CHAPTER 4

Water Transport on the Nile

In ancient Egypt, the movement of goods relied primarily on river transport along the Nile. This was a natural consequence of agricultural development, settlement, and urban growth along its banks.

The Nile flows from south to north, from Ethiopia and Sudan to the Mediterranean. Transport from Upper Egypt downstream required little more than surrendering to the current. Upstream navigation, by contrast, depended on sail power. Egypt is characterized by a persistent northerly wind blowing from the Mediterranean along the Nile Valley. These winds are especially stable during the summer inundation season, enabling boats to drift downstream with the current and return upstream under sail.

In winter, however, the northerlies are less reliable, and calm days occur. Between March and May, sudden westerly winds from the Sahara can bring dust storms, reduced visibility, and rapid temperature increases.

For this reason, any discussion of Nile transport—particularly the movement of heavy materials such as stone—must distinguish between downstream transport and upstream sailing.

Tura, the principal source of high-quality limestone, lies on the east bank of the Nile, whereas Giza and Dahshur lie on the west. Crossing the river was therefore unavoidable. Giza lies downstream of Tura, while Dahshur lies upstream. Transport to Giza could simply follow the current, whereas transport to Dahshur required either upstream sailing or an alternative route: crossing the river at Tura and hauling the stone overland southward. The latter was likely the preferred method.

Granite from Aswan presents a different case. The distance from Aswan to Giza, following the river's meanders, is roughly 1,000 km. Modern writers sometimes cite this distance as evidence of the difficulty of transport, but this reflects a modern misconception. Drifting downstream requires time, but little labor. The real operational burden lay in quarrying, hauling to the riverbank, loading, unloading, and final delivery. When time constraints are loose, spatial distance becomes a secondary concern—a point modern readers often overlook.

In modern maritime trade, the concept of FOB (Free on Board) separates responsibility: the shipper is responsible until loading, and the receiver thereafter. In ancient Egypt, communication between Aswan and Giza depended entirely on river traffic and was far from continuous. The quarrying crews would have worked steadily, while the receiving crews at Giza simply began work whenever a shipment arrived.

In such a system, the question "When will it arrive?" is meaningless. Ships were things that eventually drifted into view, and their arrival marked the beginning of work.

1. Memories of Flat-Bottomed Boats

Having lived in Yokohama for many years, I often saw a distinctive type of cargo barge known as the Daruma-sen moving slowly through the city's canals. With its extremely shallow draft and flat bottom, the vessel was designed for stability and ease of loading rather than speed. It was unsuitable for open seas and operated exclusively in sheltered bays and canals.

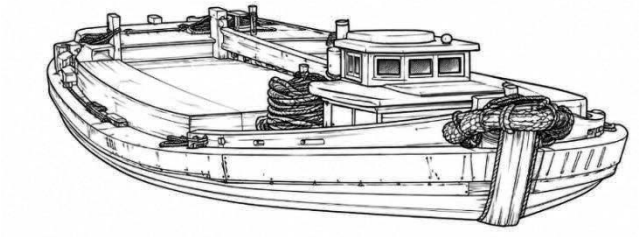


Fig. 4-1. Illustration of a Daruma-sen barge

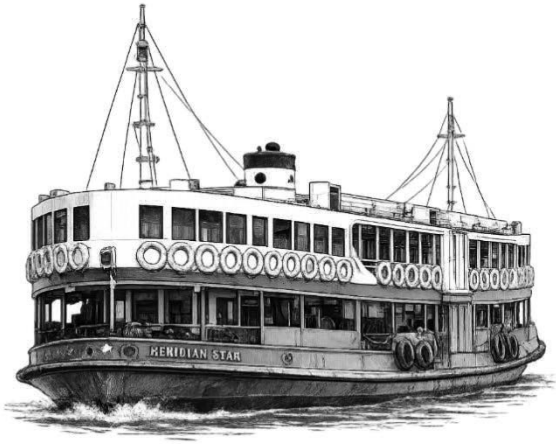


Fig. 4-2. Illustration of the Star Ferry

Another vessel that left a strong impression on me is Hong Kong's Star Ferry. Its unusually wide passenger deck, wooden benches, and two-level structure are distinctive, but its most remarkable feature is its double-ended design, which eliminates the need for turning the vessel around. This allows rapid docking and departure—ideal for high-frequency passenger transport across the sheltered waters between Hong Kong Island and Kowloon.

