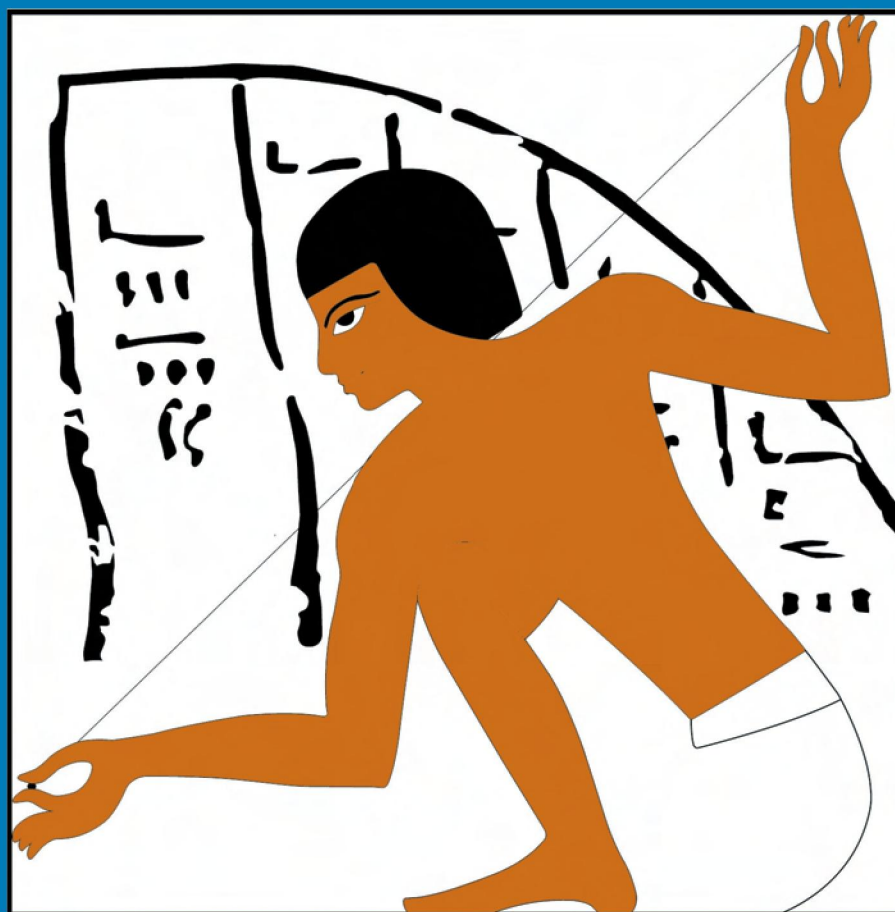


# STRUCTURE AND SIGNIFICANCE

THOUGHTS ON ANCIENT EGYPTIAN ARCHITECTURE



VERLAG DER ÖSTERREICHISCHEN AKADEMIE DER WISSENSCHAFTEN

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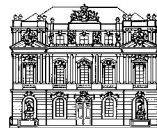
ÖSTERREICHISCHE AKADEMIE DER WISSENSCHAFTEN  
DENKSCHRIFTEN DER GESAMTAKADEMIE, BAND XXXIII

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UNTERSUCHUNGEN DER ZWEIGSTELLE KAIRO  
DES ÖSTERREICHISCHEN ARCHÄOLOGISCHEN INSTITUTES

HERAUSGEGEBEN IN VERBINDUNG MIT DER KOMMISSION FÜR ÄGYPTEN  
UND LEVANTE DER ÖSTERREICHISCHEN AKADEMIE DER WISSENSCHAFTEN  
VON MANFRED BIETAK

BAND XXV



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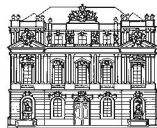
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Editor  
Peter Jánosi



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WIEN 2005

Vorgelegt von w. M. MANFRED BIETAK in der Sitzung am 15. Oktober 2004

British Library Cataloguing in Publication data  
A Catalogue record of this book is available from the British Library

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ISBN 3-7001-3552-1  
Copyright © 2005 by  
Österreichische Akademie der Wissenschaften  
Wien

Grafik, Satz, Layout: Béatrice Boileau-Hassoun  
Druck und Bindung: Börsedruck, A-1230 Wien

<http://hw.oeaw.ac.at/3552-1>  
<http://verlag.oeaw.ac.at>

Printed and bound in Austria

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# G I-a, -b, -c and -d Ashlars\*

Nabil  
SWELIM

**T**HIS SHORT PIECE of research is devoted to Dieter Arnold who has been enriching our pyramid library with valuable material on the Middle Kingdom monuments. Little attention has been paid, however, to 10<sup>1</sup> small pyramids dating to the Old Kingdom on the Giza plateau<sup>2</sup>. Recently, the unexpected discovery of G I-d did not add much enthusiasm to the subject. It is rather astonishing that, in the year 2001, we have no up-to-date plans and sections of these pyramids and publications are still using drawings made by Perring in the 1830s<sup>3</sup>.

