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Building in the High Desert:

the Great Pyramid of Giza

The gigantic mass of stone that makes up the Great Pyramid of Giza was put into place some 4500 years ago through the hard labor of countless men and women without the help of technical devices we take for granted today. What do we know about these people, how they were organized, worked, and lived, what they ate, and why they agreed to do this? These are some of the questions this article tries to answer based on new evidence from archaeology and ancient Egyptian textual sources.

Wer baute das siebentorige Theben?
In den Büchern stehen die Namen von Königen.
Haben die Könige die Felsbrocken herbeigeschleppt?
(Bertolt Brecht: Fragen eines lesenden Arbeiters)

The great pyramid of Giza: the oldest of the seven wonders of the ancient world, it still stands majestically on the desert plateau at the edge of modern-day Cairo, towering over the western suburb that gives it its name. It occupies a liminal space: to anyone driving west from the city-center over the Shāri' al-ahram, the avenue of the pyramids, through the hustle and bustle of daily life, it rises ahead as an icon of tranquility. Beyond it seemingly appears nothing but the desert, an empty space stretching for hundreds of kilometers. East of the pyramid one stands in what is perhaps the largest city in Africa today—a city that never rests; west of it (and this is the angle from which most tourists take pictures) one is in a vast void, one of the largest deserts on earth. And while this liminal space is alive teeming with activity during the daytime with visitors clambering all over it, at night quiet descends over it. Were pharaoh Khufu still in his tomb in

the great pyramid, he would rest in peace.

What was it like, 4,500 years ago when Khufu planned his burial?¹ In those days too, the plateau he had chosen to build his pyramid –farther north than his predecessors’ resting places– was a liminal space. It was right on the edge of the Nile valley, land just too high to benefit from the annual flood that turned the soil into rich agricultural land. Today the Nile is at least some seven kilometers from the plateau, but in Khufu’s time natural basins off it came much closer especially when the river level was high, and archaeologists have determined that an artificial basin was dug to make the water reach the pyramid site as well. In the ancient Egyptian view of the universe too, the edge of the plateau was a border area. The valley was the land of the living, the desert that of the dead. Just like the sun when it sets at the end of its daily cycle, the dead found a resting place there. Khufu’s body was laid in a heavy sarcophagus placed in a room in the center of a giant mass of stone with the hope never to be disturbed – a false hope. Within a century of his death parts of the Giza complex, which contained many more structures than Khufu’s pyramid alone, were being looted. When exactly Khufu’s sarcophagus was opened and his body removed, we do not know, but it was already in antiquity.

But was Khufu’s burial a quiet place when it was still respected? Certainly not. For some seventy-five years starting in his lifetime, the Giza plateau was the busiest building site on earth with hectic activity that probably resembled what one sees on Cairo’s streets today. The people involved were not the kings, queens, and high officials whose funerary complexes we so often focus on when discussing Giza, but the people whose labor constructed them. Let us try to answer the poetic question Bertold Brecht posed at the start of this chapter: What do we know about the tens of thousands of men and women who turned the dreams of the pharaohs into reality? Although some of the names of officials who were involved in day-to-day matters are recorded, no single individual in the large labor force is known to us so that we can reconstruct his or her daily routine. We can, however, recreate some sort of simulacrum piecing together fragmentary evidence from archaeological and textual sources, several of which have only recently come to light, to give us a sense of how various people were involved in this gigantic project. Let us first follow for a moment the trajectory of a building stone, and try to find out who had to deal with it and what they did.

The great pyramid is so gigantic that it is hard to appreciate for anyone who never stood in front of it: its sides measure 230.3 meters each and its

top originally was 146.7 meters above ground level. Its volume was 2,650,000 cubic meters and the estimated number of blocks used is 2,300,000 with an average weight of 2.5 tons (2500 kilograms). Listing figures this way gives the impression that the center was laid out in uniform blocks placed carefully side-by-side, but that is a misconception: the inside looks like a Swiss cheese and the blocks vary in dimensions and were fitted together in an ad hoc manner. Still, the number of stones was immense. Khufu likely ruled for 26 years, and if, let us say, 23 of those were used for the construction, each ten-hour day 340 cubic meters of stone had to be quarried, transported, dressed, and put in place. One cubic meter is about the average size of a core block, so 34 stones were handled each hour– and the pyramid was just one element of a much more extensive funerary complex with a valley temple, causeway, mortuary temple, and secondary burials for queens and officials, all in stone too.²

Most of the blocks came from a quarry just south of the Giza plateau, but for the outer casing the builders used high-quality white limestone brought from Tura across the river. There some fifty tunnels can still be seen, cut into the rock to mine the stone. When these galleries were cleared out in World War II for the British Middle East Forces to store ammunition (the Egyptian army uses them for the same purpose today).

