

Archaeologists can be trained in one or more of these fields, or specifically trained in archaeology, including Near Eastern archaeology, classical archaeology (the archaeology of ancient Greece and Rome), anthropological archaeology, and archaeology as taught in departments of archaeology, which are mainly found in European universities. Archaeologists' training and background strongly influence their focus and methods of investigation.

1.3 Egyptology

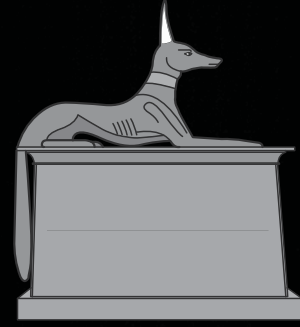
Whereas the methods of archaeology, both prehistoric and pharaonic, developed in the later 19th and 20th centuries – and continue to develop – Egyptology, the study of ancient Egypt, is an even older discipline. The systematic study of ancient Egypt is generally seen as beginning with the Napoleonic expedition to Egypt in 1798 (see Box 1-A). The great military tactician who crowned himself emperor of France (before he met his Waterloo), Napoleon Bonaparte was also a man of the Age of Enlightenment. In Cairo Napoleon founded the French Institute of Egypt, whose successor was re-established in the later 19th century as the Institut français, which continues to be an important center of archaeological and Egyptological studies in Egypt today. Soldiers of Napoleon uncovered the Rosetta Stone while building fortifications in the Delta, and, recognizing its significance as a possible aid to the decipherment of hieroglyphs, Napoleon had Parisian lithographers brought to Egypt to make copies of it. The Rosetta Stone was subsequently handed over to the British, who defeated Napoleon's fleet in Egypt, and it now resides in the British Museum in London, but Jean-François Champollion, a French scholar who studied copies of the Rosetta Stone, made the decipherment of ancient Egyptian (see Box 2-B and Figure 1.1).

1.4 History of Egyptology and Egyptian Archaeology

The ancient Greeks and Romans were interested in the history of pharaonic Egypt. In the 5th century BC Herodotus, a Greek historian who wrote a nine-volume *History*, visited Egypt and narrated its history, including its natural history, in his Book II and part of Book III. The accuracy of some of Herodotus's account has been questioned by historians because some fairly fanciful explanations were included in his books. But when writing about the period in which he lived and the Persian conquest of Egypt Herodotus provides a vital source of information. In late Ptolemaic times Egypt was the subject of historian/geographer Diodorus Siculus's Book I, and Strabo, who visited Egypt shortly after the Roman conquest, provides detailed information about Alexandria, as well as other sites in the country.

After about AD 400 the ancient Egyptian hieroglyphic and demotic scripts ceased to be used and were gradually forgotten, although the ancient language continued to be spoken as Coptic, written in the Coptic alphabet (an extension of the Greek alphabet). In late antiquity, when Christianity spread throughout Egypt, ancient Egyptian culture, with its pagan temples, became increasingly discredited. Christian hermits occupied isolated Dynastic tombs and temples fell into disrepair as their sites were taken over for churches. Christian communities and monasteries continued to exist and use Coptic after the Muslim conquest of Egypt in the 7th century AD, but pharaonic Egypt receded into the legendary past – with its language gradually replaced by Arabic.

CHAPTER 3



The Environmental Background to Pharaonic Civilization Geography, Environment, Agriculture, and Natural Resources

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INTRODUCTION

Pharaonic Egypt arose in the lower Nile Valley, which was a kind of oasis environment between the Eastern and Western Deserts. With adequate Nile floods, Egypt's agricultural potential was enormous, providing surpluses to feed a large and expanding population. Cereal agriculture (emmer wheat and barley) was the true economic base of the state, and through taxation on agricultural surplus all full-time specialists, from priests and bureaucrats to pyramid construction crews, were paid in rations. The great agricultural wealth of ancient Egypt, controlled by the state, meant that some of the agricultural surplus could support the many craftsmen whose work is evident in tombs and tomb goods, and the supply of exotic raw materials imported into Egypt, such as frankincense and elephant ivory, which were mainly consumed by royalty and the elite.

The Nile was ancient Egypt's most important natural resource. Within the Nile Valley and Delta, with the adjacent low deserts, all of the basic resources that sustained human life were available – water, food, and the raw materials for tools, clothing, and shelter.

3.1 Geography: Terms and Place Names

Ancient Egypt was the land of the lower Nile Valley, from the First Cataract at Aswan in southern Egypt to the Mediterranean shore of the northern Delta. Because the Nile River flows from south to north, southern Egypt is called Upper Egypt, while northern Egypt (the Cairo region and the Delta) is Lower Egypt. In modern times the northern part of Upper Egypt, from Asyut to the Faiyum, is often referred to as Middle Egypt. The Egyptian Nile Valley consists of a continuous stretch of river and floodplain through Upper and Middle Egypt and the Cairo region. About 700 kilometers long, the Egyptian Nile Valley is unimpeded by any rapids.