Both vessels share a shallow draft, which simplifies harbor construction and maintenance. The Nile, with its calm waters and gentle current of roughly one meter per second, would have favored similar designs. For cargo transport, stability mattered far more than speed.

The German Egyptologist Karl Richard Lepsius published a monumental twelve-volume survey of Egyptian monuments. Volume IV includes depictions of broad, shallow-draft cargo boats, likely from the Fifth Dynasty mastaba of Ptahhotep at Saqqara.

Although stylized, the depicted boat appears to be about six meters long and more than one meter wide. Archaeological evidence confirms that ancient Egyptians built flat-bottomed boats, including the famous solar boats. It is therefore reasonable to assume that even broader flat-bottomed vessels could have been constructed for short-distance cargo transport.

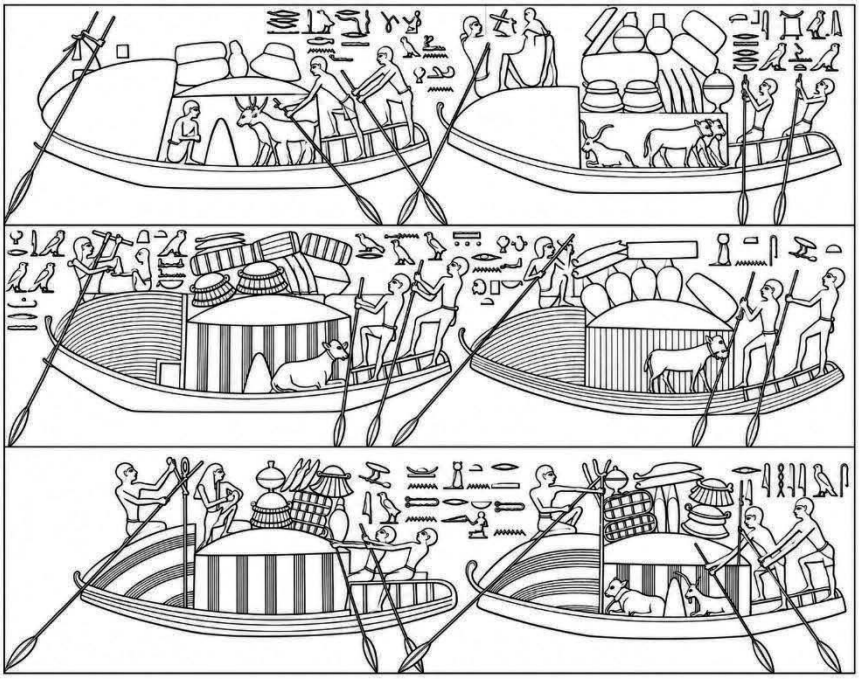


Fig. 4-3. Low-draft boat depicted in tomb art (Source: Traced from Karl Richard Lepsius, Denkmäler aus Aegypten und Aethiopien, 1849–1859, Abteilung II, Blatt 104b.)

A flat-bottomed boat six meters long and two meters wide could likely carry a block weighing around 2.5 tons. Since casing stones were generally smaller than core blocks, such vessels may have been the primary means of transporting Tura limestone to Giza.

2. Papyrus Rafts as an Alternative

Although no papyrus rafts for stone transport appear in Egyptian art, papyrus was abundant, and bundles of papyrus reeds could be lashed together to form a raft capable of carrying perhaps 1.5 tons.