At one point at the end of the quarry a pyramid block was found lying on wooden rollers, still after some five thousand years awaiting delivery. On the side was a job code number in lamp black. To me (the author of the report, Nial Charlton, writes) that job code number was and is the most moving relic of Pharaonic Egypt. It indicates the presence of a working engineer, part of that huge team of engineers and managers who first designed the programme for building a pyramid, and then carried it out.³

The whereabouts of this block are unknown today. We do know, however, how stones like it reached Giza. Very recently, in 2013, French archaeologists found in a cave on Egypt's Red Sea coast more than 1000 fragments of papyrus rolls (ca. 30 rolls originally, these are the oldest preserved papyri known today) that contain the archives of a boat crew named “the uraeus of Khufu and his bow” under inspector Merer. Merer kept logbooks of their work in the months July to November of the 26th year of Khufu's reign, which was transporting stone from two mines in Tura to the pyramid building site taking advantage of the high river level. Even if they only needed to cross the Nile each trip took two or three days and the men spent the night at a

place called *Ro-She Khufu*, “entrance to the pool of Khufu,” an administrative center under the control of Khufu’s half-brother, Ankh-haf. The loading and unloading of the boats must have taken considerable time. Merer’s crew had 40 men (the typical size of a crew, cf. later) and the boat was perhaps 25 to 30 meters long and could carry a load of 70 to 80 tons, that is about 30 blocks of stone. These trips were only possible seasonally when the Nile flood was high and filled up the basins at the foot of the pyramid. Other papyri in the archive document the crew’s activities elsewhere at other times.⁴

All the stones, including those of Merer’s team, were probably brought to the building site in a roughly hewn state so that it would not matter much if a piece chipped off. But they had to be turned into rectangular blocks with straight sides before they could be set in place. Some of the tools needed for that have been preserved. The hammers were bulky and heavy, made of wood or stone, and did not allow for the targeted blows modern iron hammers permit. The masons used chisels made of copper, the only metal available in Egypt at the time and quite soft, and an army of smiths must have worked full-time to keep them sharp (figure 1). Others planed the blocks; they used sand, which was readily available, as an abrasive, and the physical effort rubbing it back and forth with a stone to make the sides smooth was enormous.

How the stones, weighing up to sixteen tons, were raised into position on top of an increasingly high pyramid remains a mystery. Most likely a ramp was used wrapping itself around the parts already constructed. That ramp itself was a major building project, made of stone chippings, mud, and



Figure 1: Ancient Egyptian mallet and chisel. These examples date 600 years later than Khufu’s pyramid but are the same shape as the tools his workers used. The hammer is 28 cm long, the chisel 19.5. Source: Metropolitan Museum of Art website. Mallet: Accession Number: 24.1.76, Rogers Fund and Edward S. Harkness Gift, 1924; chisel: Accession Number: 27.3.12, Rogers Fund, 1927. Image in public domain.

wooden logs, and its volume may have been two-thirds of that of the pyramid itself. Huge heaps of stone debris have been found on the southern edge of the plateau which may be the remains of such ramps.⁵ We know from later Egyptian depictions that teams of men pulling ropes attached to a sledge could move massive monoliths (figure 2) and in 1991 archaeologists were able to recreate the conditions with modern-day workers raising stones on the top of a small pyramid, but the challenge still baffles the mind. How did they manage to pull a block up to a height of 146 meters? How long would it have taken to maneuver it from the ground to the top? Space on the ramp was limited and probably not more than ten men could deal with one average block of 2.5 tons, including one or two who had to make sure the sledge did not move off-center. It was possible to make the ground surface more slippery by covering it with wet desert clay, but how would the men have found a foothold then? How did they round corners if the ramp wrapped around the pyramid? How did they come back down without blocking the path of their fellows pulling another stone to the top?⁶ It is no surprise that theories abound some invoking skills like sonic levitation, others arguing that the stones were not monoliths but made of concrete poured into molds.⁷

In addition, we have to remember that while the pyramid was raised builders also constructed the surrounding temples and subsidiary tombs. Coordinating all this activity was a logistical nightmare which became worse after Khufu's project was finished. The architects of his son Khafra (the king of the sphinx) and his grandson Menkaura who built their complexes on the

