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From River to Sea: Evidence for Egyptian Seafaring Ships

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Abstract

Questions over when and how the ancient Egyptians went to sea continue to engage scholars in debate. Recent excavations of ship timbers at a pharaonic harbor on the Red Sea provide direct evidence for technological approaches that affirm Egypt's idiosyncratic patterns of ship and boat construction (as familiar from Nile riverboats, which provide the largest and most ancient assemblage of watercraft before the classical period). This technological patterning illustrates comparable antiquity to other artisanal products of the upper hierarchies of the state. Reconstruction of a twenty-meter vessel—based on archaeological evidence from seagoing timbers, representations, models, and river hulls—resulted in an efficient and effective sailing ship.

From its earliest days, Egyptian society clearly relied on boats and maritime travel. Archaeologists have excavated thousands of boat and ship representations and models that date from the Neolithic long past the end of the dyna indeed, Egypt boasts the largest assemblage of Bronze Age watercraft in the ancient world. Nevertheless, little direct evidence of seafaring has been found.

Yet while the origins of seafaring in Egypt remain poorly defined, the steady proliferation of burials from mid–fourth millennium Nile Valley sites includes seashells and fragments of copper that document at least an early familiarity with the Red Sea. At the same time, representations—and, by the First Dynasty (ca. 3050 BCE), planked wooden boats deposited as part of burial monuments along the Nile—illustrate a progression toward complex boatbuilding technology (Figure 1).[1]

The Punt reliefs at Hatshepsut's mortuary temple at Deir el-Bahri (ca. 1480 BCE) engaged many scholars interested in questions of how, when, and where the ancient Egyptians went to sea. These reliefs served as the primary template for discussions of Red Sea trade until 2005, when preliminary excavations at Mersa/Wadi Gawasis by a Boston University and University of Naples team uncovered a vast complex for staging round-trip voyages to Punt, primarily of Middle Kingdom date.[2] Recent Institut français d'archéologie orientale (IFAO) excavations at Ayn Soukhna near Suez discovered a similar facility with stored ship timbers, probably supporting shorter voyages linked to direct acquisition of raw materials across the Gulf of Suez.

In this paper, I review archaeological evidence for Egyptian seafaring vessels before 1450 BCE and briefly describe the reconstruction of a Red Sea Punt ship at full scale.

Indirect Evidence

Although Egypt is bordered by two seas, seafaring by the ancient Egyptians has been, until recently, supported only by indirect evidence.[3] No shipwrecks of demonstrably Egyptian origin have been located. In the Mediterranean, artifacts such as Naqada II pottery found off Israel's shore, a stone vase fragment bearing the name of the Second Dynasty ruler Khasekemwy, and a gold Egyptian axe head found in Lebanon—inscribed with the Fourth Dynasty epithet "the boat crew Pacified-is-the-Two-Falcons-of-Gold port gang"—complement a variety of textual sources that indicate regular contact with the Levant (especially Byblos) from the early third millennium.[4] Familiar evidence includes the mention of forty ships loaded with *ʿs* wood (probably cedar) brought to Egypt during the Fourth Dynasty reign of Snefru (ca. 2600 BCE), as recorded on the Palermo Stone.[5] From the late Predynastic, small quantities of cedar (*Cedrus libani*) occur at Nile sites, and cedar planks over two meters long, as well as statues, coffins, and furniture, are known from the Early Dynastic period.[6] Most striking in terms of volume of trade is a 43.5-m-long cedar hull reassembled beside Khufu's pyramid. A second "ship kit" remains disassembled and unexcavated in an adjacent boat grave, providing physical evidence for high-volume trade in cedar.[7] Ezra Marcus summarizes much of this indirect evidence and offers a provocative and convincing analysis of Middle Kingdom Mediterranean seafaring and the transport of slaves, cedar, and booty with respect to the Mit Rahina inscription of Amenemhat II.[8]

Twelve ships portrayed with fine details of rigging, hull construction, cargo, and passengers on the Fifth Dynasty causeway of Sahure further demonstrate Egyptian voyages in