My emphasis on small, shallow-draft vessels stems from the likely presence of extensive shallows along the Nile's banks, even during the

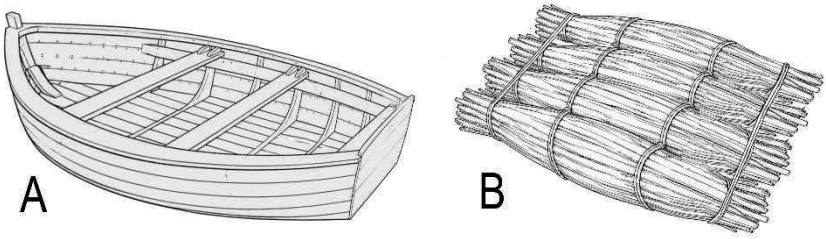


Fig. 4-4. Conceptual reconstruction of a flat-bottomed boat and papyrus raft

inundation. A flat-bottomed boat or raft could simply be run aground like a landing craft, providing a stable platform for loading and unloading stone.

Deep-draft vessels moored to a quay would have been far less practical. The shifting weight of stone during loading would cause dangerous rolling.

For the short 10-km journey from Tura to Giza—downstream and with favorable current—small vessels or rafts would have been entirely adequate.

Granite from Aswan is a different matter. Over a distance of 1,000 km, small craft would be impractical, and larger vessels must have been used. Massive blocks such as the ceiling stones of the King's Chamber or the great gabled lintels above the entrance would have required such ships.

But these exceptional stones represent only a tiny fraction of the total volume. The overwhelming majority of transported stone consisted of Tura limestone casing blocks.

3. Ancient Giza's Flood-Season Topography

A recent study, The Pyramid Builders' Waterways: Reconstructing the Ancient Topography of Khufu's Pharaonic Harbour at Giza, Egypt by Gamal Younes and colleagues at Aix-Marseille University, provides a highly informative reconstruction of Giza's flood-season landscape.

The square structure in the center is the so-called Khufu Harbor.

More intriguing, however, is the large basin immediately to its north.

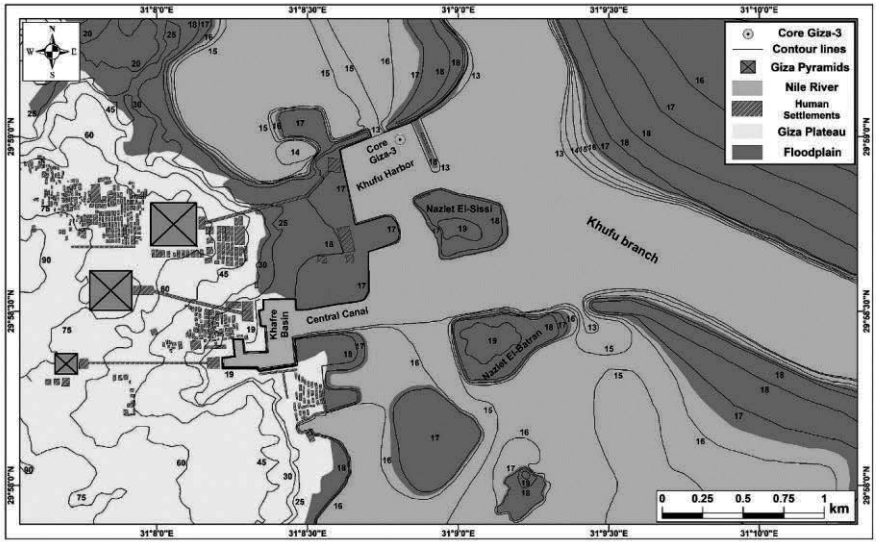


Fig. 4-5. Reconstructed paleogeography of Giza during the flood season in the Fourth Dynasty (Younes et al., Journal of Archaeological Science: Reports, 2024. Reproduced with permission from Elsevier Ltd.)