The variety of work that has been done on these monuments by H. Vyse<sup>4</sup>, W.M.F. Petrie<sup>5</sup>, G.A. Reisner<sup>6</sup>, V. Maragioglio and C. Rinaldi<sup>7</sup>, M. Lehner<sup>8</sup> and Z. Hawass<sup>9</sup> is worth of mention, but much more still needs to be done. During my visits to the Giza plateau, I made some notes on the outer-facing ashlar of G I a-d that I will be presenting in the following chapters.

## 1. ASHLARS

An ashlar is a building stone that is cut and dressed by a mason to achieve intricately-fitting joints in a construction. Most pyramid substructures were floored, walled and roofed

\* I would like to thank Dr. Zahi Hawass for helping my investigation at Giza. I also would like to thank Mrs. Lyla Pinch Brock for reading the manuscript and making useful hints that have improved my English. The pyramid numbering follows Reisner's system.

1. N. Swelim, «Pyramid Research from the Archaic to the Second Intermediate Period, Lists, Catalogues and Objectives», in: *Hommages à Jean Leclant, BdE* 106/1, 1994, 340.
2. *PM III*<sup>2</sup>, 16.
3. J.S. Perring, *The Pyramids of Gizeh*, London 1839.
4. H. Vyse, *Operations Carried on at the Pyramids of Gizeh in 1837*. Vol. II, London 1840, 63, 69, 66.
5. W.M.F. Petrie, *The Pyramids and Temples of Giza*,

(new and revised ed., with an update by Zahi Hawass) London 1990.

6. G.A. Reisner, *A History of the Giza Necropolis*. Vol. I, Cambridge/Mass. 1942, 129.
7. V. Maragioglio, C. Rinaldi, *L'architettura delle piramidi Menfite*, pt. IV: *La Grande Piramide di Cheope*, Rapallo 1965, 76.
8. M. Lehner, *The Pyramid Tomb of Hetep-heres and the Satellite Pyramid of Khufu, SDAIK* 19, 1985.
9. Z. Hawass, «The discovery of the Satellite Pyramid of Khufu G I-d», in: *Studies in Honor of William Kelly Simpson*, vol. I (ed. P. Der Manuelian) Boston 1996, 379.

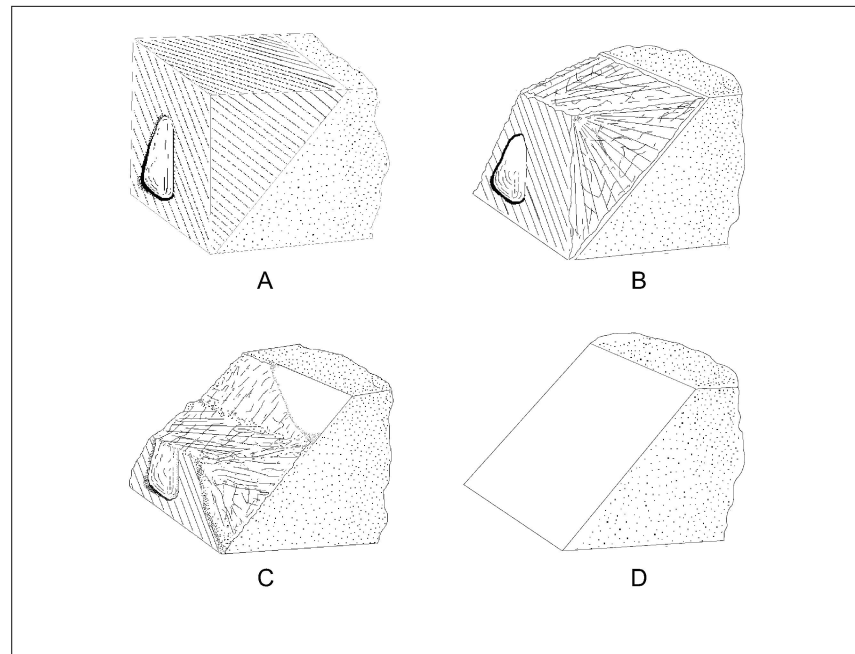


fig. 1. Trimming and dressing of a casing-block

with ashlar. All pyramids, however, were cased – or were going on to be – by ashlar<sup>10</sup>. Before laying an ashlar-casing block, it was cut and dressed on four sides, the inner side was left rough, and the outer side was squared at right angles to the sides (fig. 1.A). Its face was then intricately dressed and polished<sup>11</sup> with a boss or an indent.

During the penultimate phase of pyramid-building, the ashlar had already been laid side-by-side in stepped courses (pl. I.1). It is not clear to me, however, if they were laid untrimmed, or if they had some initial trimming done before they were laid. I have not hitherto seen any completely untrimmed ashlar set up inside these pyramids; almost all the trimmed ashlar still preserve part of the squared front with a boss or an indent. At the ultimate building stage, the final trimming and dressing of the ashlar added the stepped courses to the sloping plane of the pyramid side (pl. I.2, 3).

