Köpp-Junk 2015a, 109, 139, table 5, fig. 51.

27 A. Erman, *Ägypten und ägyptisches Leben im Altertum* (Tübingen: Laupp, 1887), 699.

28 C. Desroches-Noblecourt, S. Donadoni, and E. Edel, *Grand temple d'Abou Simbel. La bataille de Qadech* (Cairo: Centre de documentation et d'études sur l'ancienne Égypte, 1971), pl. 5.

29 Pyramid group A, northern cemetery, pyramid 15, south wall; C. R. Lepsius, *Denkmäler aus Aegypten und Aethiopien 10. Abtheilung 5: Aethiopische Denkmaeler* (Berlin: Hertz, 1970), pl. 41a; K. H. Dittmann, "Der Segelwagen von Medinet Mâdi," *Mitteilungen des Deutschen Archäologischen Institutes Abteilung Kairo* 10 (1941): 67, fig. 6.

30 Dittmann 1941, 67.

31 PM VII, 245.

32 N. de Garis Davies and A. H. Gardiner, *The Tomb of Huy, the Viceroy of Nubia in the Reign of Tutankhamun* (London: Egypt Exploration Society, 1926), fig. 4.

33 Davies and Gardiner 1926, 34.

34 E. Woytowitsch, *Die Wagen der Schweiz in der europäischen Bronzezeit* (Zürich: Helvetia archaeologica, 1995), figs. 197, 198.

35 H. Hayen, "Der Wagen in der europäischen Frühzeit," in W. Treue (ed.), *Achse, Rad und Wagen* (Göttingen: Vandenhoeck und Ruprecht, 1986), 115 (figure).

36 T. Larsson, "Streitwagen, Karren und Wagen in der bronzezeitlichen Felskunst Skandinaviens," in M. Fansa (ed.), *Rad und Wagen. Der Ursprung einer Innovation im Vorderen Orient und Europa* (Mainz am Rhein: von Zabern, 2004), 390–392, fig. 14.

37 A. Häusler, "Rad und Wagen zwischen Europa und Asien," in W. Treue (ed.), *Achse, Rad und Wagen* (Göttingen: Vandenhoeck und Ruprecht, 1986), 143.

38 Larsson 2004, 393, fig. 15.

39 C. Züchner, "Frühbronzezeitliche Wagen und Transportmittel in der Felskunst Süd- und Südwesteuropas," in M. Fansa (ed.), *Rad und Wagen. Der Ursprung einer Innovation im Vorderen Orient und Europa* (Mainz am Rhein: von Zabern, 2004), 406, fig. 8 (9).

40 M. Devlet and E. Devlet, "Felsbilder mit Wagendarstellungen in Sibirien und Zentralasien," in M. Fansa (ed.), *Rad und Wagen. Der Ursprung einer Innovation im Vorderen Orient und Europa* (Mainz am Rhein: von Zabern, 2004), 244, fig. 7 (2).

41 K. H. Striedter, "Bronzezeitliche Wagen in der Sahara?" in M. Fansa (ed.), *Rad und Wagen. Der Ursprung einer Innovation im Vorderen Orient und Europa* (Mainz am Rhein: von Zabern, 2004), 160, fig. 3.

42 K. A. Kitchen, "An Unusual Stela from Abydos," *Journal of Egyptian Archaeology* 47 (1961): 10–18, pl. 3; J. Bourriau, *Pharaohs and Mortals: Egyptian Art in the Middle Kingdom* (Cambridge: Cambridge University Press, 1988), 60–63, 62 (photograph). Concerning the dating to the Thirteenth Dynasty, see Bourriau 1988, 60, 63.

43 The surface of the container is subdivided into six sections, each of them inscribed with what is inside (emmer, dates, barley malt, and wheat or rush). The sixth is not identifiable, but all the inscriptions on the container are unusual; see as well Kitchen 1961, 14 (with a partly different reading).

44 In northwestern Europe oak or alder trees of a diameter of ca. 1 m, indicating trees about 200–300 years old, were used for the manufacture of a one-piece disk wheel of 80 cm in diameter in the early 3rd millennium BCE (Piggott 1992, 17).

45 The tomb was at first dated to the Thirteenth Dynasty (J. J. Tylor and S.. Clarke. 1896. *Wall Drawings and Monuments of El Kab 2: The tomb of Sebeknekht* [London: B. Quaritch, 1896], "Introduction," pl. 2), but according to recent research it belongs to the Seventeenth (V. Davies, "Sobeknakht of Elkab and the Coming of Kush," *Egyptian Archaeology* 23 [2003]: 3; V. Davies, "Sobeknakht's Hidden Treasure," *British Museum Magazine* 46 [2003]: 18; S. Kubisch, *Lebensbilder der 2. Zwischenzeit. Biographische Inschriften der 13.–17. Dynastie* [Berlin: de Gruyter, 2008], 281).

46 Tylor and Clarke 1896, "Introduction," pl. 2; N. de Garis Davies, "An Apparent Instance of Perspectival Drawing," *Journal of Egyptian Archaeology* 12 (1926): 110–112; Dittmann 1941, 65, fig. 4.

47 For the interpretation that the inner circles of the wheels are the ends of the axles, see Creasman and Doyle 2010, 21.

48 Lisht: Arnold 1992, 92, 94, pl. 102, 103a–c, 106a–d, 107a–d; Lahun: W. M. F. Petrie, G. Brunton, and M. A. Murray, *Lahun II* (London: British School of Archaeology in Egypt, 1923), pl. 13, 15.

49 See, for example, the scenes shown in R. Macramallah, *Le mastaba d'Idout* (Cairo: Institut français d'archéologie orientale, 1935), pl. 9a, b; P. Montet, *Le tombeau de Ti I* (Cairo: Institut francais d'archéologie orientale, 1939), pl. 55; B. van de Walle, *La chapelle funéraire de Neferirtenef* (Brussels: Musées Royaux d'Art et d'Histoire, 1978), pl. 15.

50 J. Assmann, *Tod und Jenseits im Alten Ägypten* (München: Beck, 2001), 404, 418.

51 See for example the depiction in the tomb of Roy (Thebes, TT 255, Eighteenth–Nineteenth Dynasty; M. B. E. Drioton, *Tombes Thebaines, Necropole de Dira Abu el Naga: Le Tombeau de Roi* [Cairo: Institut français d'archéologie orientale], 1, fig. 7).

52 Egyptian Museum Cairo, CG 24095; M. Saleh, M. and H. Sourouzian, *Die Hauptwerke im ägyptischen Museum Kairo* (Mainz am Rhein: von Zabern, 1986), no. 142a.

53 This is one of the various means to attach the pulling rope to the oxen (see as well C. Maystre, *La Tombe de Nebenmât [No. 219]. Tombes de Deir el-Médineh* [Cairo: Institut français d'archéologie orientale, 1936), pl. 7; C. Beinlich-Seeber and A. G. Shedid, *Das Grab des Userhat [TT 56]* [Mainz am Rhein: von Zabern, 1987], pl. 15; W. K. Simpson, *The Mastabas of Qar and Idu, G 7101 and 7102* [Boston: Department of Egyptian and Ancient Near Eastern Art, Museum of Fine Arts, 1976], fig. 35; Musées Royaux d'Art et d'Histoire, *Illustrations pour l'éternité, Musées Royaux d'Art et d'Histoire, Bruxelles, 28.10.–18.12.1966* [Bruxelles: Musées Royaux d'Art et d'Histoire, 1966], fig. 11; H. G. Fischer, *Varia Nova, Egyptian Studies III* [New York: The Metropolitan Museum of Art, 1996], fig. 12; J. J. Tylor and F. L. Griffith, *The Tomb of Paheri at El Kab* [London: Egypt Exploration Fund, 1894], pl. 5; T. *Säve-Söderbergh, Four Eighteenth Dynasty Tombs* [Oxford: Griffith Institute, 1957], pl. 24; K. P. Kuhlmann and W. Schenkel, *Das Grab des Ibi, Obergutsverwalter der Gottesgemahlin des Amun [TT 36]* [Mainz am Rhein: von Zabern, 1983], pl. 65). Another variant would be to fix it directly to the horns (Davies, N. de Garis, *Five Theban Tombs* [London: Egypt Exploration Fund, 1913], pl. 2). Not a single scene showing the pulling of sledges by oxen depicts the use of a yoke (Köpp-Junk 2015a, 108); on oxen as transport animals in Egypt see Köpp-Junk 2015a, 107–109. Maybe the towing rope is fixed to the horns when pulling the deceased or the canopic chest because this is a more sensible area of the animal and they can more easily be kept in line.

