On the daily amount of excavation for the construction of the rock-cut tomb during the New Kingdom Period of Ancient Egypt

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INTRODUCTION

Rock-cut tombs are a well-known type of building from the early period of ancient Egypt. Their construction peaked during the New Kingdom period (ca. 1550–1069 BC). Many tombs of royal families and high officials were built on the western bank of a rocky mountain near the present city of Luxor. Many hieratic documents, written mainly by workers at the Kings’ tombs in Deir el-Medina (Cerny 1930–35; Cerny and Sauneron 1935–70) inform us in detail about the organization of work in constructing these rock-cut tombs (Cerny 1973; Eyre 1987). The daily amount of excavation by these workers, however, is not known because of the scarcity of any written records; thus, we have not succeeded in calculating the actual duration of construction from the size of the existing tombs.

Given this situation, we may now pay attention to the hieratic inscriptions left in Theban rock-cut tomb no. 32 (hereafter «TT32» in accordance with Egyptological convention). These inscriptions, recently described by Fábián from the Hungarian archaeological team (Fábián 1992), are mostly short notes containing measurements and dates. We can safely assume that the excavation workers left these graffiti to record their rate of progress. Unfortunately, as there seem to have been some errors in deciphering the dates in the hieratic inscriptions in Fábián’s report, it cannot be used as a direct source for research. In this paper, I examine the amount of excavation per day for the construction of this rock-cut tomb, whilst reconsidering the decipherment of the hieratic inscriptions reported by Fábián.

RECONSIDERATION OF THE HIERATIC INSCRIPTIONS LEFT IN TT32

The places where the hieratic inscriptions remain in TT32 are the ceiling and walls of the narrow corridor to the burial chamber, which stretches over 20 m in the same sectional form. The inscriptions often include a measurement and a date, accompanied by a horizontal line. The further into the rock-cut tomb, the later the date, and it is possible to calculate the amount of excavation per day by comparing the number of days between the recorded dates. In the ancient Egyptian calendar, a year was divided into three seasons: Akhet (inundation); Peret (emergence of crops, or winter); and Shemu (harvest, or summer). Each season was four months long, with each month comprising 30 days, and with 10 days in a week. By adding the five epagomenal days at the end of Shemu, a year totalled 365 days (Spalinger 2001). The dates written in the tomb are in accordance with this calendar system. The hieratic inscriptions and their interpretation are shown in Figure 1, and below is a reconsideration of the inscriptions that Fábián seems to have deciphered incorrectly.

[Inscription 5] Fábián interpreted the date of this inscription to be «day 29?», but according to the
1. extremity, the first month of Peret, day 6, inside measurement?
   \[ \text{r} = 3\text{bd} \ 1 \text{ prt sw 6 q3b f ldst} \] (transliteration by Fábián)

2. the first month of Peret, day 23, extremity
   \[ \text{3 bd} \ \text{1 prt sw 23 r} \] (transliteration by Fábián)

3. the fourth month of Peret, day 2
   \[ \text{3 bd} \ \text{4 prt sw 2} \] (transliteration by Fábián)

4. the first month of Shemu, day 28
   \[ \text{3 bd} \ \text{1 sw 28 sw} \] (transliteration by Fábián)

5. the third month of Shemu, day 29?
   \[ \text{3 bd} \ \text{3 sw 29 sw} \] (transliteration by Fábián)
   the third month of Shemu, day 15
   \[ \text{3 bd} \ \text{3 sw 15 sw} \] (transliteration by author)

6. the second month of Akhet, day 23
   \[ \text{3 bd} \ \text{2 3 lft sw 23 sw} \] (transliteration by Fábián)
   the second month of Akhet, day 17
   \[ \text{3 bd} \ \text{2 3 lft sw 17 sw} \] (transliteration by author)

7. the third month of Akhet, day 16
   \[ \text{3 bd} \ \text{3 lft sw 16} \] (transliteration by Fábián)

8. the fourth month of Akhet, day 25
   \[ \text{3 bd} \ \text{4 3 lft sw 25} \] (transliteration by Fábián)
   the third month of Akhet, day 25
   \[ \text{3 bd} \ \text{3 lft sw 25} \] (transliteration by author)

9. the fourth month of Akhet, day 20+?
   \[ \text{3 bd} \ \text{4 3 lft sw 20+ sw} \] (transliteration by Fábián)
   the fourth month of Akhet, day 10
   \[ \text{3 bd} \ \text{4 3 lft sw 10} \] (transliteration by author)

10. the fourth month of Akhet, day 26, 60 cubits
    \[ \text{3 bd} \ \text{4 lft sw 26 mlh 60} \] (transliteration by Fábián)

Figure 1
Hieratic inscriptions with dates, inscribed in the corridor of TT32 (adapted from Fábián 1992, pp. 141–152)
palaeography in the New Kingdom period (Möller 1927, p. 60), it could represent «day 15».