According to the reconstruction, this basin was connected to the Nile by a channel cut down to an elevation of 13 meters, with surrounding ground rising to about 15 meters. During the dry season, the basin would have emptied and become a depression. At peak inundation, the Nile could reach 17 meters above sea level, flooding the basin.

The southwestern edge of this basin lay only about 500 meters from Khufu's Pyramid.

I therefore propose that Tura limestone blocks, carried on shallow-draft boats or rafts, did not dock at the Khufu Harbor quay but instead were run aground along the southwestern shore of this basin, where unloading would have been far easier.

Even if the basin dried out during the low-water season, this posed no problem. Pyramid construction relied primarily on agricultural laborers during the inundation, when fields were underwater. An infrastructure usable only during the flood season would have been entirely adequate.



Fig. 4-6. Kuruwa, a small fishing port in Yokosuka, Japan (modified from Geospatial Information Authority of Japan maps)

In this sense, Khufu Harbor was not a single facility but a dual-structure port, consisting of:

a quay for deeper-draft vessels, and

a broad, shallow basin for small boats and rafts.

This arrangement is common in small Japanese fishing ports, such as the one shown in Fig. 4-6, where a deep-water pier coexists with a shallow beaching area for small craft. Having grown up seeing such harbors, I immediately recognized the pattern when examining the Giza reconstruction.

These considerations suggest that Khufu's harbor was not a facility that operated year-round. Rather, it must be understood as a seasonally functional port, whose usability fluctuated dramatically with the Nile's annual cycle of inundation and low water.

During the lowest stages of the river, the harbor basin would have partially or completely dried out, becoming a mudflat. Under such conditions, navigation was impossible, and any dredging or excavation required for harbor maintenance would likely have been carried out precisely during this period, when the water had receded.

Conversely, at the peak of the inundation, the Nile could rise to approximately 17 meters above sea level, as indicated in the reconstruction by Younes and colleagues. Portions of the harbor's shoreline may have been temporarily submerged, again limiting its functionality.

In short, Khufu's harbor should be regarded not as a permanent, continuously operating installation but as a hydrologically constrained infrastructure, usable only during the moderate phases between extreme high and low water. This interpretation aligns well with the seasonal nature of pyramid construction itself, which relied heavily on agricultural laborers available primarily during the inundation months.

A port that functioned only during part of the year would therefore not have posed a logistical problem. On the contrary, it would have matched the rhythm of the labor force and the natural environment in which the pyramid builders worked.

4. Reading the Diary of Merer

In examining the transport of stone to Khufu's harbor, it was essential to consult the primary source known as the Diary of Merer. I therefore obtained and read the 2017 IFAO edition in its entirety.

My initial impression, however, was that the editor, Pierre Tallet, approached the text with strong prior assumptions. His identification of the toponym  as "Tura," and several of his interpretive choices, struck me as more definitive than the evidence strictly allows for a corpus of logographic writing. For this reason, I set aside Tallet's translation and commentary and undertook a careful, independent reading of the hieratic text itself.

The surviving material is divided into what are conventionally called Papyrus A and Papyrus B, each accompanied by smaller associated fragments. The two papyri differ significantly in structure and are not parts of a single continuous document.

This is something of a tangent, but it may be worth noting the

following. Tallet's own line-by-line reading of these two documents—the diary proper—contains no reference to a "13th cattle count" or to any regnal year. Although one occasionally encounters the claim online that "Merer's diary records Year 27 of Khufu," this dating appears only in the Conclusions of the 2017 IFAO edition, introduced abruptly and without citation or supporting figure. The Conclusions do mention that the excavated batch included numerous other fragments beyond Papyri A and B, which may lend the figure a superficial plausibility; but no specific source document is identified, nor is any accompanying illustration provided (see Column 4 for a broader critique of how such numbers are converted into regnal years).

As far as I could determine, the diary contains no description of navigation itself, nor any concrete details about the boats. It reads less like a log of voyages and more like a daily record of harbor operations—loading, unloading, and preparations for departure. The verb for sailing () does not appear; instead, the sign for a stationary boat () is consistently used.