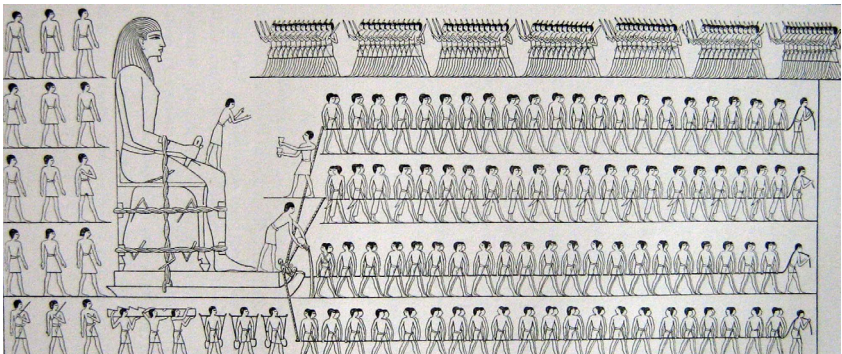


Figure 2: Wall painting from the tomb of Djehuti-hotep, ca. 1900 BC. The scene shows 172 men pulling a colossal stone statue on a sledge, which the accompanying text says was 6.75 meters high. Its estimated weight is 58 tons. Source: <https://upload.wikimedia.org/wikipedia/commons/7/7f/Colosse-djéhoutihétep2.jpg> Image in public domain.

same plateau had to find the spaces for ramps, for the treatment of stones, for the workshops and for much other activity in an increasingly cluttered restricted space. The third pyramid, Menkaura's, was smaller than the others, only 102.2 by 106.6 meters at the base and ca. 65 meters high, but no effort was spared for it. Its outer casing was made of hard red granite stones shipped all the way from Aswan in the very south of Egypt.

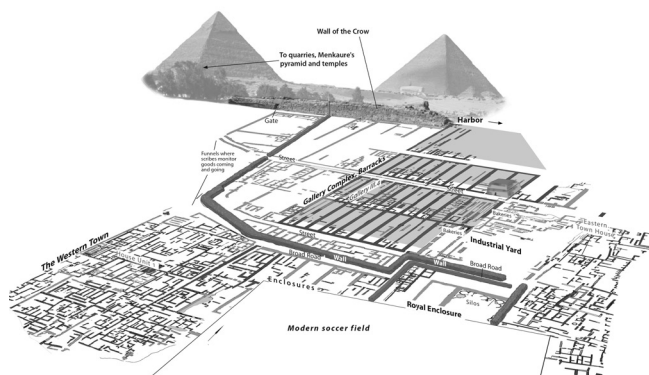


Figure 3: Reconstruction plan, based on Mark Lehner's excavations of the Giza Pyramid Town, showing the different areas of the site excavated to date, and the relationship of the workers' village to the pyramids of Khafra (left) and Khufu (right). © 2019 by Ancient Egypt Research Associates. Source: <https://erenow.net/ancient/the-complete-cities-of-ancient-egypt/38.php>

We speculate that a stone-layer would work a ten-hour day. He could not go home afterwards –as we will see later workers came from all over Egypt– and indeed recently archaeologists have found remains of a workers' village on the Giza plateau behind a 200-meter long wall, 10 meters wide and 10 meters tall, a feature in the countryside called *Heit el-Ghurab* ("wall of the crow") today. It stands some 800 meters southeast of Khufu's pyramid and although the remains excavated in the village date to the reigns of the later pyramid builders, Khafra and Menkaura, they probably overlay a settlement of Khufu's time. The village gives us a vivid idea of how workers lived while active on the massive building projects, so let us look at it even if it postdates Khufu. It was a warren of buildings but three broad streets running east to west provided structure to its layout (figure 3). In the center were four blocks of galleries, each gallery ca. 35 meters long and ca. 4.5 meters wide. The front