54 Egyptian Museum Cairo, JE 27301; V. Schmidt, *Sarkofager, mumiekister, og mumiehylstre i det gamle Aegypten: typologisk atlas* (Copenhagen: Frimodt, 1919), 123, nos. 625, 626; A. G. Shedid, *Das Grab des Sennedjem* (Mainz am Rhein: von Zabern, 1994), fig. 110; Köpp-Junk 2015a, 121, 141-142, table 5, pl. 9b. The following resulted from study of the wagon in the Egyptian Museum Cairo by the author in 1997.

55 Köpp-Junk 2015a, pl. 9b.

56 Köpp-Junk 2015a, 121, 141-142, table 5, pl. 9b (color photograph).

57 C. Nebelsick, "Wagen- und Prunkbestattungen von Frauen der Hallstatt- und frühen Latènezeit in Europa.

Ein Beitrag zur Diskussion der sozialen Stellung der Frau in der älteren Eisenzeit," in J. M. Bagley, Chr. Eggl, D. Neumann, and M. Schefzik (eds.), *Alpen, Kult und Eisenzeit. Festschrift für Amei Lang zum 65. Geburtstag* (Rahden: Verlag Marie Leidorf, 2009), 240.

58 This is a common technique for the pulling of sledges as well; see e. g. N. de Garis Davies, *The Tomb of Rekh-mi-Re at Thebes II* (New York: Arno Press, 1943), pl. 93. Three other variants are known in ancient Egypt for the fixation of the towing rope to sledges (Creasman and Doyle 2010, 18; Köpp-Junk 2015a, 120, 126–127, figs. 40, 44, 46–47, pl. 6e): attaching it to metal loops (G. Foucart, *Le tombeau d'Amonmos. Tombes Thébaines* [Cairo: Institut français d'archéologie orientale, 1935], pl. 2; Kuhlmann and Schenkel 1983, pl. 62; G. *Jéquier, Le monument funéraire de Pepi II III: Les approches du temple* [Cairo: Institute français d'archéologie orientale, 1940], pl. 32; tomb relief of Montemhet, Thebes, TT 34, Twenty-fifth—Twenty-sixth Dynasty; Staatliches Museum Ägyptischer Kunst München, ÄS 5363), to the first cross bar (Arnold 1991, fig. 3.5; P. Lacovara and M. Lehner, "An Enigmatic Object Explained," *Journal of Egyptian Archaeology* 71 [1985]: fig. 2; Davies 1913, pl. 8), or looping it around the top parts of the runners (N. de Garis Davies and A. H. Gardiner, *The Tomb of Antefoker, Vizier of Sesostris I, and of His Wife, Senet [No. 60]* [London: G. Allen & Unwin, 1920], pls. 19, 21; N. de Garis Davies, *The Tomb of Amenemhet (No. 82)* [London: Egypt Exploration Fund, 1915], pl. 12). For a detailed analysis of Egyptian sledges see Köpp-Junk 2015a, 117–132; regarding their religious connotation, see Partridge 1996, 135, 137; H. Köpp-Junk, "Sledges in Religious Contexts in Ancient Egypt," *Material Religion: The Journal of Objects, Art and Belief* 10.1 (2014): 122–124; Köpp-Junk 2015a, 127–132.

59 Gurob, tomb no. 611; Petrie Collection, University College London, UC 16044; for details see S. Wachsmann, *The Gurob Ship-cart Model and Its Mediterranean Context* (College Station: Texas A&M University Press, 2013). See as well G. Brunton and R. Engelbach, *Gurob* (London: British School of Archaeology in Egypt, University College, 1927), pl. 52; A. P. Thomas, *Gurob: A New Kingdom Town* (Warminster: Aris & Phillips, 1981), pl. 56; Köpp-Junk 2015a, 142, fig. 57. There are different reconstructions possible, showing a nearer or a wider arrangement of the wheels (Wachsmann 2013, figs. 1.4, 1.6A). Occasionally, the Gurob model is referred to as a child's toy (Wachsmann 2013, 4, 7). The radiocarbon dating suggests a period between 1256–1054 BCE (C. A. Prior, "Appendix 5: Radiocarbon Age Analysis of the Gurob Ship-Cart Model," in Wachsmann 2013, 241).

60 Wachsmann 2013, 21, 201. For the wood analysis, see C. Cartwright, "Appendix 7: Wood Identification," in Wachsmann 2013, 249.

61 From Deir el-Bahri; British Museum London, EA 22941; R. van Walsem, *The Coffin of Djedmonthuiufankh in the National Museum of Antiquities at Leiden I–II*(Leiden: Nederlands Institut voor het Nabije Oosten, 1997), figs. 366, 369, 373; pl. 145; J. H. Taylor, *Death and the Afterlife in Ancient Egypt* (London: British Museum Press, 2001), 187–188, fig. 131; Creasman and Doyle 2010 17, fig. 9; Wachsmann 2013, 99; The British Museum, "Coffin" (EA22941), *Collection Online*, http://www.britishmuseum.org/research/collection_online/collection_object_details/collection_image_gallery.aspx?partid=1&assetid=1341045001&objectid=117259, accessed 21 March 2016.

62 The British Museum, "Coffin" (EA22941), *Collection Online*, http://www.britishmuseum.org/research/collection_online/collection_object_details.aspx?objectId=117259&partId=1&searchText=22941&page=1, accessed 21 March 2016.

63 Taylor 2001, 188, fig. 131.

64 There might be a second one on the rear of the transport platform, but in the available photographs this is not verifiable.

65 Finnish National Museum Helsinki, no. 14560:660.

66 It is not clearly visible whether disk wheels or spoked wheels are depicted, but the spokes would be very slim toward the nave for a spoked wheel and too tapered, with only a small contact area at the outer rim of the wheel; therefore, it is more likely that disk wheels are depicted. Moreover, 16 spokes on one wheel would be the highest number for all known wagons from ancient Egypt.

67 See the wagons on the coffin now in Helsinki no. 14460:660; British Museum London, EA 36211; Vatican Museum 25008.2.2.

68 ÄM 20132, Ägyptisches Museum und Papyrussammlung, Staatliche Museen zu Berlin; M. Werbrouck, *Les pleureuses dans l'Égypte ancienne* (Bruxelles: Fondation Egyptologique Reine Elisabeth, 1938), pl. 46; Köpp-Junk 2015a, 142, pl. 9c.

69 British Museum London, EA 30092; K. Parlasca, *Mumienporträts und verwandte Denkmäler* (Wiesbaden: Steiner, 1966), 159–160, pl. 58, 2; L. Kákosy, "Bark and Chariot," *Studia Aegyptiaca* 3 (1977): 57–65, fig. 3; Köpp-Junk 2015a, 142, pl. 9d.

70 Roman Period: Parlasca 1966, 160; Greco-Roman: The British Museum, "Shroud" (EA30092), *Collection Online*, http://www.britishmuseum.org/research/ collection_online/collection_object_details.aspx?objectId=124452&partId=1&museumno=30092&page=1, accessed 9 March 2015.

71 Tylor and Clarke 1896, "Introduction," pl. 2; Dittmann 1941, 65, fig. 4.

72 G. Dattari, *Monete Imperiali Greche. Numi Augg. Alexandrini. Catalogo della Collezione G. Dattari II* (Cairo: Tipografia dell'Instituto Francese d'Archeologia Orientale, 1901), pl. 27, no. 3557; J. Vogt, *Die alexandrinischen Münzen* (Stuttgart: Kohlhammer, 1924), 145; Dittmann 1941, 68; Köpp-Junk 2015a, 142–143, fig. 58.

73 Collection Fouquet, Louvre Museum, Paris, CA 5965; P. Perdrizet, *Les terres cuites grecques d'Égypte de la Collection Fouquet* (Nancy: Berger-Levrault, 1921),115–116 (300), pl. 32; C. Boutantin, "Quelques documents de la région memphite relatifs au taureau Apis," *Bulletin de l'Institut français d'archéologie orientale* 113 (2013): 94, pl. 6, fig. 19 (for interpretation of the object as a lamp, see Boutantin 2013, 94); P. Ballett and P. Pomey, "Bateaux du Nil en terre cuite pour des dieux et des hommes. Un groupe inédit de l'Égypte romaine," in P. Pomey (ed.), *La batellerie égyptienne. Archéologie, histoire, ethnographie* (Alexandria: Centre d'études alexandrine, 2015), 181–182, fig. 3.

74 W. Werner, "The Largest Ship Trackway in Ancient Times: The Diolkos of the Isthmus of Corinth, Greece, and Early Attempts to Build a Canal," *International Journal of Nautical Archaeology* 26.2 (1997): fig. 21 (caption); Wachsmann 2013, 109 and 111, fig. 3.28 (caption).