Nevertheless, the diary records harbor work at two different locations within the same day, indicating short-distance transport. Even if the document does not describe the transport of Tura limestone, it remains highly informative for understanding how such transport might have been organized. My purpose here is not to evaluate the diary itself, but to note that several aspects of its interpretation warrant further scrutiny.

Ultimately, the diary does not provide direct information about the waterborne transport of stone. However, it does record three destinations at Giza:

 ("Akhet-Khufu," the Horizon of Khufu)

 ("the Basin of Khufu")

 ("the Entrance to the Basin of Khufu")

These references, together with the operational context implied by the diary, suggest a harbor system staffed not only by overseers like Merer, responsible for cargo handling, but also by sailors, administrative officials

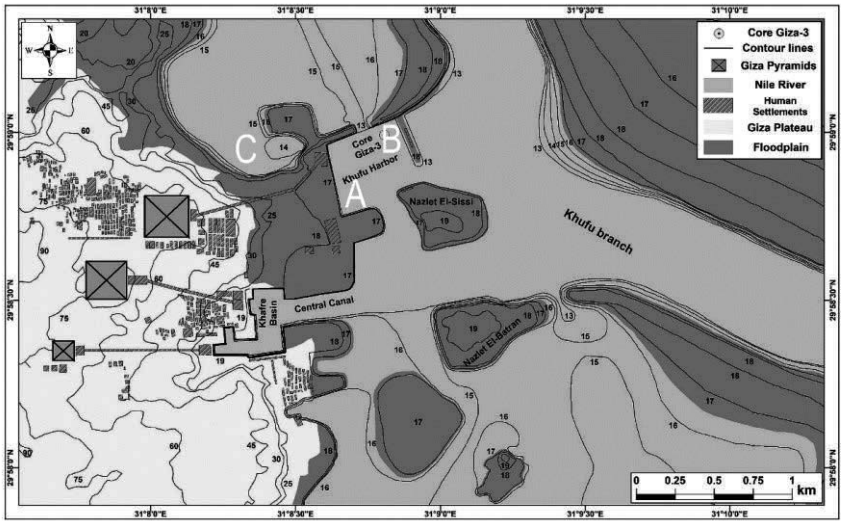


Fig. 4-7. Hypothetical reconstruction of the Giza harbor locations mentioned in the Diary of Merer

managing inventories, and personnel responsible for maintaining the harbor infrastructure.

The text thus offers a glimpse—though a faint one—into a highly differentiated bureaucratic apparatus.

Using the map shown in Fig. 4-7, I propose the following identifications for the three locations mentioned in the diary:

 "the Horizon of Khufu"

The presence of the Horus falcon before the toponym indicates a royal installation. Papyrus A1 suggests that this facility was already in operation just before the onset of the inundation. This evokes an image of a dredged, quay-like harbor structure—effectively the ceremonial and administrative "front entrance" to the Giza complex. I identify this with point A on the map, near the Old Kingdom monuments.

 "the Basin of Khufu"

I associate this with point C. Whether "basin" or "lake" is immaterial: the location becomes a dry depression during low water and a navigable basin during the inundation. When flooded, it would have been the

closest possible landing point to Khufu's Pyramid for shallow-draft vessels. Its function as a harbor, however, was limited to the flood season.  "the Entrance to the Basin of Khufu"

If C is the basin, then the "entrance" must correspond to point B, the area where the main Khufu Harbor quay meets the channel leading into the basin. A and B would have been usable even during low water, while B's quay could have accommodated deeper-draft vessels during the inundation.

Taken together, these identifications suggest that Khufu's harbor system consisted of three functional tiers:

A—the administrative and ceremonial gateway

B—the main, nearly year-round harbor

C—an inner harbor usable only during the inundation

5. Operational Logistics of Supplying the Giza Plateau

The construction of the pyramids required not only Tura limestone but also a vast quantity of additional materials—food, rope, timber, tools, and other consumables. These supplies must have been transported continuously to Giza.