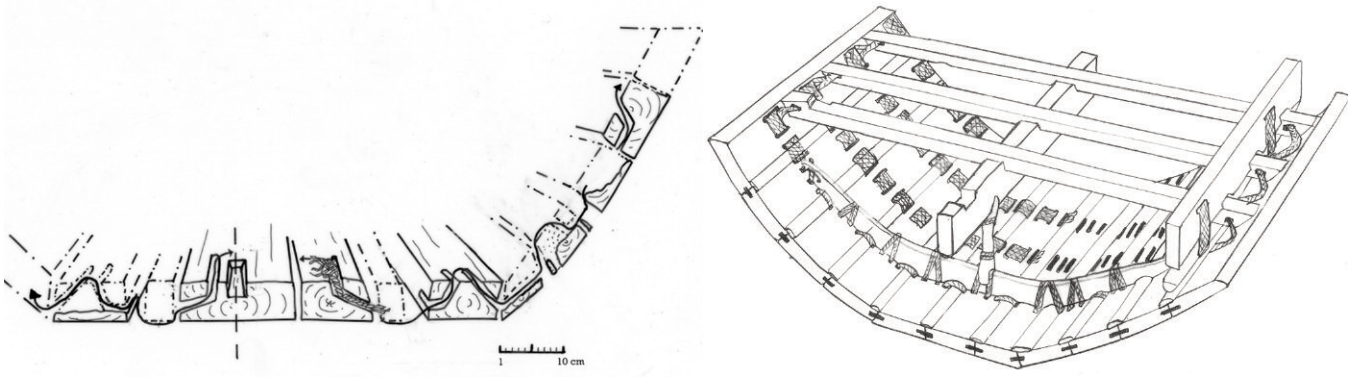

Figure 1. Edge-joined planks and an angled (rather than curved) cross-section are characteristic of both the Abydos boats (left) and Khufu watercraft (right). Drawings by the author.

Figure 2. Details in the Punt reliefs at Hatshepsut's funerary temple accurately represent a functional rigging plan. Photograph by the author.

the Mediterranean along established routes by the mid–third millennium. Excavations in the mortuary temple of Sahure at Abusir by Miroslav Verner and the Supreme Council of Antiquities of Egypt apparently document decorated relief fragments featuring an incense tree as well as inscriptions referencing primates, dogs, and Puntites. The expedition took place in Sahure's thirteenth regnal year (ca. 2443 BCE) and, according to the Palermo Stone, returned from Punt with incense trees and 80,000 measures of incense.

Such a capacity suggests the use of relatively large ships operated by crews with experience in successfully navigating the reef-lined shores of the Red Sea, as dramatically illustrated by the Hatshepsut Punt reliefs (Figure 2). The Hatshepsut vessels generated significant speculative scholarly discussion,[9] but few reliable conclusions have been reached about these Red Sea vessels, called *h'w* or *kbn.wt*, translated as "Byblos ships." I suggest that recent discoveries on the Red Sea coast support the argument that *kbn.t* specifically refers to the wood source for seagoing vessels as cedars from the Levant, rather than to ships built for the Byblos trade or by people from Byblos.

Ship Timbers from Excavations at Mersa/Wadi Gawasis

The first direct evidence of pharaonic seafaring in Egyptian ships was uncovered in excavations at Mersa/Wadi Gawasis. The site, earlier examined by Abdel Monem el Sayed of the University of Alexandria,[10] was *Saww*, a harbor and staging area

for sea voyages. Short fragments of cedar planks, bearing mortises for edge-fastening with tenons, complemented inscriptions on limestone anchors arranged as shrines above the bay. Only a single historic steel anchor was documented by a 1994 underwater survey by the Institute of Nautical Archaeology, Egypt, at Mersa Gawasis,[11] but the site continued to intrigue archaeologists. Beginning with a 2001 survey, an Italian-American expedition (directed by Rodolfo Fattovich of the University of Naples "Institut l'Orientale" and Kathryn Bard of Boston University) has documented its use, primarily during the Middle Kingdom.[12] A number of inscriptions honoring the officials and kings who organized the trips to Punt emphasize its special function.