75 Benaki Museum Athens, no. 12775, 12776; bought in Egypt (Wachsmann 2013, 109); Wachsmann 2013, 109, fig. 3.28; Werner 1997, fig. 21.

76 Deir el-Bahri, Second Intermediate Period or Eighteenth Dynasty; British Museum London, EA 29943, made of acacia wood, 59.5 cm in diameter and 14.5 cm thick; see The British Museum, "Wheel" (EA29943), *Collection Online*, http://www.britishmuseum.org/research/collection_online/collection_object_details.aspx?objectId=125745&partId=1&searchText=29943&page=1, accessed 23 March.

77 Dittmann 1941, 60–78, figs. 1–3, pl. 16 a–c; Köpp-Junk 2015a, 141, 143, fig. 59 a–f.

78 Dittmann 1941, 62.

79 See for example the one found near the pyramid of Senwosret I in Lisht or of Senwosret III in Dahshur (Arnold 1991, fig. 6.35, 6.36; Creasman and Doyle 2010, 18, fig. 12).

80 Those holes and slots are observed on Egyptian sledges as well (Arnold 1991, fig. 6.35; Creasman and Doyle 2010, fig. 12; Köpp-Junk 2015a, 122).

81 Dittmann 1941, 62.

82 Dittmann 1941, 62.

83 Burmeister 2010b, 224, 228, hinting at the fact that without steerability the turning circles of wagons with two axles range between 24.8–69.7 m (Burmeister 2010b, 228, table 1).

84 Bourriau 1988, 62, with photograph on that page.

85 Egyptian Museum Cairo, CG 29702; C. Gaillard and G. Daressy, *La faune momifiée de l'antique Égypte: Nos 29501–29733 et 29751–29834. Catalogue général des antiquités égyptiennes du Musée du Caire* (Cairo: Institut français d'archéologie orientale, 1905), 113, pl. 46.

86 W. B. Emery, "Preliminary Report on the Excavations at North Saqqara 1964–1965," *Journal of Egyptian Archaeology* 51 (1965): 4.

87 Bourriau 1988, 62 (photograph).

88 Bourriau 1988, 62 (photograph).

89 Egyptian Museum Cairo, CG 24095; Saleh and Sourouzian 1986, no. 142a.

90 Arnold 1991, 273–275. For transport on rollers see as well J. Harrell and T. M. Bown "An Old Kingdom Basalt Quarry at Widan el-Faras and the Quarry Road to Lake Moeris," *Journal of Egyptian Archaeology* 32 (1995): 82–83; Clarke and Engelbach 1990, 85, 89–90, 224; Creasman and Doyle 2010, 20.

91 W. Nagel, *Der Mesopotamische Streitwagen und seine Entwicklung im ostmediterranen Bereich* (Berlin: Hessling, 1966) 1, 2, fig. 3; A. Salonen, *Die Landfahrzeuge des Alten Mesopotamien* (Helsinki: Suomalainen Tiedeakatemia, 1951), 155, pl. 1, 1–2; H. Hayen, "Früheste Nachweise des Wagens und die Entwicklung der Transportmittel," *Mitteilungen der Berliner Gesellschaft für Anthropologie und Ethnologie und Urgeschichte* 10 (1989): 44; Burmeister 2004, 14, fig. 5; Köpp-Junk 2015a, fig. 39.

92 Littauer and Crouwel 1979, 13.

93 Egyptian Museum Cairo, JE 27301; Shedid 1994, fig. 110; Köpp-Junk 2015a, 121, 141–142, table 5, pl. 9b.

94 Model from the tomb of Queen Ahhotep, Thebes, Dra Abu el-Naga, beginning of the Eighteenth Dynasty; Egyptian Museum Cairo, JE 4669 = CG 52668.

95 M. G. Lefebvre, *Le tombeau de Petosiris I* (Cairo: Institut français d'archéologie orientale, 1924), pls. 30, 34; Dittmann 1941, 68; Köpp-Junk 2015a, 145, pl. 10c.

96 F. W. von Bissing, *Ein thebanischer Grabfund aus dem Anfang des Neuen Reiches* (Berlin: Duncker, 1900), 20–22, pl. 10; Dittmann 1941, 65–66, fig. 5; Saleh and Sourouzian 1986, no. 123; S. Wachsmann, "Ahhotep's Silver Ship Model: The Minoan Context," *Journal of Ancient Egyptian Interconnections* 2.3 (2010): 31–41, figs. 3–4; Wachsmann 2013, 88–92, figs. 3.3–5.

97 Finnish National Museum Helsinki, nr. 14560:660; E. Grothe-Paulin, *Der ägyptische Sarg in Helsinki* (Helsinki: Finnish Oriental Society, 1988), 28, 66 (images); R. Holthoer et al. 1993. *Muinainen Egypti, hetki ikuisuudesta: 30.8.1993–2.1.1994; Ancient Egypt: A Moment of Eternity* (Tampere: Algraphics Oy Tamprint, 1993), 159–160, 163, no. 173; van Walsem

1997, 228.

98 From Deir el-Bahri; British Museum London, EA 22941; Taylor 2001, 187–188, fig. 131; Creasman and Doyle 2010 17, fig. 9; Wachsmann 2013, 99.

99 British Museum London, EA 36211, see below.

100 Thebes; National Museum of Antiquities at Leiden, coffin M3, AMM 18; van Walsem 1997, 21, 225–231, color pl. 1B, pls. 10–11, 147.

101 Van Walsem 1997, 21.

102 Louvre Museum, Paris, N 3057; M. Étienne, *Les Portes du Ciel, Visions du monde dans l'Égypte ancienne. Exhibition catalogue Musée du Louvre, 6 mars—29 juin 2009* (Paris: Somogy, 2009), object no. 95.

103 Van Walsem 1997, 225.

104 The decoration of the wheels is done in a manner similar to that on the wagon of Amenemope (British Museum London, EA 22941; Taylor 2001, 187–188, fig. 131).

105 From Thebes, probably Deir el-Bahri; Museo Gregoriano Egizio, Musei Vaticani, no. 25008.2.2; O. Marucchi, *Guide du Musée égyptien du Vatican* (Rome: Imprimerie polyglotte vaticane, 1927), fig. 11; A. Gasse, *Aegyptiaca Gregoriana III*: *Les sarcophages de la Troisième Période Intermédiaire du Museo Gregoriano Egizio* (Vatican: Tipografia Poliglotta Vaticana, 1996), 13–43, pl. III, 1 and front page; Creasman and Doyle 2010, fig. 8.

106 British Museum London, EA 22941 (coffin of Amenemope) and EA 36211 (coffin of Nesmut); Finnish National Museum Helsinki, no. 14560:660 (coffin of Ankhefenamun).

107 The *tekenu* is an important part of the funerary procession since the Old Kingdom. It is often depicted wrapped in cloth or hide. The interpretations of the *tekenu* range widely. These include, for example, that it is a priest, that it consists of body parts remaining from the mummification process, and that it is a special form of appearance of the deceased. The identification and interpretation of the *tekenu* is still under discussion; see for example J. M. Serrano, "A Contribution to the Study of the *Tekenu* and Its Role in the Egyptian Funerary Ritual," *Zeitschrift für Ägyptische Sprache und Altertumskunde* 138 (2011): 150–162.

108 See Finnish National Museum Helsinki, no. 14560:660; British Museum London, EA 36211.

109 See for example Tylor and Griffith 1894, pl. 5; Davies 1915, pl. 12; N. de Garis Davies, *The Tomb of Nefer-Hotep at Thebes I* (New York: Arno Press, 1933), pl. 20; Davies 1913, pl. 2, 8; G. Maspero, *Le Tombeau de Montouhikhopshouf. Le Tombeau de Nakhti* (Paris, 1894), 439, fig. 1. Usually the sledge with the *tekenu* is drawn by individuals, not by oxen.

110 Littauer and Crouwel 1979, 79; Littauer and Crouwel 1985, 27, pls. 30–31, object A4; U. Hofmann, *Fuhrwesen und Pferdehaltung im Alten Ägypten* (Bonn: Hochschulschrift, 1989), 173, fig. 2a.

111 Tylor and Clarke 1896, "Introduction," pl. 2; Dittmann 1941, 65, fig. 4.

112 This interpretation is proposed by Wachsmann 2013, 101 as well.

113 British Museum London, EA 22941; van Walsem 1997, fig. 366, 369, 373; pl. 145; Taylor 2001, 187–188, fig. 131; Creasman and Doyle 2010, 17, fig. 9; Wachsmann 2013, 99; The British Museum, "Coffin" (EA22941), *Online Collection*, http://www.britishmuseum.org/research/collection_online/collection_object_details/collection_image_gallery.aspx?partid=1&assetid=1341045001&objectid=117259, accessed 21 March 2016.