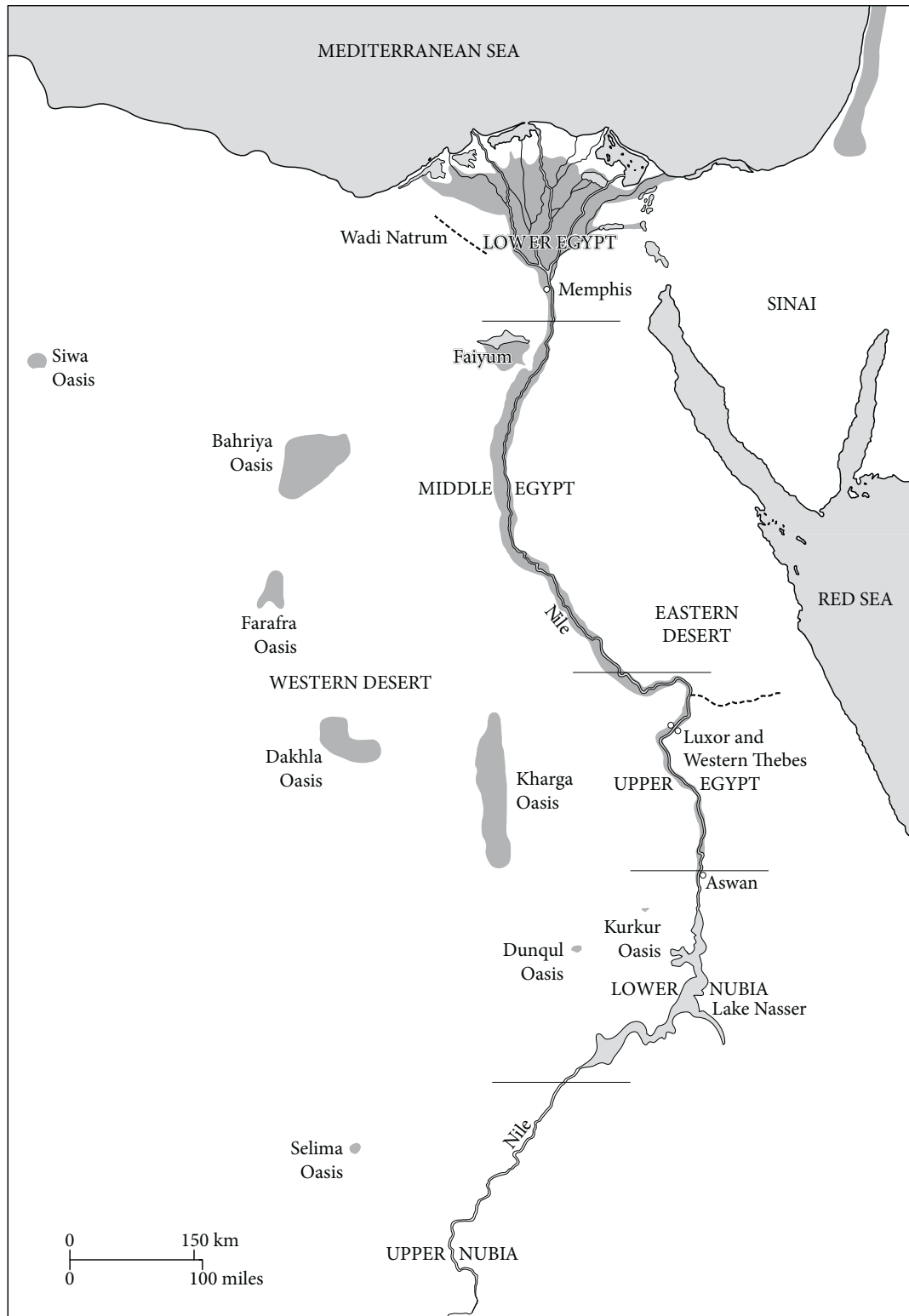
The Nile Delta, in the northernmost part of the country, is where the river breaks off into several branches, which have changed over the course of millennia as some channels silted up and others formed (seven branches were known in the 1st century AD). The two main branches of the Nile of the present Delta are the western Rosetta branch and the eastern Damietta branch.

The southern border of ancient Egypt was at Aswan, where the northernmost Nile cataract is located. Nubia is to the south of Egypt along the Nile, with Lower Nubia between the First and Second Cataracts, and Upper Nubia to the south, farther up the Nile. During much of pharaonic times Egypt controlled parts of Nubia, but the region was culturally and geographically distinct from Egypt. Lower Nubia is now covered by Lake Nasser, which flooded the region after the Aswan High Dam was built in the 1960s. As a result, thousands of archaeological sites in Lower Nubia were destroyed, and tens of thousands of Nubians had to be relocated to new settlements in Egypt and Sudan.

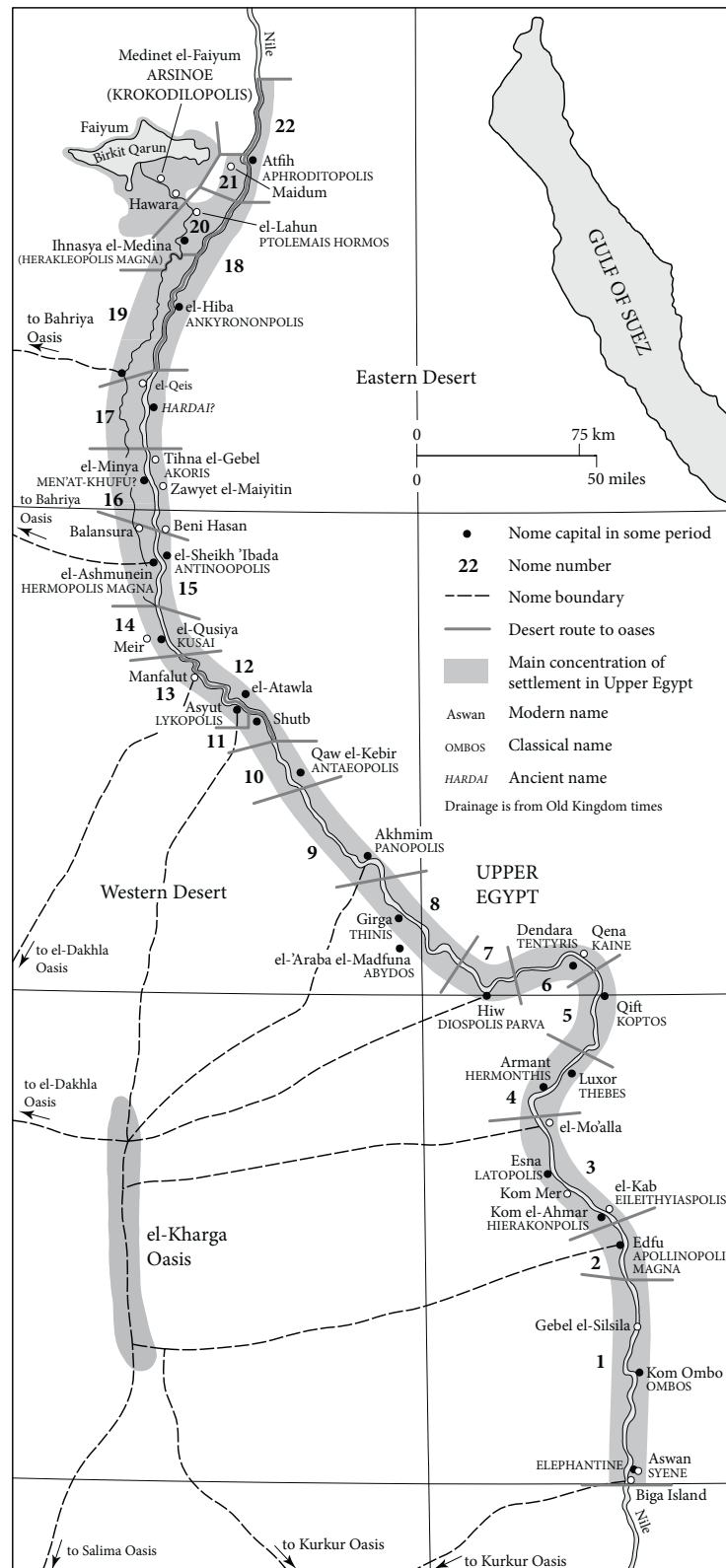
From the beginning of the Dynastic period the capital of Egypt was at Memphis in Lower Egypt, to the west of which was Saqqara, where many kings of the Old Kingdom built their pyramids. The Theban area in Upper Egypt (modern Luxor) became important from the First Intermediate Period onward. Thebes was the power base of the kings who founded both the Middle and New Kingdoms, and the major cult center of the god Amen-Ra was located there. From the New Kingdom onward many cities were located in the Delta, which became highly populated. Middle Egypt remained a provincial region, except when the heretical king Akhenaten of the 18th Dynasty built his new capital city at the site of Amarna. To the west of the river in the northern part of Middle Egypt is the Faiyum region, with a large lake (Greco-Roman Lake Moeris, known as Birkat Qarun in Arabic) which is connected to the Nile via the Bahr Yusef branch of the Nile. The Faiyum is where there is evidence of the earliest farming in Egypt, in the late sixth millennium BC.