Since 2004, excavations have identified at least eight rooms and galleries carved about twenty meters deep into the fossil coral terrace and incorporating work, habitation, and ritual areas (Figure 3). Geological and geophysical mapping outline a lagoonal system linked to the sea, with sufficient water depth to allow large ships access. Some of the first artifacts found were two wooden rudder blades for a steering oar,[13] Egyptian-type stone anchors, and cedar ship timbers rife with traces of shipworms, the larval form of wood-devouring mollusks.[14]

Combined with the archaeological evidence, hieroglyphic texts carved on stelae and anchors at the site—as well as hieratic texts on ostraca and papyrus fragments—permit preliminary reconstruction of site activities. Gawasis regularly served as a frontier post for staging seafaring expeditions to Punt during the Middle Kingdom, perhaps at times when conflicts with groups on the central Nile closed traditional land routes.[15] Discoveries there provide direct evidence that when the Egyptians sought exotic raw materials such as incense, ivory, and animals from the southern Red Sea region, they sailed the Red Sea in ships built of imported cedar.

Trade, tribute, and military actions in the region of modern Lebanon and Syria provided the ancient Egyptians with cedar for ships, furniture, statues, coffins, and other finely crafted objects. Marcus recently argued that the Mit Rahina inscription suggests two ships returned from a single expedition with 8–134 tons of cedar, depending on whether trunks or cut wood are referenced.[16] It is likely that imports such as this and other briefly mentioned examples were shipped as trimmed, roughly shaped balks or squared logs. Cedar intended for ships was transported from a port with marine access to the Nile, then to a royal shipyard such as Thinis (at Koptos, modern Quft).[17]

At Gawasis, a lengthy inscription documented the construction of ships on the Nile and the Red Sea but omitted various details of the process. It is certain that ships were built at Nile facilities, dismantled, and then carried across the desert, in what Kenneth Kitchen has called "ship kits."[18] Koptos is the closest point on the Nile to the Red Sea, about 140 km across the Eastern Desert from Gawasis. Individual "kits" likely consisted of all the planks, beams, and other timbers needed to build an entire vessel, along with spare parts and wood for fasteners. Panels of inscribed hieroglyphic signs and marks on

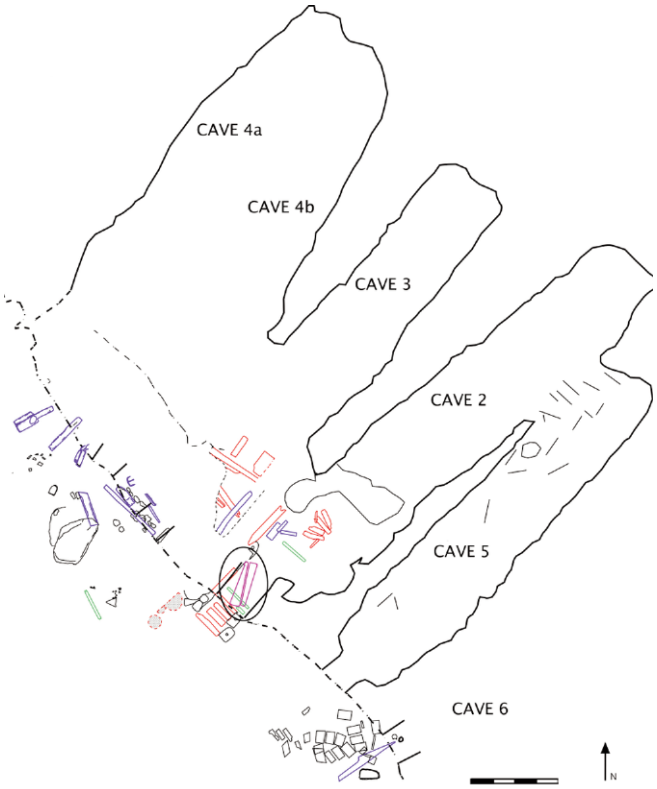

Figure 3. The complex site at Mersa/Wadi Gawasis supported expeditions to Punt and Bia Punt for about five hundred years, according to texts and ceramics found at the site. Plan courtesy of Joint Archaeological Expedtion at Mersa/Wadi Gawasis.

ancient planks at Gawasis may be related to this process (Figure 4). The Intef-iker stele from Gawasis records more than 3,200 men as part of an expedition that transported the ship kits to *Saww*. In addition to transporting timbers, probably with the help of donkeys, the men reassembled the ships and outfitted each vessel with a square sail (almost certainly of linen) as well as oars to use for maneuvering in and out of port each night. Others visited a quarry about ten kilometers west to acquire white limestone for the manufacture of weight anchors and anchor "blanks" like the twenty-six so far recorded at Gawasis by Chiara Zazzaro and Mohamed Abd el-Maguid.[19] Five ships feature in the Hatshepsut Punt relief, but other texts offer only the plural form of "ships" rather than a precise numbers of vessels; the number of ships required to make the journey is unknown. Once the fleet departed, the work crew may have dispersed or been reassigned to mining duties for a few months, but when the ships returned, cargo was unloaded and disassembly of the hulls began.