Large, deep-draft vessels carrying heavy granite blocks from Aswan may well have unloaded at point B, the main quay. Even during the agricultural season, when many laborers left Giza, the delivery of supplies would have continued, and both A and B would have remained in use.

The transport of Tura limestone, however, followed a different logic.

Casing-stone transport was not uniform throughout the year; it would have peaked during the inundation, when the largest labor force was available. These stones were relatively small—typically one to three tons. Tura lies only about ten kilometers upstream from Giza, and the blocks could drift downstream with the current.

Given the short distance, modest block size, and the need for high throughput, it is likely that transport relied on numerous small vessels operating in parallel, rather than a few large ships. A piston-shuttle

system would have maximized efficiency.

Loading stone onto a vessel moored broadside to a quay is difficult without cranes. In modern settings, cranes lower loads vertically, but without such equipment, loading must occur from the side. This causes the hull to roll as the weight shifts, making the operation unexpectedly hazardous.

Shallow-draft flat-bottomed boats or papyrus rafts behave differently. Instead of mooring alongside a quay, they drive their bows directly into the shallows, grounding themselves like modern landing craft. Workers on shore can then pull the bow slightly farther onto the bank. In this semi-beached position, the vessel becomes extremely stable, making the loading and unloading of stone far easier.

Fig. 4-8 illustrates this model. On the left, small vessels drift downstream from Tura to Giza, carried by the Nile's current. The river flows at roughly one meter per second, increasing to about 1.5 m/s during the inundation. The journey from Tura to Giza would have taken only two to three hours.

The return trip required sailing upstream, but northerly winds blow along the Nile for most of the year, especially during summer. Thus, the upstream voyage to Tura would have been accomplished primarily under sail.

In such a system, there would have been no need for a transport overseer to accompany the cargo. Loading at Tura and unloading at the

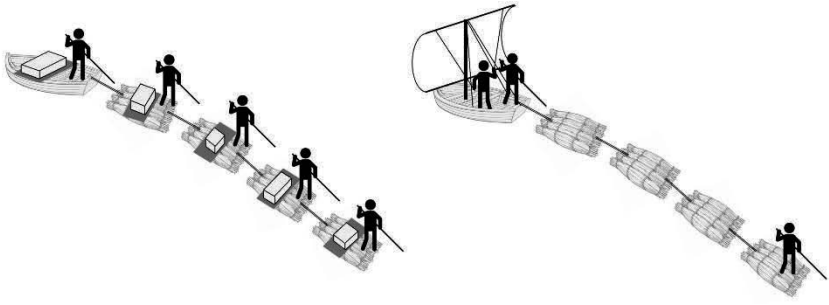


Fig. 4-8. Conceptual model of stone transport using small boats and rafts

Basin of Khufu could have been handled entirely by personnel stationed at each landing site.

I further propose that the fleet operated on a fully divided-labor model. Rather than waiting for unloading to finish, crews of unloaded vessels would immediately sail upstream, while other vessels—already loaded at Tura—would depart downstream toward Giza. This continuous cycle of loading, sailing, and unloading would have maximized throughput. Under such a system, a round trip between Tura and Giza could easily have been completed within a single day.

Notably, no harbor structures comparable to Khufu's harbor have been identified at Tura. This absence supports the idea that casing stones were not loaded onto deep-draft ships but onto shallow-draft vessels that simply ran aground on the riverbank.

Khufu's Pyramid required roughly 100,000 casing stones. Although this number is far smaller than the 2.3 million core blocks, it still implies a peak transport rate of perhaps 50 to 100 stones per day.

Achieving such throughput would have been far easier with many small vessels than with a few large ones. Small craft can be loaded and unloaded quickly, operate in parallel, and require minimal infrastructure.