Ancient Egypt was divided into administrative districts or provinces (which the Greeks called *nomes*). Along the Nile Valley the provinces were divided in sequence with land on both sides of the river. These were the 22 provinces of Upper Egypt, which were established by the 5th Dynasty. The 20 provinces of Lower Egypt in the Delta were numbered separately, but were not finally fixed until much later, in Greco-Roman times.

The deserts to the east and west of the Nile Valley are called the Eastern and Western Deserts. In the Western Desert there is a series of major oases (Siwa, Bahriya, Farafra, Dakhla, and Kharga Oases) which are fed by underground springs. Three smaller oases (Dunqul, Kurkur, and Selima Oases) are located to the west of Nubia. Aside from these



Map 3.1 Egypt, Nubia, Sinai, and oases in the Western Desert.



Map 3.2a Nomes of Upper Egypt. Source: J. Baines and J. Malek, *Cultural Atlas of Ancient Egypt*. Oxford: Andromeda, 2000.



Map 3.2b Nomes of Lower Egypt. Source J. Baines and J. Malek, *Cultural Atlas of Ancient Egypt*. Oxford: Andromeda, 2000.

oases, the Western Desert was barren and very dry during pharaonic times, with limited habitation only in the oases.

A range of mountains up to 2,000 meters above sea level, sometimes called the Red Sea Hills, runs along the Eastern Desert from north to south. This desert too was very dry during pharaonic times. The Eastern Desert was where many desirable stones and minerals, including gold, were found, and mining and quarrying expeditions were sent there by the state. Bisecting the Eastern Desert are a number of wadis (seasonal runoff channels and desert valleys), some with a fair amount of fresh water below the surface. Some of the Eastern Desert wadis, especially the Wadi Hammamat, were the routes the ancient Egyptians took from the Nile Valley to the Red Sea coast. Lacking much fresh water, the Red Sea coast was also a hostile region for the ancient Egyptians, but harbors are known there beginning in the Old Kingdom.

On the other side of the Red Sea is the Sinai Peninsula, which is part of the modern state of Egypt but not of the ancient one. Turquoise and copper were mined there by the Egyptians, but the Sinai also had indigenous nomads who were a threat to Egyptian operations there.

Names of ancient Egyptian towns and cities can be given in three different forms: (1) transliterated and vocalized from ancient Egyptian, (2) in Greek, and (3) in Arabic. For example, “Hierakonpolis” is the Greek name of a pharaonic town in southern Egypt known as “Nekhen.” The Arabic name of the town site is “Kom el-Ahmar.” The most frequently used names for sites are used in this book.

3.2 Environmental Setting

The most important natural resource in Egypt, in ancient times as well as modern, is the Nile River. Reflecting the importance of the Nile, the Egyptians from the Middle Kingdom on called their land *Kemet*, which means the “Black Land” of the floodplain where they cultivated their crops, in contrast to the deserts to either side, which were known as *Deshret*, the “Red Land” where any kind of cultivation was impossible.

Without the Nile, there would have been no fertile valley in which ancient Egyptian civilization could have arisen. Cereal agriculture, which was introduced into Egypt from southwest Asia (see 4.8), was the economic base of pharaonic Egypt. The special environmental and climatic conditions of the Egyptian Nile Valley greatly enhanced the productivity of emmer wheat and barley cultivation without the long-term problems (especially salinization) that threatened agriculture elsewhere in the ancient Near East. Cereal agriculture thrived in Egypt as nowhere else in the ancient world. What the farmers grew fed everyone else – not only the king and elite, but also all of the full-time workers employed by the state, from bureaucrats to laborers who built the royal tombs and cult temples.

Unlike agriculture in North America and Europe, rainfall is not a significant factor for cultivation in Egypt. The annual flooding of the Nile provided the needed moisture for cultivation on the fertile floodplain. Most of the water of the Nile originates far to the south of Egypt in highland Ethiopia, beginning as heavy rains there from June to sometime in September. Daniel Eugene Stanley, a geologist at the Smithsonian Institution who has analyzed deposits of silts at the mouth of the Nile Delta, has shown that most of these silts came from Ethiopia, carried via the Blue Nile, which originates at Lake Tana in northern Ethiopia. The Atbara River, which feeds into the Nile at Atbara in northern Sudan, also begins in highland Ethiopia, but the Blue Nile has a far greater volume of water. Flowing rapidly through high altitude, mountainous regions in northern Ethiopia, the Blue Nile and Atbara River have created deep canyons and much of their water passes directly into the Nile.

The White Nile, which originates in Lake Victoria in northern Tanzania, also provides some of the water of the Egyptian Nile (about 10 percent). But some of the volume of the White Nile does not reach Egypt. It is lost in a huge swampy region in southern Sudan known as the Sudd, where the flow of the river is sluggish and much evaporation occurs.

The confluence of the Blue and White Niles is at Khartoum, the modern capital of Sudan in the northern part of the country. From Khartoum northward the river is called the Nile. North of Khartoum there is little seasonal rainfall, although the northern extent of the rainfall belt, which first brings rains to northern Ethiopia, can change periodically.



Map 3.3 Northeast Africa.