half held two rows of platforms just long enough for one person to sleep on with the feet pointed to the center and could accommodate 40 to 50 people lying side-by-side. A row of pillars in the center of the gallery supported either a second floor or a roof, where more people could have been lodged. The back of the galleries had the layout of an ancient Egyptian house with small rooms; the archeological finds in them suggest that people cooked there and did some craftwork, and the space may have been reserved for the overseer of the team lodged in the building. Thirty-two such galleries have been found and they seem to have been the dormitories for workers during their stay at Giza (figure 4). This type of building was planned by a central authority, and we know of other worker settlements laid out likewise in later periods of Egyptian history. At the entrances of the streets giving access to the galleries stood what seem to be guardhouses – naturally some system of control was in use. East of the galleries complex was a much less organized area of little houses, more like what a typical Egyptian village would have looked like, perhaps for families rather than individual workers. And to the west were larger houses likely for higher personnel. In their midst was a rubbish dump with more than 1000 clay lumps with seals rolled over them. Before being discarded, they had been attached to papyrus rolls and boxes with scribal tools, and state the names of the officials in charge, acknowledging the king for whom they worked. The seal owners were thus high-level scribes of the royal administration who resided in the village and kept written records – now all disintegrated.

All these people had to eat. Those living in the houses may have had staff or family members who cooked for them, but the dormitory residents had neither the time nor enough space to do so even if they could have taken advantage of the kitchens in the galleries. Not surprisingly then,



Figure 4: The excavated Gallery III from the Giza Pyramid Town. © 2019 by Ancient Egypt Research Associates. Source: <https://erenow.net/ancient/the-complete-cities-of-ancient-egypt/38.php>

nearby the complex two large bakeries were discovered. The Egyptians baked bread in large earthenware bell-shaped pots, called *bedja* – these had diameters of up to 35 centimeters. They filled the pots with dough prepared in large vats, placed them in a benchlike structure with embers underneath, and put another pot upside down on top, surrounding it with hot embers and ash. The bread was made of barley and emmer wheat, which have little gluten and some type of yeast must have been used to make the loaves edible. When archaeologists tried to recreate the bread in 1993, it resulted in very large loaves – certainly with pots with a 35 centimeters diameter – that tasted quite sour. One loaf could feed several people for a few days.⁸ Bread and beer were produced in the same establishments, we know from other Egyptian sources, so probably alongside the bakery the other major component of the Egyptian diet was brewed, although no traces of it have yet been found.

Man does not live by bread and beer alone. We know nothing archaeologically about vegetables and fruits, but textual and visual sources of Khufu's time show they were consumed. In the workers' village fishbones were excavated and since it was close to a basin off the river inhabitants must have caught fish, especially catfish which can be captured in traps. A large amount of animal bones was excavated, of domesticated cattle, sheep and goat and hunted gazelle and even hippopotami. Meat was a luxury in ancient Egypt so the fact that the workers had access to it surprised the archaeologists. The higher officials in the western sector ate more cattle, the gallery residents more sheep and goat. All these animals seem to have been kept and butchered in an area corralled off south of the settlement. The fact that the residents consumed meat suggests that they were not of the lowest level of workers – more about this later.

These remains do give us an idea of the conditions in which at least some of the people who worked on the pyramids lived. Groups of them stayed in dormitories – the identified remains allow for the accommodation of about 1,600 of them, double that number if the galleries had a second floor. Some of them were given meat and had food prepared for them on an industrial scale by a support staff that probably included many women. Many ancient Egyptian representations of milling show women rubbing grain back and forth on a quern with a handstone, a very labor intensive task. Nearby lived scribes, officials, and architects who resided in houses, perhaps with their families. The work of many laborers must have been physically stressful – it is hard to imagine otherwise. This is confirmed by an analysis of workers' skeletons discovered in tombs near the village, which were compared to the

skeletons of high officials found elsewhere on the Giza plateau. Coincidentally, the groups were similar in size (ca. 170 skeletons of each group) and both included almost equal numbers of men and women. Of the male workers most died between the ages of 30 to 35; of the male officials between the ages of 40 and 44. Many women in both groups died before turning 30, probably because of complications during childbirth. Degenerative joint diseases were much more common among workers than officials: between the ages of 30 and 40 more than 60% of the workers had shoulder problems, only 10% of the officials. In the age group of 40 to 50 the numbers were 66% for workers and 31% for officials. 31% of male workers had damage to the lower spine, 22% of female workers. The numbers for officials of both genders was only about 13%. These discrepancies are easy to understand; any desk job is physically easier than manual labor and even if women did not haul or cut stones (although they may have), their injuries could certainly derive from milling grain day after day. The workers' skeletons show that bone fractures were common especially in the upper arms and lower legs. However, medical care was provided: most of the fractures had healed completely and had been set. The leg of one workman had been amputated and he survived another fourteen years. One skull shows signs of brain surgery.⁹ Written information on medical care in ancient Egypt is scarce and very dispersed over time, but the vast number of human skeletons excavated there gives us some idea on what doctors could achieve. It is clear that they had practical experience and had developed treatments for various illnesses, something also described in a few papyri of later periods. Their skills seem to have been appreciated internationally; in the late second millennium foreign rulers on occasion asked Egypt's king to send them a medical doctor. Unfortunately, many aspects of their work remain undocumented.¹⁰