114 Pyramid group A, northern cemetery, pyramid 15, south wall; Lepsius 1970, pl. 41a; PM VII, 245; Dittmann 1941, fig. 6; Wachsmann 2013, 97, 99, fig. 3.13.

115 Dittmann 1941, 67; PM VII, 245.

116 F. L. Griffith, "Oxford Excavations in Nubia," *Annals of Archaeology and Anthropology* 9 (1921–1922): pl. 32.

117 Griffith 1921–1922, pl. 32, 1. For a late chariot in the August Kestner Museum in Hannover, see Köpp-Junk and Loeben 2013, 174–175.

118 Köpp-Junk 2015a, 144–145.

119 Lefebvre 1924, pl. 30, 34; Dittmann 1941, 68; Köpp-Junk 2015a, 145, pl. 10c.

120 A. Fakhry, *Siwa Oasis* (Cairo: The American University in Cairo Press, 1973), fig. 74; K. Lembke, "Aus der Oase des Sonnengottes—Das Grab des Siamun in Siwa," in P. C. Bol, G. Kaminski, and C. Maderna (eds.), *Fremdheit—Eigenheit: Ägypten, Griechenland und Rom. Austausch und Verständnis* (Stuttgart: Scheufele, 2004), fig. 6; Wachsmann 2013, 101–102, fig. 3.16; Köpp-Junk 2015a, 146, 153, table 5, fig. 61, pl. 10d.

121 I would like to thank Dr. S. Nakaten (University of Trier, Classical Archaeology) and A. Kireenko (BA, University of Trier, Egyptology) for their contributions to the discussion on the wagon of Petosiris.

122 I am most obliged to Susanne Nakaten for this hint.

123 Wachsmann (2013, 101) assumes a mistake made by the artist.

124 I thank Samuel Butterick very much for this idea.

125 Köpp-Junk 2015a, 135–136, 146, pl. 10c.

126 Littauer and Crouwel 1979, fig. 5, 7, 80–81; S. Mühl, "Metal Makes the Wheel Go Round: The Development and Diffusion of Studded-tread Wheels in the Ancient Near East and the Old World," in Y.

Galanakis, T. Wilkinson, and J. Bennet (eds.), *Athyrmata: Critical Essays on the Archaeology of the Eastern Mediterranean in Honour of E. Susan Sherratt* (Oxford: Archaeopress Archaeology, 2014), 159–176.

127 British Museum London, EA 10265; J. G. Wilkinson: *Manners and Customs of the Ancient Egyptians II* (London: Murray, 1841), 341, no. 243; J. G. Wilkinson, *A Popular Account of the Ancient Egyptians I* (London: Murray, 1854), 384, fig. 337; Dittmann 1941, 69, fig. 8; T. G. H. James, *Egyptian Painting and Drawing in the British Museum* (London: British Museum Publication, 1985), fig. 83; Wachsmann 2013, 102, fig. 3.17; H. Kockelmann, *Untersuchungen zu den späten Totenbuch-Handschriften auf Mumienbinden II.1–2: Die Mumienbinden und Leinenamulette des memphitischen Priesters Hor* (Wiesbaden: Harrassowitz, 2008), v. I.1: 3–7, 42–43, 47, 90, fig. 1, pl. 3; v. I.2: pl. 1, 15.

128 Fakhry 1973, fig. 74; Lembke 2004, fig. 6; Wachsmann 2013, 101–102, fig. 3.16; Köpp-Junk 2015a, 146, 153, table 5, fig. 61, pl. 10d.

129 Köpp-Junk 2015a, fig. 61.

130 Tylor and Clarke 1896, "Introduction," pl. 2.

131 J. Osing, "Die Gräber des Petubastis und Petosiris," in A. Fakhry (ed.), *Denkmäler der Oase Dachla* (Mainz am Rhein: von Zabern, 1982), pl. 22 c; Köpp-Junk 2015a, 146–147, fig. 62.

132 Osing 1982, pl. 22 c.

133 Osing 1982, pl. 24a, 31 b; Köpp-Junk 2015a, 147, pl. 10b.

134 I owe my thanks to Dr. Holger Kockelmann for drawing my attention to this wagon and the precise dating of the object. For the publication of this wagon see H. Kockelmann, *Der Herr der Seen, Sümpfe und Flussläufe. Untersuchungen zum Gott Sobek und den ägyptischen Krokodilgötter-Kulten von den Anfängen bis zur Römerzeit,* habilitation thesis (Universität Tübingen, 2014; publication in preparation); see as well Boutantin 2013, fig. 15.

135 Collection Fouquet, Louvre Museum Paris, no. CA 5965.

136 Ägyptisches Museum und Papyrussammlung, Staatliche Museen zu Berlin, ÄM 20803; unknown provenance, bought in Giza in 1913; W. Weber, *Die ägyptisch-griechischen Terrakotten* (Berlin: Curtius, 1914), 256, fig. 128; Woytowitsch 1995, 176–177, fig. 142; O. Höckmann, "Boote mit stumpfem Bug und scharfem Heck im römischen Ägypten," *Jahrbuch des Römisch-Germanischen Zentralmuseums* 54 (2007): 463; Wachsmann 2013, fig. 3.27; Köpp-Junk 2015a, 147, fig. 63.

137 British Museum London, EA 30092; Parlasca 1966, 160, pl. 58, 2.

138 Greco-Roman: The British Museum, "Shroud" (EA30092), *Collection Online*, http://www.britishmuseum.org/research/collection_online/collection_object_details.aspx?objectId=124452&partId=1&museumno=30092&page=1, accessed 9 March 2016.

139 Parlasca 1966, 160.

140 Louvre Museum, Paris, N 305; Étienne 2009, object no. 95.

141 Thebes; National Museum of Antiquities in Leiden, coffin M3, AMM 18; van Walsem 1997, 21, 225–231, color pl. 1B, pl. 10-11, 147.

142 Unknown provenance; Louvre Museum, Paris, no. E 21524 (formerly Musée Guimet); F. Dunand, *Catalogue des terres cuites gréco-romaines d'Egypte. Musée du Louvre, Département des antiquités égyptiennes* (Paris: Edition de la Réunion des Musées Nationaux, 1990), 332–333, no. 1007; Boutantin 2013, 94.

143 F. Dunand, *La nécropole de Douch: exploration archéologique. Structures sociales, économiques, religieuses de l'Égypte romaine. Documents de fouilles de l'Institut français d'archéologie orientale du Caire.* (Cairo: Institut français d'archéologie orientale, 1992), pl. 61, 1–2; Boutantin 2013, 93, pl. 6, fig. 18.

144 E. Brovarski, "*Henu*-bark," in W. Helck, and W. Westendorf (eds.), *Lexikon der Ägyptologie V* (Wiesbaden: Harrassowitz, 1984), 1066.

145 Emery 1965, 4.

146 Emery 1965, 4, pl. 5; Boutantin 2013, 98, pl. 8, fig. 26.

147 Boutantin 2013, 98, pl. 8, fig. 26.

148 Thebes; British Museum London, EA 36211; A. Niwiński, *21st Dynasty Coffins from Thebes: Chronological and Typological Studies* (Mainz am Rhein: von Zabern, 1988), 153–154, no. 271; van Walsem 1997, 227, 230–231, fig. 365, pl. 145; The British Museum, "Coffin" (EA36211), *Collection Online*, http://www.britishmuseum.org/research/collection_ online/collection_object_details.aspx?objectId=117255&partId=1&searchText=36211&page=1, accessed 3 March 2016.

149 For a different explanation see van Walsem 1997, 229.

150 The British Museum, "Coffin" (EA36211), *Collection Online*, http://www.britishmuseum.org/research/collection_online/collection_object_details.aspx?objectId=117255&partId=1&searchText=36211&page=1, accessed 13 March 2016; Van Walsem (1997, 227) dates the object between the late Twenty-first Dynasty and the Twenty-second Dynasty.

151 Niwiński 1988, 154.

152 Finnish National Museum Helsinki, no. 14560:660.

153 Dattari 1901, pl. 30, no. 1158.

154 British Museum London, EA 30092; Parlasca 1966, 159–160, pl. 58, 2; Kákosy 1977, 57–65, fig. 3; Köpp-Junk 2015a, 142, pl. 10e.

[155] Dartmouth College Museum, no. 39-64-6623; R. A. Caminos, "Fragments of the Book of the Dead on Linen and Papyrus," *Journal of Egyptian Archaeology* 56 (1970): 120, pl. 53.

[156] D. B. Redford, *The Akhenaten Temple Project II:* Rwd-mnw, *Foreigners and Inscriptions* (Warminster: Aris & Phillips, 1988), 10, pl. 31.

[157] Redford 1988, 10.

[158] Redford 1988, 10, n. 66.