Between Khartoum and Aswan in southern Egypt there are six (numbered) cataracts, bands of igneous and metamorphic rocks which intersect with the river, creating shallows and rapids that impede boat traffic. This region of the Nile is known as Nubia, corresponding to where some Nubian languages were spoken from late antiquity onward. Above (south of) the Second Cataract there is a stretch about 160 kilometers long called the Batn el-Hagar ("Belly of Rocks"), where the rocky river bed makes navigation difficult or treacherous for much of the year except during the flood season. About midway between the Second and Third Cataracts there is also another cataract known as the Dal Cataract. Cutting through soft sandstone bedrock in Nubia, the Nile has a narrow floodplain until about 100 kilometers north of Aswan in Egypt proper. This greatly limits the agricultural productivity in most of Nubia, and the deserts on either side are some of the hottest and driest regions in the world.

The Egyptian Nile Valley, from Aswan to the apex of the Delta in northern Egypt, is a much more homogeneous stretch of the river, with no cataracts to impede navigation and communication along the river. Navigation downstream was with the current, while navigation upstream by sailboat was greatly enhanced by the prevailing northerly winds. But as John Cooper has recently demonstrated, navigating on the Nile before modern dams were built could be difficult – especially after the annual floods were finished.

Broad floodplains, up to 25 kilometers across, are characteristic of much of the Egyptian Nile Valley and are ideally suited for large-scale cereal cultivation. In cross-section the river in Egypt is a deep channel, with floodplains to either side. As Karl Butzer, a geomorphologist at the University of Texas, has emphasized, the Nile Valley is a slightly convex type of floodplain, with natural levees that rise above parts of the floodplain and often remain dry during the seasonal inundation. The levees divide the floodplain into flood basins, which are where crops were cultivated in pharaonic times. Ancient settlements were located on levees within the floodplain or at the edge of the floodplain. There were also low-lying areas beyond the floodplain, near the desert edge, which retained moisture and were good grazing places for domesticated animals.

The Egyptian Nile Valley is a very circumscribed environment, with farming possible in ancient times only on the floodplains. The present course of the river is not the same as it was during pharaonic times. For example, investigations in the Giza–Saqqara region have demonstrated that the river flowed much farther west (and closer to the pyramids) than it does today. Beyond the fertile silts and seasonally moist soils of the floodplain is the low desert, where almost nothing grows. Immediately beyond that is the high desert, consisting of limestone cliffs and hills, where tombs were excavated in the bedrock, or limestone plateaus, which provided a solid bedrock base for pyramid construction.

In the northernmost part of Egypt, the Nile Delta is a somewhat different environment from the Valley. With more river channels, the Delta is not such a highly circumscribed environment as the Valley. In the winter there are Mediterranean rains, some of which reach the Cairo region. In pharaonic times some of the Delta was used for animal grazing, including government-controlled pasturage where cattle and sheep were fattened. There was also seasonally flooded land in the Delta suitable for farming, while settlements were located on low, sandy knolls called turtlebacks that rose above the floodplain.

Since the High Dam at Aswan was built in the 1960s, the environment of the lower Nile Valley has changed. Flooding no longer occurs annually, but as needed throughout the year for perennial cultivation. The dam prevents the destruction of villages and towns in Egypt, which sometimes occurred when the annual flooding was too high. Too low floods, which decrease the amount of land under cultivation and thus total agricultural yields, are also prevented by the dam. But nutrient-rich silts brought downstream are now blocked behind the dam, and huge amounts of artificial fertilizer need to be used in Egypt.

The annual flooding used to flush out salts in the soil, which increase when fields are irrigated and evaporation occurs. Without the yearly inundation there is now much more salt in the ground water. Ground water is also higher now in the lower Nile Valley, which is a major problem for ancient stone monuments. As ground water percolates up into ancient building stones, it evaporates, leaving salts in the stone, which will eventually weaken and crumble.

3.3 Environmental and Other Problems for Archaeology in Egypt

The best preserved archaeological sites from ancient Egypt are the monuments and tombs located beyond the floodplain in the very dry low desert. In Upper Egypt sandstone temples from the New Kingdom and later are much better preserved than earlier mud-brick or stone temples, which were frequently dismantled so that new structures could be built in the same sacred space. Temples built of fine limestone, especially in the Delta, were often recycled, either for construction or to make lime.

Because of their relatively good preservation and monumental proportions, stone tombs and temples were the focus of most early scholarly fieldwork in Egypt. Well-preserved human burials and mummies also fascinated early archaeologists. Philologists and historians were interested in finding new texts, and museum curators were interested in reconstructing ancient monuments and finding works of art to send back to museums in Europe and North America. The evidence from temples, tombs, and royal mortuary complexes is highly specialized, however, and much less is known about ancient Egyptian cities and villages, and settlement patterns.

Tell (also called *kôm* in Egypt) is an Arabic word for a mound formed by many layers of usually continuous human habitation – with people living in the same space over millennia and buildings rebuilt through time. The mound gets built up when houses or other structures are abandoned or collapse, and artifacts (especially potsherds) and debris from long-term occupation collect in layers, which represent different time periods of site use. The *tells* of ancient Egyptian settlements are poorly preserved, especially with the expansion and growth of Egypt's villages, which may have destroyed *tells* or now cover them. In the New Kingdom the total population of Egypt may have reached nearly 3,000,000, while today Egypt's population is around 83,000,000. Only about 2 percent of the land of modern Egypt is inhabitable (mostly in the Nile Valley and Delta), the rest being desert. This means that modern towns and villages within or near the floodplain are often built over ancient ones, making excavation impossible. In this respect Akhenaten's capital at Tell el-Amarna is an exception in that major parts of the ancient city were built in the low desert beyond modern villages and fields. The city is also unusual in that it was abandoned not long after Akhenaten's death, and being in an area of low population density it was not reoccupied.

Box 3-A Site preservation, context, and looting

A number of natural processes have endangered or obscured archaeological sites in Egypt. Looting has also been very destructive. But tomb looting is not only a recent phenomenon; it is ancient. Old Kingdom pyramids were probably robbed during the First Intermediate Period (see 2.8), and pyramid blocks were used for building stones in medieval Cairo. Despite current Egyptian laws, looting of antiquities continues, especially after the recent uprising that led to the downfall of ex-President Hosni Mubarak. Egyptian antiquities bring high prices on the international art market, and because of the great demand art dealers are willing to acquire antiquities illegally.

An article by Ricardo Elia in the *Wall Street Journal* of 19 June 2002 illustrates how a New York antiquities dealer, Frederick Schultz, tried to sell stolen Egyptian antiquities. Schultz had been notified by a British associate in Egypt, Jonathan Tokeley-Parry, that “boys have just returned from the hills above Minea [in Middle Egypt] . . . and we are offered a large hoard.” Two Old Kingdom reliefs were sent to Schultz, who was assured that they came from a tomb unknown to Egyptian authorities. Later a stone head of King Amenhotep III (18th Dynasty) was covered with plastic resin and painted to look like a tourist souvenir, in order to smuggle it out of Egypt. In New York, Schultz claimed that the head came from an old English collection and was therefore legal to sell.