Of course, people died while working on the pyramids –some of them may have spent their entire active life at the building site. A cemetery was located to the west of the workers' village and although there is no explicit evidence that the two were connected, it seems highly unlikely they were not. The occupants were not of the lowest level of society, however. Although their tombs were much smaller than those of the high officials buried alongside Khufu's pyramid, they included the same elements albeit in miniature size: false doors to let the dead's soul go in and out the tomb chamber, statuettes representing the dead and sometimes his wife, chapels for funerary offerings, and inscriptions that give his name and titles. The more prominent people's tombs were surrounded by smaller ones, probably those of their workers

and family members. Women were often buried with their husbands, but there are two tombs of single women. None of the bodies were mummified, a procedure reserved for the elites in this period.

When we see the size of the monuments it is easy to imagine that large numbers of people were involved in their construction. How else would all this work have been completed? And some scholars indeed write that up to 36,000 men and women built Khufu's pyramid. This seems unlikely, however, as the logistics to keep them all employed without tripping over each other's feet must have been extremely complicated. The lowest estimate of people active at one time is 2,000, which is not that much more than the galleries could accommodate.¹¹ The truth was probably somewhere in between, closer to 10,000 perhaps.¹² This labor force had to be organized, and a system already existed in Khufu's days that survived for much of ancient Egyptian history: workers were grouped into units made up of divisions. These units were gathered into gangs, two of which formed a crew. Each unit was called a *za* in Egyptian, a term the Greeks translated as *phyle* (which means tribe), which modern Egyptologists continue to use although it is somewhat misleading. The hieroglyph to write *za* is a rope tied in (often) ten loops – such loops were tied on the legs of young animals so that they moved in unison. Workers were expected to do the same. In Khufu's time four divisions, that is 40 individuals, made up a *phyle*. That is the number of men on Merer's boat, mentioned before. Four *phyles* formed a gang, and there were two gangs in a crew.¹³ The gangs took on names that regularly mentioned the name of a king, such as "Friends of Khufu," or, less respectful perhaps, "Drunkards of Menkaura."¹⁴ They regularly left graffiti with these names in nooks and invisible places, claiming the work. The "Friends of Khufu," for example, painted the name in red ink inside the relieving chambers above the king's burial chamber, out of sight once the pyramid was finished.¹⁵

These names still do not tell us who the gang members were. The fifth century Greek historian Herodotus, who probably visited the pyramids, wrote that Khufu (he calls him Cheops, a name still often used) "commanded all Egyptians to work for him" and reduced a prosperous country to a completely awful condition.¹⁶ The grand scale of the project and the enormous weight of some of the individual stones used in it, make it clear that a lot of blood, sweat, and tears were involved in building the great pyramid. It is thus tempting to conclude that the laborers were forced to do the hard work, that they were slaves. Such a term can be misleading as it needs to be situated within the general structure of a society, and ancient Egypt's was certainly

very different from Rome's, the premier example of ancient slavery.¹⁷ There certainly were people in Egypt who had very little freedom of movement and these seem to have included foreigners captured during military actions. War accounts often record large numbers of captives and it is possible that those men and women were put to work in building projects such as the pyramids.¹⁸ Also native Egyptians could have been forced to provide service against their will and one can imagine a centralized bureaucratic state that recruited *corvée* labor throughout the country. There is sufficient evidence from the period when Khufu reigned to indicate that the king received resources and labor from the various provinces of Egypt –what makes Egypt unique in early World History is the fact that the king from the beginning of the state's existence collected contributions from communities spread all over its large geographical area. No other early state had such a reach. But was it possible to make young men and women come to Giza and work against their will? I think not, for the simple practical reason that it would have been physically impossible to prevent them from resisting. Every stone mason with a hammer handled a tool that was as deadly as the weapons soldiers used at the time, mostly maces. Unless there was a guard for every workman, making the latter work against their will was impossible. Thus, the people building the pyramid must have agreed to do so. Somehow an ideology existed that inspired them to leave their villages for periods of time –probably when they were not needed to tend the fields– and provide hard physical labor in honor of their king, whom they thought of as a semi-divine being. From the beginning of Egyptian history the king was regarded as someone in between the human and heavenly worlds, someone whose task it was to maintain good relations with the gods, so that universe would remain well-ordered. The Egyptians feared chaos, and the king's role was to prevent it from happening. In return his people were raised to believe that king's eternal comfort after death was his just reward. The famous *Pyramid Texts*, slightly later than the monuments in Giza discussed here, make clear that part of the royal burial's purpose was to help the king reach his final destination alongside the gods in the hereafter. There he would be happy and reside forever in luxury. The ancient Egyptians may have done the work on his tomb willingly, because they thought he deserved this after fulfilling his role as a good king. The entire state contributed to this effort, which, were we to call it “national service” rather than the off-putting “conscripted labor,” does not sound that unreasonable.¹⁹