[Inscription 6] As in the previous case, Fábián's interpretation of «day 23» seems to be incorrect; according to the palaeography it could represent «day 17».

[Inscription 8] Fábián translates this as «the fourth month of Inundation, day 25», but as earlier dates than this are inscribed further along the corridor, a different translation seems to be required. Additionally, a date from the inscription about 1.65 m further along from this inscription is translated as «the fourth month, day 26» (Figure 1–10). However, it seems impossible to excavate such a large section in a single day, considering the amount of excavation completed during other work periods. Although we cautiously acknowledge that it is possible to read the first hieratic in the figure as «the fourth month» as interpreted by Fábián, since the date is clearly interpreted as «day 25», it could also be interpreted as «the third month».

[Inscription 9] Fábián reads the date as «day 20+x?», but according to the palaeography, it should probably be interpreted as «day 10». Because he translated the inscriptions in Figure 1–8, located before this inscription, as «the fourth month, day 25», he probably judged that all the dates on the inscriptions further along the corridor were later than «day 25».

**DISCUSSION**

It is a well-known fact—for instance, from the ostracon discovered in the tomb of Senenmut (TT71), the high official who was in Queen Hatshepsut’s favour (Hayes 1942) 1973, pp. 21–23, pls. XIII–XVI)—that the amount of excavation was recorded after each day’s work in order for the workers’ supervisor to monitor the progress of the work. I believe that the short inscriptions found in TT32 are graffiti recording the progress of work, just as in the abovementioned hieratic inscription, although it is very rare to find an example of such inscriptions remaining in the actual architectural relics. Moreover, in the case of TT32, the fact that it contains dates recorded intermittently for almost a whole year makes it a valuable source of information for studying the construction process (Figure 2).

In referring to the drawing of TT32 made by the Hungarian investigation team (Kákosy 1988, abb. 1), the section of the corridor where the inscriptions remain is about 1.58 m high and 1.05 m wide. Supposing the workers worked without any holidays, it is possible to calculate the daily amount of excavation by multiplying the distance between the recorded dates by the cross-sectional area of the corridor (= approx. 1.58 m × 1.05 m), and then dividing it by the number of days between those dates. Based on the reconsideration of Fábián’s translation in the preceding paragraph, the result of calculations using the abovementioned formula is indicated in Table 1. The amount of excavation was converted to dny, which was a unit commonly used in ancient Egypt (1 dny = 1 cubic cubit; 1 cubit = approx. 52.5 cm; 1 dny = 0.14 m³). The number of days from «the third month of Shemu, day 15» to «the second month of Akhet, day 17» of work period V was calculated to be a total of 97 days, by adding five epagomenal days to the 45 days of the season of Shemu and the 47 days of the season of Akhet.

When we look at Table 1, some differences in the amount of excavation per day during each work period can be observed, but they tend to be approximately 0.5–1.0 dny. Concerning the number of workers engaged in the excavation work, one excavator with a few assistants behind him to carry out limestone chips would have been the best arrangement when we consider the limited workspace width of about 1.05 m. My provisional conclusion is
to set the daily amount of excavation per worker at 0.5–1.0 dny (0.07–0.14 m³), and presuming that there were some holidays from work, this indicates that a volume somewhat larger than this was excavated in one day’s work.

For comparison, we consider the hieratic documents of the New Kingdom period, which was contemporary with TT32. The study by Ventura (1988), who attempted to decipher papyrus number 1923 (stored in the Egyptian Museum of Turin), presumed that the scribe who had the role of controlling the work schedule for the excavation of the royal tomb of Ramesses VI made an estimate that «the project to complete the tomb in three years would go as planned if 108 dny were excavated per day (54 dny per crew with two crews working) with 348 work days in each year». Unfortunately, as this papyrus has no description of the number of workers, the amount of excavation per worker is not clear. However, it is known from other hieratic documents that during the reign of Ramesses IV of the same 20th dynasty, between 60 and a maximum of 120 people—and during the reign of Ramesses IX, 62 workers in two crews composed of 31 workers per crew—were employed in the excavation of the royal tombs (Cerny 1973, pp. 103–108; Eyre 1980, p. 113). If we apply these numbers to the excavation of Ramesses VI’s tomb, the daily amount of excavation per worker would be 0.9–1.8 dny (approx. 0.13–0.25 m³), and this amount is not far from the abovementioned number for TT32. Therefore, although there is still scope for further investigation, we can safely conclude that a daily amount of excavation per worker of 0.5–1.0 dny is an appropriate gauge for calculating the number of days taken to construct the rock-cut tomb.