Schultz was convicted of dealing in stolen antiquities by US District Judge Jed Rakoff. He was fined \$50,000 and sentenced to 33 months in prison. But the condition of the Old Kingdom tomb which was the source of the reliefs remains unknown, and the context of where the royal head was found is lost.

Why is context so important? Tutankhamen’s tomb is the only largely unrobbed royal tomb of the New Kingdom. Its artifacts are priceless, but knowing their context is even more valuable to archaeologists. For example, why were 11 oars placed on the floor between the north wall of the burial chamber and the gold-covered shrine that housed the king’s mummified body? The intentional placement of such artifacts, which was carefully recorded by Howard Carter, must have had something to do with Egyptian beliefs about the king’s burial and afterlife. Such information would be lost if Tutankhamen’s tomb had been robbed. The mummy would have been stripped of all of its gold jewelry and possibly destroyed in the process.

Without context, cultural information about artifacts is lost, archaeological sites are destroyed, and artifacts become nothing more than pretty objects in private and museum collections.

With expanded cultivation, especially of cash crops such as cotton and sugar cane, and modern economic activity, such as factories and quarries, many ancient sites have been destroyed. Farmers still excavate *sebbakh* – dark, nitrogen-rich deposits from ancient settlements and decayed mud-brick – which they use for fertilizer and soil conditioner. Agricultural intensification and modern industries are necessary in Egypt, but many ancient settlements have been lost as a result of these activities.

To expand cultivation, water is now pumped up to some areas of the low desert beyond the floodplain where many prehistoric sites are located. This results in destruction of settlements previously untouched by human activity. Deflation (wind erosion) has also been destructive of the stratigraphy of sites in the low desert, many of which now consist only of the heaviest artifacts – stone tools, debris from stone tool production, and potsherds.

Many prehistoric and Dynastic sites within the floodplain have been destroyed over millennia by cultivation. With meters of deposits of river alluvium (in both the Valley and Delta) over the millennia a number of settlements have either been covered or destroyed. Shifts in the course of the river over the past 5,000–6,000 years have probably removed many sites, both prehistoric and Dynastic, particularly on the east bank. While Egypt in all periods has depended on the Nile for its subsistence, the river has also created problems of preservation of ancient settlements that archaeologists must try to understand.

Recent research by geologists Katy Lutley and Judith Bunbury, who analyzed satellite images and historical maps, combined with on-ground walking surveys in the Giza region, suggests considerable migration of the Nile River over the past 5,000 years (Plate 3.2). These investigations, combined with the results of soil corings done in the Memphis area obtained by archaeologist David Jeffreys, director of the Egypt Exploration Society's Survey of Memphis, also suggest that the head of the Delta reached a more southern point in pharaonic times. Such studies have major implications for the changing locations of ancient settlements and monuments, not only in the Giza region, but probably also in other areas of the Egyptian Nile Valley. The use of satellite image analysis, along with other relevant evidence, is thus becoming increasingly important for understanding the location of archaeological sites on a regional scale and pharaonic Egypt's greatest resource – the Nile.

3.4 The Seasons and the Agricultural System

The ancient Egyptians recognized three different seasons that accorded with the flood cycle of the Nile and the agricultural system. With the heavy rains beginning in highland Ethiopia in June, the season of inundation (*Akhet*), when the Nile flooding occurred, began in late July/August in southern Egypt. The river crested several weeks later in northern Egypt. Basins were flooded with up to 1.5 meters of water. By October the southern basins were dry enough for sowing. This was an ideal climatic cycle for the cultivation of emmer wheat and barley, which germinated and grew during the cooler months of the year (known as the season of *Peret*). The cereal grains matured and could be harvested in March–April (early in the season of *Shemu*) before the hottest and driest months of the year, from May through July, when such crops would perish with no floodwater or rain.

In his book *Early Hydraulic Civilization in Egypt* (1976), Karl Butzer has given an excellent summary of the ancient Egyptian agricultural system, which is termed "basin irrigation." Although there is not much textual information about ancient irrigation, it probably consisted of directing and controlling water in the natural flood basins of the lower Nile Valley. Levees were built up, cross-cutting dykes were created, and natural channels were maintained. Extensive, large-scale irrigation canals for field cultivation, such as those used by farmers of the contemporary city-states of southern Mesopotamia, were not needed. The bucket lift, known in Arabic as the *shaduf*, which is connected by rope to a long weighted lever, was not used in Egypt before the New Kingdom. The *shaduf* cannot raise large volumes of water and was used to water small

garden plots. It may also have been used to water additional areas of fields during the inundation. Irrigation with the much more effective water wheel, which is still used today in Egypt to lift water to higher elevations, was not introduced into Egypt until Greco-Roman times.

Essentially, during pharaonic times the Egyptians relied on the annual Nile flooding to water their fields. When the flooding was too low, less land could be cultivated, which could create food shortages and possibly famine. When the flooding was too high, villages could be destroyed and temples flooded. But with normal floods the potential for cereal cultivation in this environment was enormous, and this provided the economic base of the pharaonic state.

Box 3-B Egyptian agriculture as depicted in tomb scenes

Tomb scenes and related artifacts provide a wealth of information about ancient Egyptian agriculture. Perhaps the earliest scene relating to agriculture is carved on the ceremonial macehead of King Scorpion of Dynasty 0, excavated at Hierakonpolis near the remains of an early temple. The king is depicted about to dig soil with a hoe.

Numerous scenes of agricultural activities are found in private tombs of the later Old Kingdom at Saqqara, including the harvest scenes in the 5th-Dynasty tomb of Ti.

The newly cut cereal is tied in bundles and transported to a granary, where it is threshed under the hooves of donkeys and oxen, and winnowed by women. In addition to the hunting and fishing scenes in the 6th-Dynasty tomb of the vizier Mereruka, there are many scenes of activities on his estate, including wine-making.

From the 12th-Dynasty tomb of Meketra in western Thebes comes a remarkable cache of wooden models, including a cattle barn and a bakery/brewery. Middle Kingdom tombs recorded by Percy Newberry (1893) at Beni Hasan in Middle Egypt include the tomb of Amenemhat, governor of the 16th province of Upper Egypt (the Oryx Nome), with scenes of flax cultivation and linen production, as well as cereal production, from plowing and hoeing to threshing. The Beni Hasan tomb of Khnumhotep, Administrator of the Eastern Desert for King Senusert II, has similar agricultural scenes and an orchard/vineyard scene of farmers collecting grapes and figs.