Shipbreaking is the primary activity documented in areas directly outside the carved rooms at Gawasis.[20] Thousands of pieces of wood debris, cordage, linen fragments, and ship parts with tool marks on them attest to the quick work of dismantling each ship. Large copper-alloy tools such as adzes, chisels,

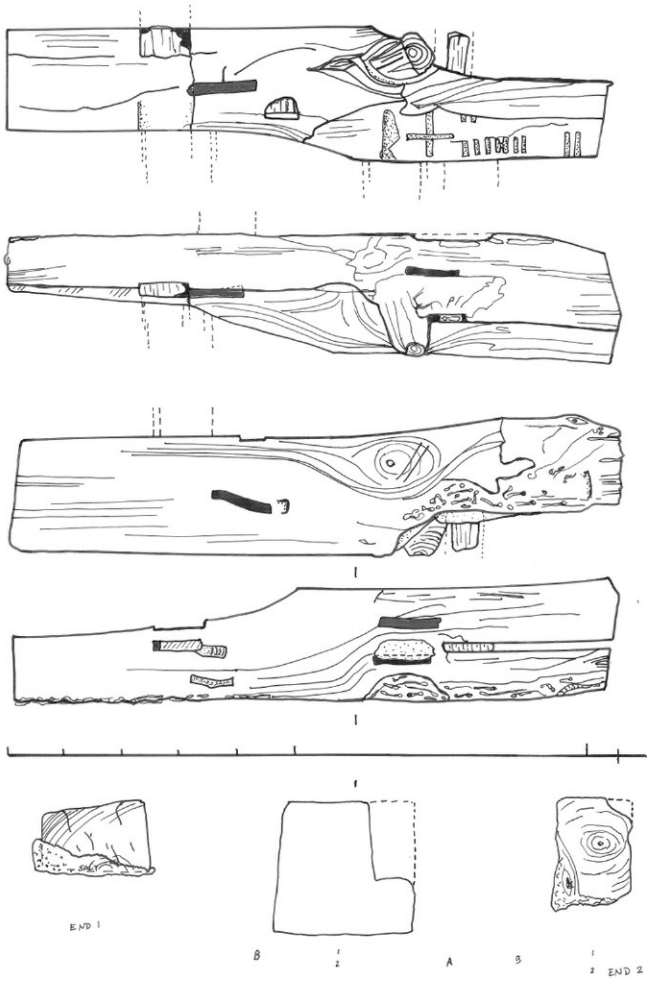

Figure 4. Notational marks and a few hieroglyphic signs inscribed on the inner surfaces of hull and deck planks hint at organizational processes. Drawings by the author.

and saws—as well as stone tools, wooden wedges, and other improvised devices made on the spot—left their marks on the chips of wood, splintered bits of planks, and the remains of ship fittings in and near the galleries. Below layers of windblown plant debris and collapsed sections of coral terrace, extensive deposits of wood chips and shipworm-infested wood fragments, fastenings cut and broken with tools, and even whole recycled timbers testify to the trimming and reworking of planks after a sea voyage of several months.

I suggest that a desire to reuse the timbers is the basis for this activity. Papyrus Reisner refers to the reuse of ship planks and other elements,[21] and a few reworked planks are present on the Dashur boats, as foundations for ramps at Lisht and Lahun,[22] as door and sculpture components and as architectural features at Gawasis.[23] Hull planks with traces of shipworm tunnels and gribble measure 14–22.5 cm thick. Because the voyage lasted several months in warm seawater, shipworm infestation destroyed up to 5 cm of planking thickness. That loss meant that the planks could not be reused in their original configuration, but even after a three- to five-month immersion in seawater, the value of the cedar timbers repaid the effort to remove barnacles, rotten wood, and other debris.