**SUMMARY**

In this paper, I have examined the rock-cut tombs of ancient Egypt by focusing on the hieratic inscriptions on the ceiling of rock-cut tomb No.32 (TT32) in Thebes, which recorded the progress of excavation work. When I calculated the daily amount of excavation per worker during the construction of the rock-cut tomb, based on the reconsideration of the hieratic inscriptions first reported by Fábián, the result was approximately 0.5–1.0 dny (0.07–0.14 m³). In addition, I have demonstrated that these values do not conflict greatly with hieratic documents related to the excavation of royal tombs in the same New Kingdom period as TT32. It is expected that this conclusion will shed new light on studies concerning the number of days taken to build rock-cut tombs in ancient Egypt.

**ACKNOWLEDGEMENTS**

Many thanks are due to Shin-ichi Nishimoto, Associate Professor of Waseda University, for reading through the draft of this paper and providing valuable suggestions.

**NOTES**

1. This paper is a revised version of a paper written in Japanese by Endo and Nishimoto, 2002.

2. In addition, regarding practical methods for excavation of the rock-cut tombs, see Mackay 1921; Arnold 1991, 211–218; Owen and Kemp 1994.

3. Although it is not the case with rock-cut tombs, some successive hieratic dates with parallel red lines are

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**Table 1**

<table>
<thead>
<tr>
<th>Period</th>
<th>Number of Days</th>
<th>Excavated Distance</th>
<th>Amount of Excavation</th>
<th>Daily Amount of Excavation</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>17 days</td>
<td>1.23 cubits</td>
<td>7.43 days</td>
<td>0.44 day</td>
</tr>
<tr>
<td>II</td>
<td>69 days</td>
<td>10.76 cubits</td>
<td>66.37 days</td>
<td>0.94 day</td>
</tr>
<tr>
<td>III</td>
<td>56 days</td>
<td>6.86 cubits</td>
<td>41.14 days</td>
<td>0.73 day</td>
</tr>
<tr>
<td>IV</td>
<td>47 days</td>
<td>3.24 cubits</td>
<td>19.43 days</td>
<td>0.41 day</td>
</tr>
<tr>
<td>V</td>
<td>97 days</td>
<td>11.62 cubits</td>
<td>69.72 days</td>
<td>0.72 day</td>
</tr>
<tr>
<td>VI</td>
<td>79 days</td>
<td>4.57 cubits</td>
<td>27.42 days</td>
<td>0.35 day</td>
</tr>
<tr>
<td>VII</td>
<td>10 days</td>
<td>1.33 cubits</td>
<td>8.00 days</td>
<td>0.80 day</td>
</tr>
<tr>
<td>VIII</td>
<td>13 days</td>
<td>1.95 cubits</td>
<td>11.43 days</td>
<td>0.86 day</td>
</tr>
<tr>
<td>IX</td>
<td>16 days</td>
<td>1.24 cubits</td>
<td>7.43 days</td>
<td>0.46 day</td>
</tr>
</tbody>
</table>

Daily amount of excavation for the construction of TT32. Each work period is based on the reconsideration of hieratic inscriptions, in section 2 above. Regarding the column labelled «excavated distance», the figures with asterisks are obtained from a plan (Fábián 1992, Fig. 3), and the rest are adapted from the description in Fábián’s paper.
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preserved on the walls and ceilings of the quarry at Qurna on the western bank at Luxor. This record is very valuable for quantifying the daily work on producing stone blocks at the quarry (Nishimoto, Kawasaki and Endo 2001; Nishimoto, Yoshimura and Kondo 2002).

4. According to the textual sources from the workers’ village at Deir el-Medina during the Ramesside period, the days 9–10, 19–20, and 29–30 of the Egyptian month were generally regarded as holidays from work. However, if the completion of a tomb had to be hastened for some unexpected reason, then the excavation work was done with almost no holidays. Cf. Helck 1977, 145.

5. A number of hieratic inscriptions during the New Kingdom period indicate that the building crew was divided into two sides, called «smby (the left)» and «wnmy (the right)». However, it is difficult to determine whether the distinction was related to the actual work or to the administrative practice. Cf. Eyre 1987, 185–186.

Reference List