Agricultural scenes abound in New Kingdom private tombs in western Thebes. In the tombs of Nakht (TT 52), the scribe of the granaries of Thutmose IV, and of Menna (TT 69), the scribe of the fields of Thutmose IV, are painted scenes of plowing, hoeing, sowing, and the various harvesting activities. A part of the ceiling of the tomb of Sennefer (TT 96), who was overseer of the gardens of Amen during the reign of Amenhotep II, is covered with a painted grape arbor.

In the cemetery of the New Kingdom workmen's village of Deir el-Medina in western Thebes is the well-preserved tomb of Sennedjem (TT 1), who was buried with 19 other family members. Like other men who lived in this village, Sennedjem was a workman in the royal tombs in the Valley of the Kings. On the east wall of the 19th-Dynasty tomb are idealized afterlife scenes of agriculture from the Book of the Dead: Sennedjem and his wife are shown plowing and sowing, and harvesting flax by uprooting it (Plate 3.1). Above this is another scene of Sennedjem cutting off heads of grain with a sickle while his wife collects them in a basket.

To conserve moisture in soil, most cultivation was done by broadcast sowing using a simple type of plow driven by oxen to cover the seeds. Farmers also used hoes, but Butzer believes that soil preparation with plows or hoes would have been restricted to drier fields. Cow manure was used for fuel, while bird droppings collected from dovecotes may have been used as fertilizer in gardens. After harvesting cereals, domestic animals would have fed on the stubble of these crops, and their droppings would help fertilize the soil. Butzer also suggests that farmers may have alternated the planting of cereals with legumes. Fallowing may have been practiced as well, but with only one crop grown annually, fallow fields would not have been necessary in this environment.

3.5 The Ancient Egyptian Diet

Bread and beer were the main staples of the ancient Egyptian diet. They were made from the two major cereals cultivated in Dynastic Egypt, emmer wheat (*Triticum dicoccum*) and six-row barley (*Hordeum vulgare* subsp. *Hexastichum*). Tomb scenes of baking and brewing

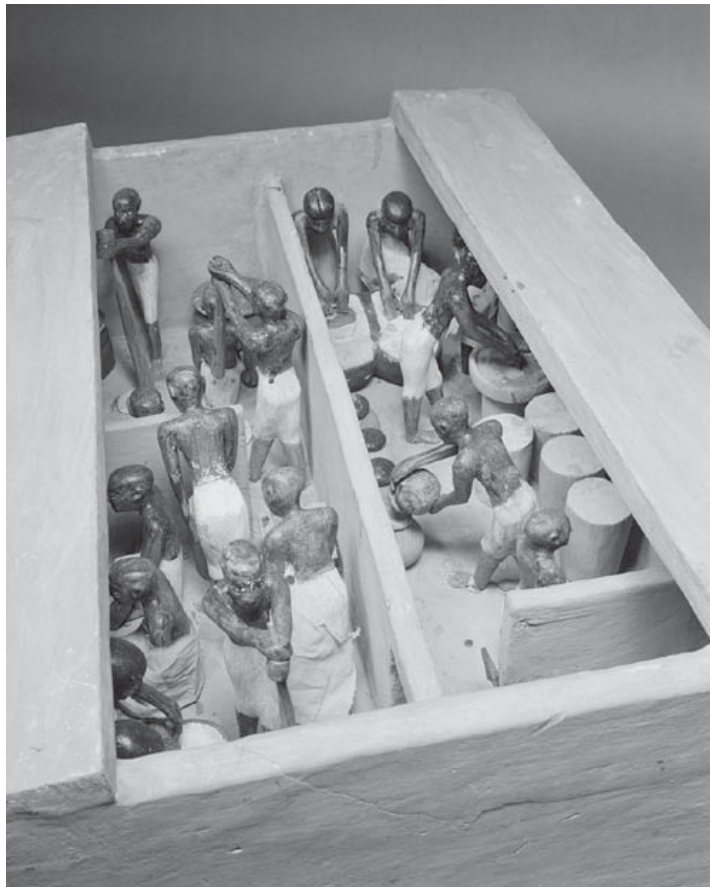


Figure 3.1 Wooden model of a bakery/brewery, from the 12th-Dynasty tomb of Meketra, Deir el-Bahri. Source: © 2013. Image copyright The Metropolitan Museum of Art/Art Resource/Scala, Florence.

are known, as are three-dimensional models of these activities (Figure 3.1). At Giza, 4th-Dynasty bakeries have been excavated, and real bread has been preserved in some Predynastic and later burials. Bread was made from flour ground on grinding stones and mixed with water that was then kneaded and left to rise. The dough could be shaped in a flat loaf or baked in ceramic molds. Potsherds from bread molds are often found in the remains of ancient settlements.

Delwen Samuel, a paleoethnobotanist at the University of Cambridge, has studied residues of ancient Egyptian beer from jars. According to her analyses, most household beer was made from barley in a two-part process. Brewing was done by sprouting (malting) one batch of barley and then mixing it in water with another batch that had been malted and heated. The mixture was then sieved and it fermented in jars. This type of beer was highly nutritious, with complex carbohydrates, sugars, and B vitamins.

Although domesticated cattle, sheep, goats, and pigs were raised in pharaonic Egypt, the major source of animal protein for most people was fish, including Nile perch, catfish, and mullets. Beef was used as offerings in temples, and would have been consumed by priests and persons of high status. Geese were domesticated, providing both meat and eggs. The chicken, which originated in southeast Asia, is not well attested in Egypt until Persian times.

Wild animals were also hunted for their meat, but as human habitation expanded in the lower Nile Valley populations of wild mammals declined or disappeared.

Wild cattle, addax, antelope, hartebeest, gazelle, ibex, Barbary sheep, and oryx were found in the desert, as were ostriches. (Other desert fauna included lions and hyenas, which were not hunted for food.) In pharaonic times many of these desert fauna were hunted for sport by royalty and nobles; hunting dogs similar to the greyhound were used for this.

Hippopotamuses were found in the Egyptian Nile in prehistoric times and may have been hunted for food (and the ivory of their canines), but they were also hunted because they could be very destructive in cultivated fields. The crocodile is another Nilotic animal that was hunted because of its danger to humans. The Nile Valley was also a major corridor for migratory fowl, some of which were hunted for food (especially species of duck and geese) using nets or throw sticks.

A number of vegetables were consumed by the ancient Egyptians, including onions, lettuce, radishes, and garlic, and types of cucumber, leek, and squash/gourd. The tubers of river plants, including papyrus, were also eaten, as were lotus seeds. Legumes such as chick-peas, peas, fava beans, and lentils provided protein as well.