It is likely that as soon as ships returned from Punt and anchored near the lagoon edge at Gawasis, shipwrights probably inspected the hulls, marking unsatisfactory timbers with red paint (still visible on wood debitage and reworked planks). Workers could then remove planks from the hulls by prying seams apart and sawing or chiseling through tenons, followed closely by other workers who pulled planks off the ship from the outside. Once timbers were broken off, men carried them into the gallery complex, walking down ramps of cannibalized ship elements reinforced with mud-bricks. Inside the galleries, plank sections sawn into segments about 80–100 cm long provided secure footing from the entrance, likely into a working space roughly 20 × 4 × 1.8 m. There, workers cleaned and prepared individual planks, some for return to shipyards or carpenters' workshops on the Nile, and others for recycling in architectural features on-site.

At the same time as the Gawasis excavations, French archaeologists working farther north on Egypt's Red Sea coast discovered the charred remains of ship timbers dating to the Middle Kingdom, tied in bundles and stored in similar galleries.[24] The gallery complex at Ayn Soukhna near Suez also features inscriptions documenting expeditions to the copper mines on the Sinai peninsula, about a day's sail away. At Ayn Soukhna, a number of planks 10 cm thick and up to 23 cm wide—with both mortise-and-tenon fastenings and lashing channels like those on Nile watercraft—provide additional proof of Egyptian seafaring capabilities, according to Patrice Pomey's analysis.

The maritime artifacts at Gawasis and Ayn Soukhna reveal not only the technology and level of shipbuilding expertise four thousand years ago, but also expand our knowledge of the vast administrative and bureaucratic nature of ancient Egyptian relations with the world beyond its borders. Studying these forgotten ship planks and equipment—the products of shipyards operating in a style not too far removed from an assembly line—demonstrates that the ancient Egyptians developed a unique technology to achieve their aims as a seafaring people, undertaking long-distance voyages thousands of years ago.

Interpretation

Because the world's most ancient assemblage of complex watercraft belongs to the Nile Valley (twenty-four vessels dating between 3050 and 500 BCE), the unique methods of hull construction developed in ancient Egypt are easily recognizable.[25] Thick, irregularly shaped thick planks, fastened along their edges by long, thin slips of acacia (*Acacia nilotica*) called tenons, created a sturdy planking shell reinforced by beams at deck level but almost entirely lacking interior framing. Because indigenous Egyptian construction techniques for rivercraft dif-

Figure 5. Edge joinery, plank thickness, and plank shapes in *Min of the Desert* were drawn directly from excavated timbers wherever possible. The paired mortise-and-tenon joints in the hull below the deckline are deeper and more widely spaced than those from the Uluburun ship (ca. 1300 BCE). Photograph courtesy of D. Guilhelm.

fer significantly from those of other Mediterranean cultures' seagoing craft, many scholars erroneously assumed that Egyptian seafaring ships would more closely reflect Mediterranean-style construction. Documentation of nearly one hundred identifiable ship components at Gawasis demonstrates that Egyptian design and construction techniques—relying on unpegged, deep mortise-and-tenon joints—were successful both on the Nile and at sea.

Documented constancy in Egyptian hull construction techniques is visible in the rejection of locked (pegged) mortise-and-tenon joints and even in the dimensions of fastenings between planks. By relying on paired, deep mortise-and-tenon joints left unpegged for seagoing craft, Egypt's shipwrights followed long-standing Nilotic traditions that allowed watercraft to be more easily disassembled and reassembled, transported, and recycled. The ability to transfer vessels across the desert from the Nile to the Red Sea is likely one of the most important reasons to design hulls that could be easily disassembled.

Despite the discovery of individual hull components at Gawasis, we lack basic information about the performance, seaworthiness, and reliability of Egyptian seagoing ships. Experimental archaeology helped us address these questions. in 2008–2009, with funding and administrative support from the documentary production company Sombrero & Co. of Paris, I led a team that designed, built, and sailed a full-scale reconstruction of an ancient Egyptian ship.[26] The reconstruction relies on archaeological data as much as possible but must be classified as a floating hypothesis. For example, ship components illustrated in the Hatshepsut Punt reliefs show consistency in dimensions for steering oar blades, beam ends, oar looms, beam spacing, and crutch height with finds from Gawasis. That consistency—and similarities between the profile of Hatshepsut's ships and that of the Middle Kingdom Dashur boats—provided the foundation for a vessel design created by naval architect Patrick Couser.