[159] Griffith 1921–1922, pl. 32.

[160] Louvre Museum, Paris, N 3081; J.-L. Cenival, *Le Livre pour sortir le jour: le Livre des morts des anciens Égyptiens* (Bordeaux: Musée d'Aquitaine, 1992), 42–43; Boutantin 2013, pl. 7, fig. 20.

[161] For a detailed analysis of these objects, including an extensive bibliography for every example, see Boutantin 2013, 81–110.

[162] Egyptian Museum Cairo, JE 21881: E. Drioton, *Encyclopédie photographique de l'art. Le Musée de Caire* (Paris: Éditions Tel, 1949), fig. 192; Boutantin 2013, 83, pl. 3, fig. 10. Egyptian Museum Cairo, JE 45044: Boutantin 2013, 84, pl. 1, fig. 4. Egyptian Museum Cairo, JE 47229: Boutantin 2013, 84, pl. 3, fig. 11. Egyptian Museum Cairo, TR 30/3/22/8: Boutantin 2013, 84-85, pl. 4, fig. 12. Egyptian Museum Cairo, number unknown: Boutantin 2013, 85, pl. 2, fig. 5; M. el-Amir, "The ΣΗΚΟΣ of Apis at Memphis," *Journal of Egyptian Archaeology* 34 (1948): 52, pl. 17, 4; G. J. F. Kater-Sibbes and M. J. Vermaseren, *Apis I: The Monuments of the Hellenistic-Roman Period from Egypt* (Leiden: Brill, 1975), 20, no. 67.

[163] Ägyptisches Museum und Papyrussammlung, Staatliche Museen zu Berlin, no. 7494; Kater-Sibbes and Vermaseren 1975, no. 66; Boutantin 2013, 81, pl. 1, fig. 1.

[164] Fitzwilliam Museum Cambridge, no. 74.1911; Kater-Sibbes and Vermaseren 1975, no. 68; Boutantin 2013, 82, pl. 1, fig. 2.

[165] Roemer- and Pelizaeus-Museum Hildesheim, PM 1876; Kater-Sibbes and Vermaseren 1975, no. 69; Boutantin 2013, 82-83, pl. 1, fig. 3; Köpp-Junk 2015a, pl. 10f.

[166] Rijksmuseum van Oudheden Leiden, F 1959/5-2; Boutantin 2013, 86, pl. 2, fig. 7.

[167] Louvre Museum, Paris, E 3887; Boutantin 2013, 86, pl. 4, fig. 13.

[168] Ägyptisches Museum der Universität Leipzig, 1830; E. Blumenthal, "Reliefblock mit Apisstier," in R. Krauspe (ed.), *Das ägyptische Museum der Universität Leipzig* (Mainz am Rhein: von Zabern, 1997), fig. 96; Boutantin 2013, 85, pl. 2, fig. 6; R. Mond and O. H. Myers, *The Bucheum III* (London: Egypt Exploration Society, 1934), pl. 109.

[169] No. 16824: Boutantin 2013, 86, pl. 2, fig. 9; no. 287: Boutantin 2013, 88.

[170] Boutantin 2013, 87, pl. 2, fig. 8 and pl. 5, fig. 14.

[171] Dittmann 1941, 67; Kater-Sibbes and Vermaseren 1975, 20, nos. 67–68.

[172] Kater-Sibbes and Vermaseren 1975, 19–21.

[173] PM III^2, 841–842.

[174] Boutantin 2013, 90–91, 101. For a discussion of their function see Boutantin 2013, 99–102 and Blumenthal 1997, 119.

[175] Referring to one of the Kom el-Fakhry examples: Dittmann 1941, 67; Wachsmann 2013, caption related to fig. 3.25A.

[176] Kater-Sibbes and Vermaseren 1975, 19–20; for the dating of the Louvre example to this period see Wachsmann 2013, caption related to fig. 3.25B.

[177] Blumenthal 1997, 119.

[178] Boutantin 2013, 91–95.

[179] Boutantin 2013, 101.

[180] Egyptian Museum Cairo JE 47229; Boutantin 2013, pl. 3, fig. 11.

[181] Egyptian Museum Cairo, TR 30/3/22/8; Egyptian Museum Cairo, JE 47229; Boutantin 2013, 84, 85.

[182] El-Amir 1948, 52, pl. 17, 4 (wagon on the left-hand side).

[183] Egyptian Museum Cairo, JE 21881; Drioton 1949, fig. 192; Boutantin 2013, fig. 10, pl. 3.

[184] A. Bülow-Jacobsen, "Traffic on the Roads between Coptos and the Red Sea," in O. E. Kaper (ed.), *Life on the Fringe* (Leiden: Research School CNWS, 1998), 64.

[185] A lot of research has been done concerning this issue in recent times; see for example papers in M. Fansa (ed.), *Rad und Wagen. Der Ursprung einer Innovation im Vorderen Orient und Europa* (Mainz am Rhein: von Zabern, 2004); Burmeister 2004; S. Burmeister, "'Codierungen/Decodierungen.' Semiotik und die archäologische Untersuchung von Statussymbolen und Prestigegütern," in H. Hildebrandt and C. Veit (eds.), *Der Wert der Dinge—Güter im Prestigediskurs. "Formen von Prestige in Kulturen des Altertums"* (München: Herbert Utz Verlag, 2009), 73–102; Burmeister 2010a; Burmeister 2010b; S. Burmeister, "Innovationswege—Wege der Kommuni-kation. Erkenntnisprobleme am Beispiel des Wagens im 4. Jahrtausend v. Chr.," in S. Hansen and J. Müller (eds.), *Sozialarchäologische Perspektiven: Gesellschaft-licher Wandel 5000–1500 v. Chr. zwischen Atlantik und Kaukasus. Internationale Tagung 15.–18. Oktober 2007* (Mainz am Rhein: von Zabern. 2011), 211–240; F. Klimscha, "Transforming Technical Know-How in

Time and Space: Animal Traction and the Wheel and the Complexity of Their Diffusion: Using the Digital Atlas of Innovations to Understand a Prehistoric Innovation Process," *eTopoi: Journal for Ancient Studies* (2016): in press; and the research project "Digital Atlas of Innovations" of Prof. Dr. S. Hansen, Eurasia-Department of the German Archaeological Institute in Berlin.

186 For details see H. Köpp-Junk, "Wheeled Vehicles and Their Development in Ancient Egypt—Technical Innovations and Their (Non-) Acceptance in Pharaonic Times," in S. Hansen and F. Klimscha (eds.), *Contextualising Technical Innovations in Prehistory*, in press.

187 See for example the so-called "Kobelwagen" in the "Weltchronik des Rudolf von Ems" of about 1360 CE and the miniature of Jean Le Tavernier, Brussels (Bibliothèque Nationale Paris) of about 1455 CE.

188 Thebes; National Museum of Antiquities in Leiden, coffin M3, AMM 18; van Walsem 1997, 21, 225–231, color pl. 1B, pls. 10–11, 147.

189 From Deir el-Bahri; British Museum London, EA 22941; van Walsem 1997, fig. 366, 369, 373; pl. 145; Taylor 2001, 187–188, fig. 131; Creasman and Doyle 2010 17, fig. 9; Wachsmann 2013, 99; The British Museum, "Coffin" (EA22941), *Collection Online*, http://www.britishmuseum.org/research/collection_online/collection_object_details/collection_image_gallery.aspx?partid=1&assetid=1341045001&objectid=117259, accessed 21 March 2016.

190 Erman 1887, 699; Desroches-Noblecourt, Donadoni, and Edel 1971, pl. 5.

191 British Museum, London, EA 30092; Parlasca 1966, 160, pl. 58, 2.

192 Louvre Museum, Paris, N 3081; Cenival 1992, 42–43; Boutantin 2013, pl. 7, fig. 20.

193 Unknown provenance; Louvre Museum, Paris, E 21524 (formerly Musée Guimet).

194 Ägyptisches Museum und Papyrussammlung, Staatliche Museen zu Berlin, ÄM 20803.

195 Thebes; Archaeological Museum Florence, no. 2678.

196 Egyptian Museum Cairo JE 61990 (A1), JE 61989 (A2), JE 61991 (A3), JE 61993 (A4), JE 61994 (A5), JE 61992 (A6); Littauer and Crouwel 1985, pl. 7, 16, 30, 5, 56. For the earliest examples from the time of Thutmose III and Amenhotep II, see Hofmann 1989, 171, fig. 67 (TT78), 74 (TT93), 94 (TT 89); A. Brack and A. Brack, *Das Grab des Haremhab Theben Nr. 78* (Mainz am Rhein: von Zabern 1980), pl. 88.