For these reasons, I believe that the transport of Tura limestone relied on a high-frequency shuttle system of shallow-draft boats and rafts, rather than on large cargo ships.

6. Rethinking the Departure Point in Merer's Diary

Before concluding this chapter, one further point deserves emphasis.

Merer's diary has long been interpreted primarily as a record of transporting casing stones from Tura to Giza. Yet Giza was not only a construction site—it was also a massive consumption center.

The Giza plateau could supply only mudbrick materials and local limestone for core blocks. Everything else—food, timber, rope, tools, consumables, replacement personnel, and administrative supplies—had to be brought in continuously from outside.

If we focus solely on stone transport, we risk overlooking this vast supply network.

In this context, the question of the departure point  becomes crucial. Tura was a quarry, nothing more—it could not have served as a supply hub for food, timber, rope, or tools. If Merer's diary records something broader than stone transport, the departure point must lie elsewhere.

The signs  and  may indicate not merely a waterside location but rather an important urban center—possibly a major administrative or logistical hub. Instead of a simple quarry landing, it may have been a significant city that functioned as a supply base for the entire Giza complex.

If so, the issue extends far beyond whether Merer transported casing stones from Tura. It becomes a question about the broader supply system of the Fourth Dynasty, and about the structure of the Nile transport network itself.

Based on the descriptions in Merer's diary, I suspect that this place name should be sought somewhere south of Tura, yet not as far as Meidum, given the recorded sailing speeds. It seems more plausible that the location lay within the vicinity of Memphis, Saqqara, or Dahshur, rather than at Tura itself.

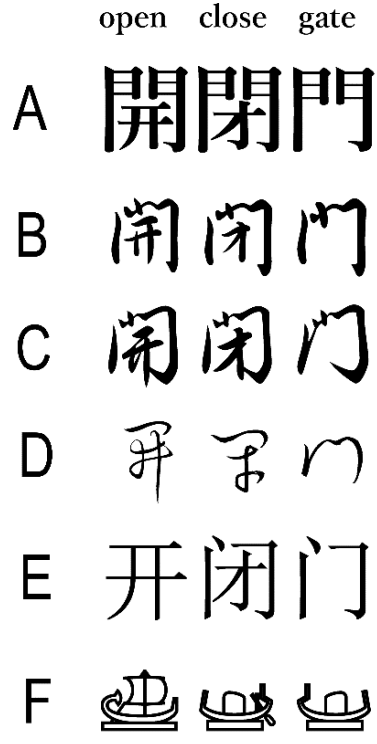
In any case, the first step must be to re-examine the toponym  itself, and to identify its true location.

Column 3: A Perspective from a Japanese Reader of Logographic Scripts with 2,000 Years of Tradition

As a Japanese reader accustomed to using Chinese characters—logographic symbols whose origins lie in ancient pictographs—for nearly two millennia, I would like to offer a few observations relevant to the interpretation of Egyptian hieroglyphs.

Figures A–D on the right illustrate the Chinese characters for "open," "close," and "gate." The characters for "open" (開) and "close" (閉) are semantic compounds derived from the character for "gate" (門).

Figures B and C represent gyōshotai (semi-cursive script), a style derived from brush writing. Although individual handwriting varies, calligraphic conventions are strict: even when the "gate" component is heavily simplified, the semantic element indicating "open" is never omitted. To do so would produce an entirely different character.



For example, 開店 means "to open a shop," whereas 門店—if it existed—would mean "a shop that sells gates," which is nonsensical. The meaning collapses if the semantic component is removed.

Figure D shows sōshotai (cursive script), in which the character for "gate" is drastically simplified, yet the semantic element indicating "open" is still preserved. In Chinese simplified characters (Fig. E), the process of reduction goes further:

閉 and 門 resemble their semi-cursive forms, and 開 has been merged with 开, originally a distinct character. Even so, the semantic distinction remains clear enough for communication.