Hamdi Lahma & Brothers shipyard in Rashid (Rosetta) built *Min of the Desert* (Figures 5 and 6), named for the ancient god of Koptos commemorated in almost all of the Gawasis stelae finds. The ship was built with the same construction technology as ships launched four thousand years ago from Gawasis on voyages to Punt (assisted in some cases by modern technologies such as electrical band saws for roughing

Figure 6. *Min of the Desert* is a reconstruction—a synthesis of archaeological data drawn from excavated timbers and hulls, along with representations and models—as no seagoing Egyptian ships have been located. Photograph courtesy of S. Begoin.

out planks). The crew of four men and two teenagers relied primarily on hand tools made to ancient specifications, though of iron rather than copper alloy.

The ship is 20 m long, nearly 5 m wide, and 1.7 m deep under the beams, with a cargo capacity of about 17 tons and a 30-ton displacement. It includes exact copies of Gawasis timbers. Recent discoveries there suggest other hulls were perhaps half again as large as *Min*.[27] Select 120-year-old Douglas fir (*Pseudotsuga* sp.) timber was chosen for its similarity in properties—including density, bending strength, and ring size—to Lebanon cedar, used by the ancient Egyptians but endangered today. Plank thickness varies from 22 cm for the lowest planks to 14 cm at the sheer, a size easily manipulated by one or two men with simple tools. The ship is held together entirely by unpegged mortise-and-tenon joints along the plank edges. In the lower part of the reconstructed hull, some seams fit poorly, so linen fibers and beeswax were used to fill gaps between planks.

Min of the Desert made only one trial voyage of 135 km, south from Safaga along the ancient route.[28] Like the ancient Egyptians, we used oars to maneuver the ship into position for raising and lowering the sail, and once to save ourselves from being blown onto a reef. A rowing crew of only fourteen—fewer than half the number illustrated on the Punt reliefs—could make 2.5 knots upwind with only a few days training, but sailing was the primary mode of propulsion. A square sail modeled on the remains of model boat sails and linen fragments measured approximately 14.25 × 5 m.[29] Rigging lines and arrangements mirrored those illustrated on the Hatshepsut Punt reliefs.[30] The ship exceeded expectations and maneuvered easily and well at an average speed of approximately 6 knots in winds up to 25 knots. Most nights, the ship anchored in protected, coral-lined bays, some still bordered by mangroves as the Gawasis lagoon once was. *Min of the Desert* is now on display outside the new Suez Museum of the Sea for the Supreme Council of Antiquities.

The Egyptians sailed much farther south on the Red Sea than our trials allowed, but I am confident *Min* could make the trip. The Egyptians very likely returned with northbound currents and a south wind (from the end of the Indian Ocean monsoon) along the Arabian coast in a sailing regime familiar from the Nile: sail south with the north wind, and use the current to travel north.

Conclusions

Like other unique artifacts discovered by archaeologists working at Gawasis, the ship timbers and maritime artifacts discussed herein expand our knowledge of the role of shipbuilding technology and achievement, and of the administrative and bureaucratic nature of ancient Egyptian engagement with the world beyond the Nile. Studying these abandoned planks and equipment—the products of shipyards operating under an approach that resembled an assembly line—at the end of their very long lives informs us about ship technology and shipbuilders, well as the integration of watercraft in multiple aspects of ancient Egyptian life.

Min of the Desert demonstrates that Egyptians were fully capable of long-distance sea voyages in ships relying on technology developed along the Nile. For its design and internal structure, *Min* relies first upon archaeological data drawn from the Gawasis timbers, and only secondarily upon contemporary rivercraft techniques. The combination of thick planks shaped to interlock with one another along their edges and deep, unpegged mortise-and-tenon joints remained structurally sound. The ship outperformed expectations in terms of sailing and seakeeping, actively demonstrating that a rigging plan copied directly from the Hatshepsut Punt reliefs and the ship's uniquely Egyptian construction were efficient and effective. Scholars have underestimated the capabilities of the ancient Egyptians because direct evidence was lacking, but new excavations in the Red Sea demonstrate mastery of technique and practice.

Acknowledgments

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