Did these recruits from all over Egypt stay in the workers' village at Heit

el-Ghurab? The fact that many residents slept in dormitories, separated from their families, suggests that they were seasonal laborers indeed. Yet, they were well-taken care of, it seems, with good food and medical care. Were these the people who hauled blocks of stone for hours on end? Many scholars think not, and suggest that the lowest workers, including Egyptians and foreigners, stayed somewhere else on the plateau and were much less well-fed.²⁰ We cannot know for sure. The pyramid is not yet ready to reveal all its secrets.²¹

Notes

1. The chronology of ancient Egyptian history, especially before 1000 BC, is not secure and scholars use various systems. The one I follow here dates Khufu's reign from 2509 to 2483 BC.
2. See Mark Lehner and Zahi Hawass, *Giza and the pyramids: the definitive history* (Chicago, IL: University of Chicago Press, 2017), 419 for these calculations.
3. Niall Charlton, "The Tura Caves," *Journal of Egyptian Archaeology* 64 (1978): 128.
4. Pierre Tallet, *Les papyrus de la mer Rouge I. Le « journal de Merer »* (Cairo: Institut français d'archéologie orientale, 2017); id., "Les journaux de bord du règne de Chéops au ouadi el-Jarf (P. Jarf A-F) : état des lieux," *Bulletin de la Société Française d'Égyptologie* 198 (2017): 8-19.
5. Barry J. Kemp, *Ancient Egypt. Anatomy of a Civilization*, third edition (London: Routledge, 2018), 132-33.
6. See Lehner and Hawass 2017: ch. 16 for this type of questions.
7. Cf. Marc Van De Mieroop, *A History of Ancient Egypt* (Malden, MA: Wiley-Blackwell, 2011), 76 for such ideas.
8. Lehner and Hawass, 376-77.
9. Lehner and Hawass, 352; Fawzia Helmy Hussien, et al., "Anthropological Differences between Workers and High Officials from the Old Kingdom at Giza," in *Egyptology at the dawn of the twenty-first century: proceedings of the Eighth International Congress of Egyptologists*, Cairo, 2000, edited by Zahi Hawass in collaboration with Lyla Pinch Brock. Volume 2. History, religion. (Cairo – New York: American University in Cairo Press, 2003): 324-331.
10. For a brief survey of the evidence, see Kent R. Weeks, "Medicine, Surgery, and Public Health in Ancient Egypt," in *Civilizations of the Ancient Near East*, edited by Jack M. Sasson. (New York: Charles Scribner's Sons, 1995): volume III: 1787-1798.
11. Mark Lehner, "Labor and the Pyramids. The Heit el-Ghurab 'Workers Town' at Giza," in *Labor in the Ancient World*, edited by Piotr Steinkeller and Michael Hudson. (Dresden: ISLET, 2015): 471.
12. Kemp, 182.
13. Lehner and Hawass, 367.

14. Lehner, 418.
15. Lehner and Hawass, 31.
16. Book II: 124.
17. Cf. Ogden Goelet, "Problems of Authority, Compulsion, and Compensation in Ancient Egyptian Labor Practices," in *Labor in the Ancient World*, edited by Piotr Steinkeller and Michael Hudson (Dresden: ISLET, 2015): 523-582.
18. Lehner offers a lengthy review of the evidence. The author seems to waver on the question whether or not foreigners were among the pyramid builders. He also ignores the possibility that foreigners voluntarily came to Egypt and participated in the work.
19. Kemp, 180.
20. Lehner, 470-471.
21. I would like to thank Dr. Wilma Wetterstrom and the Ancient Egypt Research Associates, Inc. for their generosity in providing images.