Now consider Fig. F, the Egyptian boat hieroglyphs  (upstream travel),  (downstream travel), and  (stationary boat).

In the Diary of Merer, only the stationary-boat sign appears; the upstream-sailing and downstream-travel signs do not. Tallet's interpretation effectively collapses all three into the stationary-boat sign, but this is problematic. The signs  and  encode directional meaning:
 represents upstream travel under sail,
 represents downstream travel using an oar for steering.

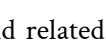
These forms reflect the environmental reality of Egypt, where northerly winds allowed upstream sailing, while downstream travel relied on drifting with the current and steering with an oar.

In a logographic writing system, using the same sign regardless of direction would be equivalent to writing "open" and "gate" with the same character—an error not merely of spelling but of semantic category.

The sign , by contrast, denotes a stationary boat, not the action of traveling upstream or downstream. This distinction parallels the difference between "open/close" (actions) and "gate" (an object).

To illustrate the linguistic point: in Japanese, "to go upstream," "to go downstream," and "boat" are entirely different words—noboru, kudaru, and fune. It would be inconceivable to write them with the same character simply because the shapes resemble one another. Likewise, it is implausible that ancient Egyptian scribes would confuse , , and , which represent different actions and likely different phonetic values.

Georg Möller's Hieratische Paläographie (vol. 1) includes hieratic forms of and . As I anticipated, the hieratic form of clearly shows a diagonal, paddle-like stroke. The form of in Merer's diary closely resembles the variant circled in Möller's table.

Faulkner's dictionary lists  with the meaning "expedition," and  with the meaning "to cross the river," suggesting a semantic field related to movement or passage. However, 

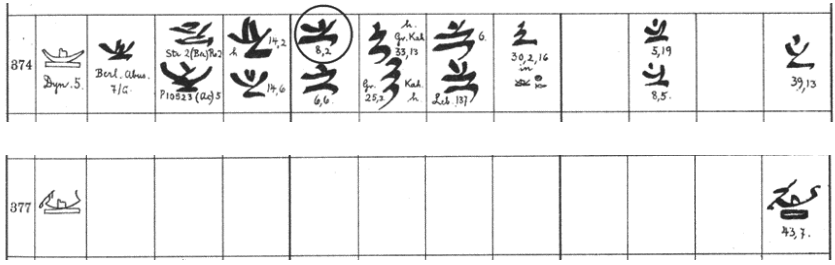


Fig. C2-1. Excerpt from Georg Möller, Hieratische Paläographie, Band I. Annotated by the author (circled marks).Courtesy of the General Library, The University of Tokyo. CC BY.

does not appear. This absence is not decisive.

In modern lexicography, specialized terms often fail to appear in general dictionaries.

For example, anchorage ground is a standard maritime term, yet many general dictionaries omit it; meanwhile, Anchorage appears widely as the name of a city in Alaska. No one would interpret anchorage ground in a maritime document as referring to a baseball field in Anchorage.

Context and domain determine meaning.

Ancient Egyptian dictionaries are far from complete; they cannot be treated as exhaustive inventories of all possible words. The absence of a term from a dictionary does not prove that the term did not exist.

Given that Merer's work clearly involved harbor operations, it is reasonable to assume that  in his diary refers to a technical term specific to port work—loading, unloading, or preparing a vessel while stationary. Words for "expedition" or "crossing the river" belong to the vocabulary of passengers, not harbor workers. Expecting specialized port terminology to appear in general dictionaries is unrealistic.

Traditional Egyptology often proceeds by phonetic transcription before semantic interpretation.

From the perspective of someone accustomed to logographic systems, this approach risks overlooking the visual logic of the script. In my view, scholars working with hieroglyphs would benefit from consulting

specialists in Chinese or Japanese calligraphy—people trained in the rules governing which parts of a logographic character may be simplified and which must be preserved.

For those who have not lived within a logographic writing culture, intuitively understanding the permissible ways to "deform" a character is extremely difficult.