197 Erman 1887, 699; Desroches-Noblecourt, Donadoni, and Edel 1971, pl. 5.

198 Hofmann 1989, 170.

199 Nagel 1966, 39; Littauer and Crouwel 1979, 80, 106–107; W. Decker, "Bemerkungen zur Konstruktion des ägyptischen Rades in der 18. Dynastie," *Studien zur altägyptischen Kultur* 11 (1984): 484; Hofmann 1989, 170, listing on page 171.

200 Littauer and Crouwel 1979, 75, 78, 81; T. Ritter, "*ḏr.wt*: der Speichenkranz des Wagenrades," *Zeitschrift für ägyptische Sprache und Altertumskunde* 117 (1990): 62; Decker 1984, fig. 2.

201 Thebes; Archeological Museum Florence, no. 2678; Decker 1986, 41-42. For details of the construction of chariot wheels see A. C. Western, "A Wheel Hub from the Tomb of Amenophis III," *Journal of Egyptian Archaeology* 59 (1973): 91–94; M. A. Littauer and J. H. Crouwel, "An Egyptian Wheel in Brooklyn," *Journal of Egyptian Archaeology* 65 (1979): 107–120; James K. Hoffmeier, "Observations on the Evolving Chariot Wheel in the 18th Dynasty," *Journal of the American Research Center in Egypt* 13 (1976): 43–45. For the construction of the felloe see G. Kossack, "The Construction of the Felloe in Iron Age Spoked Wheels," in J. Boardman, M. A. Brown, and T. G. E. Powell (eds.), *European Community in Later Prehistory: Studies in Honour of L. F. L. Hawkes* (Totowa, N.J.: Rowman and Littlefield, 1971), 143.

202 V. Horn, *Das Pferd im Alten Orient: Das Streitwagenpferd der Frühzeit in seiner Umwelt, im Training und im Vergleich zum neuzeitlichen Distanz-, Reit- und Fahrpferd* (Hildesheim/Zürich: Olms, 1995), 50. A replica of a Celtic two-wheeled chariot with spokes has a weight of 100 kg (A. Furger-Gunti, "Der keltische Streitwagen im Experiment Nachbau eines essedum im Schweizerischen Landesmuseum," *Journal of Swiss Archeology and Art History* 50 [1993]: 220).

203 Often only parts of the spoked wooden wheels of life-size vehicles were found, or the wheels were made of metal. See for example the bronze wheel of Cortaillod; the fragments have a weight of 7.69 kg, while for the whole wheel 10 kg is assumed (M. Binggeli and M. Betschart, "Das Bronzerad von Cortaillod: das älteste Speichenrad der Schweiz," *Archäologie Schweiz* 29 [2006]: 34–35).

204 M. Vosteen, *Urgeschichtliche Wagen in Mitteleuropa. Eine archäologische und religionswissenschaftliche Untersuchung neolithischer bis hallstattzeitlicher Befunde* (Rahden: Verlag Marie Leidorf GmbH, 1999), 47; S. Burmeister, "Neolithische und bronzezeitliche Moorfunde aus den Niederlanden, Nordwestdeutschland und Dänemark," in M. Fansa, M. (ed.), *Rad und Wagen. Der Ursprung einer Innovation im Vorderen Orient und Europa* (Mainz am Rhein: von Zabern, 2004), 326–327, fig. 5. Piggott (1992, 17–18) even assumes a weight of 670–700 kg for a four-wheeled wagon on disk wheels.

205 Lefebvre 1924, pl. 30, 34; Dittmann 1941, 68; Köpp-Junk 2015a, 145, pl. 10c.

206 Fakhry 1973, fig. 74; Lembke 2004, fig. 6; Wachsmann 2013, 101–102, fig. 3.16; Köpp-Junk 2015a, 146, 153, table 5, fig. 61, pl. 10d.

207 See for example chariot A4 from the tomb of Tutankhamun (Thebes, KV 62, Eighteenth Dynasty; Egyptian Museum Cairo, JE 61993; Littauer and Crouwel 1979, 79; Littauer and Crouwel 1985, 27, pl. 30–31, object A4; Hofmann 1989, 173, fig. 2a).

208 See for example the chariot of Yuya and Tjuyu, where the wheel rim is surrounded by leather segments sewn together (Thebes, KV 46, Eighteenth Dynasty; Egyptian Museum Cairo, CG 51188; J. E. Quibell, *Tomb of Yuaa and Thuiu: Nos. 51001–51191, Catalogue général des antiquités égyptiennes du Musée du Caire* (Cairo: Institut français d'archéologie orientale, 1908), pl. 51, 52; Hofmann 1989, 173; Köpp-Junk 2015a, 192, pl. 13b–c.

209 From Thebes, probably Deir el-Bahri; Museo Gregoriano Egizio, Musei Vaticani, no. 25008.2.2; Marucchi 1927, fig. 11; Gasse 1996, 13–43, pl. II, 1; Creasman and Doyle 2010, fig. 8.

210 Hayes 1959, 164, fig. 90; Decker 1986, 54, fig. 3; Köpp-Junk 2015a, 109, 139, table 5, fig. 51.

211 Littauer and Crouwel 1979, fig. 42.

212 Davies and Gardiner 1920, pl. 19; Creasman and Doyle 2010, fig. 10; Köpp-Junk 2015a, fig. 44. For other examples of sledges shown from above see F. W. von Bissing, *Das Re-Heiligtum des Königs Ne-woser-Re (Rathures) II: Die kleine Festdarstellung* (Berlin: Duncker,1923), sheet 7; D. Faltings, *Die Keramik der Lebensmittelproduktion im Alten Reich* (Heidelberg: Heidelberger Orientverlag, 1998), fig. 14a, 1.

213 The object (Egyptian Museum Cairo, CG 4928) was found near the pyramid of Senwosret III; see above (J. de Morgan 1895, fig. 204; Arnold 1991, fig. 6.35; Köpp-Junk 2015a, pl. 6b [color photograph]).

214 From Deir el-Bahri; British Museum London, EA 22941; van Walsem 1997, fig. 366, 369, 373; pl. 145; Taylor 2001, 187–188, fig. 131; Creasman and Doyle 2010 17, fig. 9; Wachsmann 2013, 99; The British Museum, "Coffin" (EA 22941), *Collection Online*, http://www.britishmuseum.org/research/collection_online/collection_object_details/collection_image_gallery.aspx?partid=1&assetid=1341045001&objectid=117259, accessed 21 March 2016.

215 Creasman and Doyle 2010, 17, fig. 9. For other objects with sledges as an integral element and the religious connotation of sledges and ships see Köpp-Junk 2015a, 127–132.

216 Hayen 1989, 36.

217 S. Vinson, *Egyptian Boats and Ships* (Princes Risborough, U.K.: Shire Publications, 1994), 11.

218 Burmeister 2004, 21.

219 The cart tracks from Flintbeck, Germany (Zich 1992–1993, 25–26, fig. 8, 10; Burmeister 2010b, 224).

220 See the pictograms from Uruk phase IV (Fig. 6; Nagel 1966, 1, 2, fig. 3; Salonen 1951, 155, pl. 1, 1–2; Hayen 1989, 44; Burmeister 2004, 14, fig. 5; Köpp-Junk 2015a, fig. 39).

221 T. G. E. Powell, "Some Implications of Chariotry," in J. L. Forster and L. Alcock (eds.), *Culture and Environment: Essays in Honour of Sir Cyril Fox* (London: Routledge and Kegan Paul, 1963), 153; Littauer and Crouwel 1979a, 15, 48.

222 British Museum London, EA 121201; Nagel 1966, 7, fig. 6; J. Crouwel, "Der alte Orient und seine Rolle in der Entwicklung von Fahrzeugen," in M. Fansa (ed.), *Rad und Wagen. Der Ursprung einer Innovation im Vorderen Orient und Europa* (Mainz am Rhein: von Zabern, 2004), 73, fig. 8; The British Museum, "The Standard of Ur," *Collection Online*, http://www.britishmuseum.org/research/collection_online/collection_object_details/collection_image_gallery.aspx?partid=1&assetid=12575001&objectid=368264, accessed 25 March 2016

223 For details see Köpp-Junk 2015a, 154.

224 Papyrus Chester Beatty I; A. H. Gardiner, *The Chester Beatty Papyri, No. I* (London: Oxford University Press, 1931), pl. 29, G, 1–4.

225 Couyat and Montet 1912, 38, no. 12, lines 19–21.

226 Bourriau 1988, 62 (photograph).

227 Hayes 1959, 164, fig. 90; Decker 1986, 54, fig. 3; Köpp-Junk 2015a, 109, 139, table 5, fig. 51.

228 See Fansa 2004; W. Treue (ed.), *Achse, Rad und Wagen* (Göttingen: Vandenhoeck und Ruprecht, 1986).

229 Erman 1887, 699; Desroches-Noblecourt, Donadoni, and Edel 1971, pl. 5.

230 *Urk.* IV 1232, 1–6; Reisner and Reisner 1933, 28–29; Creasman and Doyle 2010, 23–24.