Dates from the date palm were the most plentiful fruit in ancient Egypt, but only after hand pollination was practiced. It is not known when this tree first arrived in Egypt, where it was not indigenous, unlike the dom palm, which has a bifurcated trunk and produces a large brown fruit. Figs (both the common fig and sycamore fig), persea, melon, watermelon, and wild *Zizyphus* berries were also consumed. Pomegranate and carob trees became more common in the New Kingdom. Grapes were grown not only to eat but also to make wine. Large jars of wine were provided for King Tutankhamen in his tomb and there are numerous tomb scenes of wine production.

Although there is evidence of olives in ancient Egypt, olive trees do not grow well in the southern parts of the country, and olive oil was an imported luxury commodity. For sweetening, honey was produced in ceramic hives. Fenugreek was used as a spice and possibly the stems provided fodder for livestock after the seeds were removed. Coriander, cumin, and dill were available from the New Kingdom onward.

3.6 Other Useful Animals and Plants

For most of pharaonic times the donkey was the only beast of burden. Caravans and expeditions along desert routes had to rely on donkeys because the dromedary camel was not introduced into Egypt until late in the first millennium BC. Horses were not found in Egypt until after the Middle Kingdom. In the New Kingdom kings and elite warriors are depicted riding in horse-drawn chariots, which were used in warfare and for hunting.

Domesticated dogs and cats are depicted in tomb scenes as pets. Dog remains have been found at sites as early as the fifth and fourth millennia BC: they were used for hunting and later also for police work. Cats were domesticated in Egypt, possibly as early as the Old Kingdom. The cat would have been especially useful for pest control, as rats and mice were major problems anywhere that food was stored, especially cereals kept in state, temple, and private granaries.

For clothing, flax was cultivated to make linen, of which there were different qualities, depending mainly on the fineness of the weave. Fine linen was a major luxury product and export. Linen was also used to wrap mummies and to make sails for boats. Flax seeds were pressed for their oil. Egyptian cotton, which is highly desirable now because of its smoothness and strength, was not known in Egypt until Greco-Roman times.

Probably the most useful wild plant was the papyrus, which was cultivated in Greco-Roman times. Strips of its stalk were used to make small boats, mats, baskets, boxes, ropes, and sandals (see Figure 3.2). As a writing material, papyrus rolls were produced by skilled craftsmen and would have been an expensive commodity. Rushes and vegetation that grew along the river banks were also used for basketry as well as for writing pens. Halfa grass, which grows along waterways as well as on moist land, was important for boat riggings, including those which lashed the hull of Khufu's ceremonial boat, buried next to his Giza pyramid. It was also used to make baskets, mats, and ropes.

Although the ancient Egyptians imported cedar from the Levant to build large boats and coffins, the country was not as resource poor in wood as some have assumed. The trunks of date and dom palms could be used as ceiling rafters in mud-brick houses, with their branches covering the beams, and the hard dense wood of the dom palm was used to make domestic artifacts. Palm leaves were also used to make baskets, and palm ribs were used to make boxes (and possibly furniture). The acacia tree is another common tree which grows along the margins of the desert and in wadis where there is ground water. Acacia wood was used to make statues and furniture, and even some boats, and was also processed to make charcoal. Other local woods used in crafts include those of the persea tree, sidder (*Zizyphus spina-Christi*), sycamore fig, tamarisk, and willow.



Figure 3.2 Fishing scene (from a papyrus boat), from the 6th-Dynasty tomb of Mereruka, Saqqara. Source: MyLoupe/UiG Via Getty Images.

3.7 Building Materials

Although the earliest type of shelter in prehistoric Egypt may have been made of reeds or tree branches covered with mud, during Dynastic times most people (including the king) lived in mud-brick houses. Mud and clay for construction materials were readily available on the floodplain. Mixed with chaff to make it stronger, mud was shaped in a rectangular mold and left to dry in the sun, as is still seen today in rural Egypt. Mud-brick provides excellent insulation for buildings.

Until the New Kingdom, most cult temples were also made of mud-brick with some elements in stone, but from the New Kingdom onward many temples were made of stone. Sandstone was used for temple building blocks in southern parts of Egypt where it was available, and limestone was used farther north. Limestone was also used for tomb superstructures in the north, or for blocks carved in relief on the walls of rooms in these superstructures if the buildings were made of other materials.

Other stones that were sometimes used in temple and tomb construction included granite from Aswan, and travertine (Egyptian alabaster) from quarries in Lower and Middle Egypt. The Red Chapel of Queen Hatshepsut at Karnak was built in red quartzite. Basalt was also used in construction (mainly for floors), with an important Old Kingdom quarry in the Faiyum region. Plaster and mortar for stone construction was made of gypsum (calcium sulphate), which was quarried in the Faiyum, but it also occurs naturally in many parts of Egypt.

3.8 Other Resources: Clays, Stones, Minerals

Essentially all of the basic materials needed to sustain human life were available in the Egyptian Nile Valley – to feed, house, and clothe the ancient Egyptians. When Egyptians ventured out of the Valley on expeditions, it was usually to obtain raw materials that were used to make high-status goods for elites.

From later prehistoric times onward, pottery was the most common artifact, especially for food preparation, consumption, and storage. The Nile Valley had plentiful sources of Nile silt clay for pottery. Marl clay, which is harder when fired than Nile silt wares, was mined in deposits along margins of the Valley, with an important source in the Wadi Qena, near modern Qena.

Natron (sodium carbonate and sodium chloride) was used in the mummification process to desiccate human flesh, as well as for general cleaning and in temple ritual. It was found in the western Delta and in Upper Egypt near Elkab, but the major source was in the Wadi Natrun, to the west of the Nile Delta.

Stones used for building construction were also used to make statues and stone vessels. Royal sarcophagi were carved from granite, but also in limestone and quartzite. Some stones used for craft goods were available in or near the Nile Valley, including travertine, and red and white breccia. Diorite and quartzite were found in or near Aswan, but the most important source of quartzite was northeast of Cairo.

The Eastern Desert was the source of many of the stones for carved statues and vessels, including marble, granite, greywacke/siltstone (also used for Predynastic palettes), and serpentine. “Imperial” porphyry, quarried by the Romans for columns, sarcophagi, basins, and statues, came from the site of Mons Porphyrites in the Eastern Desert. Some porphyry columns quarried in Roman times are still in use today in old Italian churches.