231 Herodotus II, 63; Dittmann 1941, 67–68.

232 Burmeister 2009, 80–84.

233 Köpp-Junk 2015a, 135. For details on these wagons see for example F. E. Barth et al., *Vierrädrige Wagen der Hallstattzeit: Untersuchungen zu Geschichte und Technik* (Mainz: Verlag des römisch-germanischen Zentralmuseums, 1987); D. van Endert, *Die Wagenbestattungen der späten Hallstattzeit und der Latènezeit im Gebiet westlich des Rheins* (Oxford: BAR, 1987); M. Schönfelder (ed.), *Das spätkeltische Wagengrab von Boé (Dép. Lot-et-Garonne): Studien zu Wagen und Wagengräbern der jüngeren Latènezeit* (Mainz: Verlag des römisch-germanischen Zentralmuseums, 2002).

234 Metzner-Nebelsick 2009, 237–270.

235 N. Reeves, *The Complete Tutankhamun* (London: Thames and Hudson, 1990), 72 (photograph).

236 Köpp-Junk 2015a, 178–180, figs. 71–76.

237 See for example E. Hornung, *Tal der Könige* (Zurich: Artemis, 1988), fig. 109 (*Book of Gates*, tomb of Ramesses VI), 110 (*Book of Gates*, tomb of Amenhotep II), 127 (*Book of Gates*, tomb of Ramesses VI), 142 (*Amduat*, tomb of Amenhotep II), 143 (*Amduat*, tomb of Thutmose III), 144 (*The Book of the Day*, tomb of Ramesses VI).

238 Vinson 1994, 50–51.

239 Wachsmann 2013, 25. See as well, for example, the model now in the British Museum London (EA 59632) from the Badarian culture; British Museum London, EA 41575 (Twelfth Dynasty, Beni Hassan, tomb no. 723); EA 34273 (Twelfth Dynasty, without clear provenience); EA 35292 (Twelfth Dynasty, without clear provenience); EA 25360 (Twelfth Dynasty, Meir).

240 British Museum London, EA 35502 (3300 BC); EA 35324 (Naqada II).

241 M. Adams and D. O'Connor, "The Royal Mortuary Enclosures of Abydos and Hierakonpolis," in Z. Hawass (ed.), *Treasures of the Pyramids* (Vercelli: White Star, 2003), 83; D. O'Connor, *Abydos: Egypt's First Pharaohs and the Cult of Osiris* (London: Thames and Hudson, 2009), 183–194, figs. 88–89, 96–100; P. P. Creasman and N. Doyle, "From Pit to Procession: The Diminution of Ritual Boats and the Development of Royal Burial Practices in Pharaonic Egypt," *Studien zur Altägyptischen Kultur* 44 (2015), 83–84, 95 (table 1). For the ship of Khufu see M. Z. Nour and Z. Iskander, *The Cheops Boats I* (Cairo: General Organisation for Government Printing Office, 1960), pl. 31, 37, passim; Landström 1974, 26–34; Partridge 1996, 30; C. Ward, *Sacred and Secular: Ancient Egyptian Ships and Boats* (Philadelphia: University Museum, University of Pennsylvania: 2000), 45–68; Z. Hawass, "The Royal Boats at Giza," in Z. Hawass (ed.), *Treasures of the Pyramids* (Vercelli: White Star, 2003), 165–171. For the Dahshur boats see, Ward 2000, 83–102; P. P. Creasman, *The Cairo Dahshur Boats*, M.A. thesis (Texas A&M University, 2005); P. P. Creasman, "A Further Investigation of the Cairo Dahshur Boats," *Journal of Egyptian Archaeology* 96 (2010), 110–124, pl. II.

242 In the tomb of Tutankhamun 35 models of boats and ships were found (H. Carter, *Tut-ench-Amun: Ein ägyptisches Königsgrab III* [Leipzig: Brockhaus, 1934], pls. 3, 39, 59; D. Jones, *Model Boats from the Tomb of Tut'ankhamun* [Oxford: Griffith Institute, 1990]; A. Wiese and A. Brodbeck, *Tutanchamun. Das Goldene Jenseits* [München: Hirmer, 2004], 274); Creasman and Doyle 2015, 91, 99 [table 1]).

243 For a detailed overview of this development, see Creasman and Doyle 2015.

244 Partridge 1996, 135, 137; Köpp-Junk 2014, 122–124; Köpp-Junk 2015a, 127–132.

245 This is not the place to discuss the question of prestige in detail, since it is a vast field of research on its own; see e.g. M. K. H. Eggert, "Prestigegüter und Sozialstruktur in der Späthallstattzeit: Eine kulturanthropologische Perspektive," *Saeculum* 42 (1991): 1–28; Stephan Seidlmayer, "Prestigegüter im Kontext der Breitenkultur im Ägypten des 3. und 2. Jahrtausends v. Chr.," in B. Hildebrandt and C. Veit (eds.), *Der Wert der Dinge—Güter im Prestigediskurs* (München: Herbert Utz Verlag, 2009), 309–334; B. Hildebrandt and C. Veit (eds.), *Der Wert der Dinge—Güter im Prestigediskurs* (München: Herbert Utz Verlag, 2009); Burmeister 2009, 73–102; M. H. Feldman and C. Sawage, "Objects of Prestige? Chariots in the Late Bronze Age Eastern Mediterranean and Near East," *Ägypten und Levante* 20 (2010): 67–181; B. Christiansen and U. Thale (eds.), *Ansehenssache. Formen von Prestige in Kulturen des Altertums* (München: Herbert Utz Verlag, 2012); Köpp-Junk 2015a, 184–186; 191–192, and passim.

246 The same applies to later times as well (Bagnall 1985, 5). A detailed analysis of the meaning of land transport and the change of the Egyptian transport system in the period following the New Kingdom up to the end of the Greco-Roman era is now being prepared by the author.

247 J. J. Janssen, *Commodity Prices from the Ramesside Period: An Economic Study of the Age of Necropolis Workmen at Thebes* (Leiden: Brill, 1975), 167–173.

248 F. Junge, *Neuägyptisch. Einführung in die Grammatik* (Wiesbaden: Harrassowitz, 1999), 315–316; Janssen 1975, 510–515.

249 Bagnall 1985, 5, referring to the Greco-Roman Period, but probably transferable to earlier times as well.

250 Nagel 1966, 1, 2, fig. 3; Salonen 1951, 155, pl. 1, 1–2; Hayen 1989, 44; Burmeister 2004, 14, fig. 5. For a listing of the earliest vehicles from the Near East see Burmeister 2011, 211–215, and Köpp-Junk 2015a, 135–138.

251 Zich 1992–1993, 25–26, figs. 8, 10. For further information on the earliest vehicles from Europe see Burmeister 2011, 215–223, and Köpp-Junk 2015a, 134–135.

252 Burmeister 2010b, 223.

253 Burmeister 2011, 223, 226 with a concise summary of the evidence and a distribution map of wagons (fig. 25).

254 Burmeister 2004, 16; Klimscha 2016.

255 Burmeister 2010a, 225.

256 *Urk.* IV 1232, 1–6.

257 For details see Köpp-Junk 2015a; H. Köpp-Junk, "Travel," in E. Frood, E. and W. Wendrich. (eds.), *UCLA Encyclopedia of Egyptology*, 2013, http://escholarship.org/uc/item/3945t7f7, accessed 12 May 2016.

258 More detailed in Köpp-Junk in press.

259 Dittmann 1941, 70.

260 The discussed term is *t3 nt-ḫtrj* on the Kamose stela, line 13; L, Habachi, *The Second Stela of Kamose* (Glückstadt: Augustin, 1972), 36. Textual and archaeological evidence for the Hyksos is overall rare (M. Bietak, "From Where Came the Hyksos and Where Did They Go," in M. Marée (ed.), *The Second Intermediate Period [Thirteenth—Seventeenth Dynasties]: Current Research, Future Prospects* [Leuven 2010: Peeters, 2010], 139–181).

261 The chariot is explicitly mentioned in the phrase *ḥr wrrj.t=f*, "on his chariot" (*Urk.* IV 3, lines 5–6).

262 S. P. Harvey, *Abydos: Oriental Institute Report 2002–2003* (Chicago: Oriental Institute of the University of Chicago, 2003), http://oi.uchicago.edu/pdf/02-03_Abydos.pdf, accessed 20 April 2016; A. J. Spalinger, *War in Ancient Egypt: The New Kingdom* (Malden, Mass.: Blackwell Publishing, 2005), figs. 1.6–7.