Stone beads are often found in Egyptian burials. Agate occurred as pebbles in Egypt. Carnelian, green feldspar (amazonite), and red, yellow, and green jasper came from the Eastern Desert. (Beryl, also known as emerald, was not used until Greco-Roman times.) Amethyst was mined near Aswan, as was garnet, which was also found in the Eastern Desert and Sinai. Steatite, found throughout the Eastern Desert, was used for making faïence beads and scarabs, usually glazed blue-green in color.

Stone was used for tools, both in prehistoric times and pharaonic times. Metal tools were costly and for the most part unavailable to the average farmer. Quarrying hard stones such as granite was done using harder stone mauls and levers. Craftsmen also used stone tools to produce artifacts such as stone vessels, for drilling as well as polishing. Chert, which forms a sharp edge when fractured, was used for stone tools that required a cutting edge. It occurred as nodules that were quarried in limestone in the desert.

The Egyptian Nile Valley had no minerals. These had to be brought in from the Eastern Desert or imported from abroad. Both malachite (a copper ore) and galena (lead ore) came from mines in the Eastern Desert and were ground on stone palettes and used for eye paint. Small copper mines were also located in the Eastern Desert. Copper artifacts continued to be made until Ramessid times, when most metal artifacts were made of bronze. Pure copper is fairly soft, but many Egyptian copper artifacts that have been analyzed contain traces of arsenic that occurred in the copper ore deposits. Arsenic in copper makes it much harder,



Map 3.4 Major stone and mineral resources in Egypt, Nubia, Sinai, and the Eastern and Western Deserts. Source: J. Baines and J. Malek, *Cultural Atlas of Ancient Egypt*. Oxford: Andromeda, 2000.

which is also the case when copper is (intentionally) alloyed with a small amount of tin to make bronze. Tin sources are known in the Eastern Desert, but pharaonic sources of tin are uncertain.

Gold was the most important mineral found in the Eastern Desert, mainly in the region of the Wadi Hammamat and southward. The huge quantities of gold artifacts in Tutankhamen's tomb, including the solid gold inner coffin which weighs over 110 kilograms, represent only a small amount of what must have been mined by the Egyptians in the deserts to the east of the Nile in the 18th Dynasty. The largest gold mines, however, were to the east of the Nile in Nubia.

Geological investigations of the mines and quarries where minerals and stones were obtained by the ancient Egyptians are an important aspect of materials research, as are the tools and technologies used to extract minerals and stones – and the organization and logistics involved in expeditions to sometimes very remote mining and quarrying sites. Specific quarries from which stones were obtained can also be identified, but this requires laboratory analysis (e.g., elemental and isotopes composition) and petrographic studies.

3.9 Imported Materials

Nubia, Egypt's closest neighbor, was the most important source of gold. Egypt sought to control Nubia in part because of its gold (known in texts as the gold of "Wawat"). In the New Kingdom, when the Egyptians built temple towns as far upstream as the Fourth Cataract, Egypt was the main supplier of gold to the other Near Eastern kingdoms.

Amid all the glitter of Tutankhamen's gold, only one dagger in his tomb has an iron blade. Hematite (the principal ore of iron ore) was found in Egypt and used for beads as early as the Predynastic Period, and iron ores exist in the Eastern and Western Deserts. The technology for large-scale iron production, however, did not develop until the late second millennium BC, and not until the mid-first millennium BC in Egypt. A major source of iron was in the far south of Nubia, between the Fifth and Sixth Nile Cataracts at the confluence of the Nile and Atbara Rivers. This was the region of ancient Meroe, an iron-producing kingdom that rivaled Egypt in Greco-Roman times.

Nubia was also the main corridor into Egypt for exotic raw materials, some of which may have been the products of transit trade from regions to the southeast. A land known as "Punt" in ancient Egyptian texts was probably in the region of Kassala in eastern Sudan and northward, where ebony and frankincense trees are still found. Italian archaeologist Rodolfo Fattovich, who excavated in the Kassala region in the 1980s and 1990s, has found archaeological evidence of storage facilities and seals used in long-distance trade with the Nile Valley in the mid-second millennium BC. Ebony wood from Punt was used in elite craft goods, such as a small child's chair in Tutankhamen's tomb, and incense was necessary for temple and mortuary rituals – and must have been consumed in huge quantities in ancient Egypt. Gums and other resins also came from the Punt region, as did elephant ivory and leopard skins, which were worn by some Egyptian priests. Exotic animals, such as baboons, monkeys, and giraffes, which were sometimes kept as royal pets in a palace zoo, also came from this region.

Obsidian, which when fractured forms a much sharper edge than chert, is found on both sides of the southern Red Sea and may have reached Egypt through Punt and Nubia.

Obsidian tools have been found in Predynastic burials, and in Dynastic times obsidian was used for beads and other small artifacts, including the pupils of eye inlays in statues.

The Sinai Peninsula to the east of Egypt was also an important source of raw materials, including turquoise used in jewelry from mines in the western Sinai. Larger copper mines than in the Eastern Desert were located in the south-central Sinai at Wadi Maghara and in the vicinity of Serabit el-Khadim, and in the southern Negev Desert at Timna.

From Lebanon and Syria came large timbers, especially cedar, but also fir and pine. Large timbers could not have been imported overland or towed by ships, but would have been imported in the hulls of large sea-going vessels. Large royal boats for foreign trade as well as traffic on the Nile were made of cedar and this was the most desirable wood for coffins. But oils and resins from foreign coniferous trees were also desirable in Egypt, especially for use in mummification.

Perfumed oil from Palestine first came to Egypt in later Predynastic times as did copper from mines in the Negev Desert (especially Timna). In the 1st-Dynasty royal cemetery at Abydos, Flinders Petrie excavated a ramp leading to the tomb of King Semerkhet which was soaked about 1 meter deep with perfumed fat still pungent almost 5,000 years later. New Kingdom and later imports from southwest Asia included horses, silver, copper ingots (notably from Cyprus), oils, and various craft goods. Lapis lazuli, which was imported into Egypt already in Predynastic times, came though southwest Asia from mines in Badakhshan, in northeastern Afghanistan. This dark blue stone was used for beads and jewelry inlays, but its supply depended on many middlemen between Egypt and central Asia, and hence on the changing political relationships of these regions.

Although many of these imported raw materials were highly desired by royalty and the elite, none were basic necessities of daily life. For much of Dynastic times foreign trade was controlled by the crown, and the exotic imported materials were not distributed among the peasant majority of the population. The crown sent expeditions to mines and quarries in the Eastern Desert and, much less frequently, to Punt. Mining activity in the Sinai was also controlled by the state, as were parts of Nubia in the Old, Middle, and New Kingdoms.