263 A. R. Schulman, "Chariots, Chariotry and the Hyksos," *Journal of the Society for the Study of Egyptian Antiquities* 10.2 (1980): 113; M. Bibby, "The Arrival of the Horse in Egypt: New Approaches and a Hypothesis," in R. Ives (ed.), *Current Research in Egyptology III* (Oxford: Archaeopress, 2003), 15. For a short summary of the first finds of horses in pharaonic contexts at Buhen, Tell el-Dab'a, and Tell el-Maskhuta see Köpp-Junk 2015a, 167; in detail see P. Raulwing and J. Clutton-Brock, "The Buhen Horse: Fifty Years after Its Discovery (1958–2008)," *Journal of Egyptian History* 2.1–2 (2009): 1–106.

264 T. Säve-Söderbergh, "The Hyksos Rule in Egypt," *Journal of Egyptian Archaeology* 37 (1951): 60; Littauer and Crouwel 1979, 76; C. Booth, *The Hyksos Period in Egypt* (Princes Risborough, U.K.: Shire Publications, 2005), 36; I. Shaw, *Ancient Egyptian Technology and Innovation* (London: Bristol Classical Press, 2012), 97; Köpp-Junk in press.

265 Spalinger 2005, 8; Shaw 2015, 95.

266 J. Crouwel, "Studying the Six Chariots from the Tomb of Tutankhamun—An Update," in A. J. Veldmeijer, A. J. and S. Ikram (eds.), *Chasing Chariots: Proceedings of the First International Chariot Conference (Cairo 2012)* (Leiden: Sidestone Press, 2013), 74..

267 Y. Yadin, *The Art of Warfare in Biblical Lands I* (Toronto: McGraw-Hill, 1963), 86.

268 Köpp-Junk in press.

269 See the scaling ladder in the tomb of Kaemheset at Saqqara, Quibell and Hayter 1927, frontispiece, 25; Senk 1957, 207–211, fig. 1; Schulman 1982, n. 23; Clarke and Engelbach 1990, 88, fig. 83; Köpp-Junk 2015a, 137–138, table 5, fig. 49.

270 Bourriau 1988, photograph on page 62.

271 C. Wastlhuber, *Die Beziehungen zwischen Ägypten und der Levante während der 12. Dynastie. Ökonomie und Prestige in Außenpolitik und Handel*, PhD dissertation (Ludwig Maximilian University of Munich, 2011), 77.

272 Klimscha 2016.

273 Burmeister 2004, 21; Klimscha 2016.

274 In Maadi 314 spindle whorls have been found (I. Rizkana and J. Seeher, *Maadi III: The Non-Lithic Small Finds and the Structural Remains of the Predynastic Settlement* [Mainz am Rhein: von Zabern, 1989], 52–53, pls. 94–96, IX [1–8]).

275 See e.g. P. Kaplony, *Die Inschriften der ägyptischen Frühzeit 1–3* (Wiesbaden: Harrassowitz, 1963), IÄF 37, 38 and passim; G. Dreyer, *Umm el-Qaab I. Das prädynastische Königsgrab U-j und seine frühen Schriftzeugnisse* (Mainz am Rhein: von Zabern), 108–112, 181, fig. 72, 105; A. Wiese, *Die Anfänge der ägyptischen Stempelsiegel-Amulette: eine typologische und religionsgeschichtliche Untersuchung zu den "Knopfsiegeln" und verwandten Objekten der 6. bis frühen 12. Dynastie* (Freiburg: Universitäts-Verlag, 1996), 1, 87, 105.

276 D. Craig Patch, *Dawn of Egyptian Art* (New Haven: Yale University Press, 2012), 156, object no. 134 (door socket with the head of a captive).

277 Clarke and Engelbach 1990, 89, 227, fig. 267.

278 Shaw 2012, 97.

279 The chariot was the preferred mode of locomotion for the elite, both male and female (Köpp 2008, 34–44).

280 Horn 1995, 55.

281 This fact is also pointed out by Partridge (1996, 76).

282 Bagnall 1985, 5; Bagnall 1993, 38.

283 Adams 2007, 20, 25, 66.

284 Adams 2007, 20 (P. Oxy. XXXIII 2680).

285 Adams 2007, 20 (P. Mich. Zenon 103, col. 1, 2–8).

286 Dittmann 1941, 62.

287 Littauer and Crouwel 1979, 78.

288 E. Endesfelder, "Zur Frage der Bewässerung im pharaonischen Ägypten," *Zeitschrift für Ägyptische Sprache und Altertumskunde* 106 (1979): 37.

289 In ancient Egypt slabs of basalt, granite, sandstone, or even petrified wood were used for the pavement of roads (Köpp-Junk 2015a, 60–67, pls. 1 c–d, 2 a–d).

290 Burmeister 2010b, 224, 228, table 1.

291 Adams 2007, 19–20.

292 Burmeister 2011, 228; S. Burmeister, "Der Mensch lernt fahren—eine Frühgeschichte des Wagens," *Mitteilungen der Antropologischen Gesellschaft in Wien* 142 (2012): 81.

293 The oldest known road in the world is from ancient Egypt: the Widan el-Faras Road from the Old Kingdom (Harrell and Bown 1995, 71–91). For details on paved streets in ancient Egypt see Köpp-Junk 2015a, 60–64; on the Egyptian road network, see Partridge 1996, 79–82, fig. 78; Köpp-Junk 2015a, 37–81.

294 See for example in Amarna, Hatnub, those starting from Dahshur, Fayum, the Qasr Ibrim fortress, and Toshka (for details see Köpp-Junk 2015a, 52–59).

295 See, for example, a photograph from the 19th century showing a wheeled vehicle as part of the escort of the khedive in the Western Desert (E. M. Kaufmann, *Heilige Stadt der Wüste* [Kempten: Kösel & Pustet, 1924], fig. 15).

296 *Urk.* IV 1232, 1–6; Reisner and Reisner 1933, 28–29.

297 Couyat and Montet 1912, 38, no. 12, lines 19–21.

298 See above, Erman 1887, 699; Desroches-Noblecourt, Donadoni, and Edel 1971, pl. 5.

299 See, for example, O. Kaelin, *"Modell Ägypten": Adoption von Innovationen im Mesopotamien des 3. Jahrtausends v. Chr.* (Fribourg: Academic Press, 2006), 17–39.

300 On the reason for the significant increase of camels and wagons in Greco-Roman times in detail, see Köpp-Junk in press.

301 E. M. Rogers, *Diffusion of Innovations*, 3rd ed. (New York: Macmillan Publishing, 1981), 11, 164–176, 247–259, figs. 1-1, 5-1, 7-2; E. M. Rogers, U. E. Medina, M. A. Rivera, and C. J. Wiley, "Complex Adaptive Systems and the Diffusion of Innovations," *The Innovation Journal: The Public Sector Innovation Journal, Volume* 10.3, article 30 (2005): 7.

302 Partridge 1996, 76; Wachsmann 2013, 86.

303 Bagnall 1993, 38.

304 The horse was no counterpart to the donkey because it was not used as a transport animal in ancient Egypt. It covered a field of application different from that of the donkey, being used as a draft animal for chariots and as a mount when high-speed movement was necessary (Köpp-Junk 2015a, 166–171). For details on the different means of transport and locomotion see Köpp-Junk 2015a, 107–213.

305 N. Ohler, *Reisen im Mittelalter*, 2nd ed. (München: Artemis-Verlag, 1988), 35.

306 D. P. S. Peacock, and V. A. Maxfield, *Survey and Excavation at Mons Claudianus 1987–1993 II: Survey and Excavation* (Cairo: Institut français d'archéologie orientale, 2001), 296; F. Förster, "With Donkeys, Jars and Water Bags into the Libyan Desert: The Abu Ballas Trail in the Late Old Kingdom/First Intermediate Period," *British Museum Studies in Ancient Egypt and Sudan* 7 (2007): 5, n. 25; Ohler 1988, 37.

307 Ohler 1988, 35. The data concerning the carrying capacity vary very much; for detail, see F. Förster, *Der Abu Ballas-Weg. Eine pharaonische Karawanenroute durch die Libysche Wüste* (Köln: Heinrich-Barth-Institut, 2016), 407–411.

308 Peacock and Maxfield 2001, 297.

309 Adams 2007, 81 (ed. Diocl. 17, 3–5).

310 M. Jung, *Zur Logik archäologischer Deutung. Interpretation, Modellbildung und Theorieentwicklung am Fallbeispiel des späthallzeitlichen "Fürstengrabes" von Eberdingen-Hochdorf, Kr. Ludwigsburg* (Bonn: Verlag Dr. Rudolf Habelt GmbH, 2006), 157.