During these working stages at Giza, some pyramid projects were discontinued, namely G I a-d, G I-x, G III, and G III-a. However, we are concerned here with the first four pyramids. Observations made at G I a-d show that the initial trimming was carried out the same way (figs. 1.B and 1.C) whilst the dressing was carried out in a variety of ways (figs. 1.C and 1.D; pl. I.4-6).

To prepare the building site for the three pyramids G I a-c, the top of the desert surface was removed and, without leveling the exposed bedrock, received the building blocks of the nucleus and the ashlar of the outer facing. From the lower levels of the bedrock to the upper levels, the courses increased in height and length until the required layout was

10. N. Swelim, *Seven Layer Monuments of the Early Old Kingdom* (forthcoming).

11. I do not understand the reason for dressing and

polishing the outer side of a squared block that would eventually end up cut right off.

achieved. Consequently, none of these small pyramids – like the layer monuments Seila and el-Kula<sup>12</sup> – had a level platform or pavement. Such foundations exist at the layer monuments of Hebenu, Sinki, and Elephantine and at the other Fourth Dynasty pyramids at Giza and at Dahshur.

In the following pages, I shall be giving a brief outline of the present situation at the sides and corners of G I a-c and mention a few other pyramids, including G I-d. My present work will then conclude by analysing bosses, indentations, trimming and dressing.

The pyramid G I-a was built on a square area and slopes gently away to the east and south. Roughly-cut holes are bored into all pyramid sides. In the bedrock underneath the north entrance of the pyramid, there are still a few remaining large holes with the inner mortar lining leaving impressions of wooden poles that are likely to have been used to control the lowering of a basalt sarcophagus across the corridor to the burial chamber<sup>13</sup>.

Special bedding was cut at a back angle to apply the outer facing along the pyramid sides. Level bedding was prepared to apply the outer facing at the corners. The bedding on the pyramid sides was completed with a series of pockets<sup>14</sup>, arranged side-by-side in straight lines. The pockets were stepped and, except for the east side, each pocket accommodated three or four ashlar. Their stepping followed the terrain, their thickness tailored to accommodate each group of ashlar, drawing a remote parallel to the casing of G II. There are very few ashlar surviving at G I-a and there are traces of a thin layer of hard reddish mortar visible on top of the rock bedding where the missing blocks used to sit<sup>15</sup>.

On the north side of G I-a, the bedrock has acted to preserve pockets with back-sloping bedding. West of the entrance, two dressed limestone ashlar are set, inclined and *in situ*<sup>16</sup>. In the middle, the inclination of the bedding continues inwards under the masonry of the nucleus. It was in this that the nucleus was built at an angle to create an angle for the descending corridor. The discontinued project of G I-x was to follow the same method. At G I-a, an exposed roofing block above the corridor looks impressive for its huge size.

The north-eastern corner of G I-a was built on a levelled part of the bedrock<sup>17</sup> that continues flush on both sides for a short distance before descending into a series of pockets with inclined bedding. The outer-facing blocks are missing, whilst the lower courses of pyramid nucleus are preserved.

12. Swelim, *Seven Layer Monuments* (forthcoming); cf. D. Arnold, *Building in Egypt. Pharaonic Stone Masonry*, New York/Oxford 1991, 109 no. 6.

13. The basalt was suggested by Vyse and doubted by Maragioglio, Rinaldi, *op.cit.*, 63, 178.

14. By a pocket I mean a shallow rectangular pit with a level bottom for blocks to fit side-by-side.

15. Similarly, some of the outer-facing ashlar, now missing, at Seila were placed on the masonry of the

outermost layer where a hard white mortar is preserved.

16. A third one is probably modern, composed of 2 pieces.

17. This is similar to the north-east corner of the pyramid of Djedefra at Abu-Rawash where the G I-a example is followed; this information was mailed to Michel Valloggia with copies to Jean Leclant and the late Paule Posener-Kriéger on 11<sup>th</sup> January 1996. The inclined bedding was already found at Seila where the lower course had been laid on a gravel bedding.

The eastern side of G I-a is fairly level at the north. Southwards, it dips a little. In that area, one ashlar is left *in situ* and there is only one long, continuous pocket<sup>18</sup>. Near the pyramid axis, the nummulitic bedrock formation is slightly bumpy. We noticed that it had been worked at a sloping angle to fit into the outer facing along a distance of 2.70 metres and to a height of 0.20 metres. It is level with the top of the single ashlar just mentioned. This was the area where the temple used to stand. Nothing of this temple remains. The three sides flanking it are marked on the bedrock.

Originally, at the south-east corner of G I-a a large ashlar, now removed, had been sunk into the bedrock. The rock runs flush on both sides of the pit for a short distance before dropping into pockets with sloped bedding. The lower courses of pyramid nucleus are preserved. The surrounding rock still preserves the hard surface top on the plateau.

The level of the south side of G I-a dips away to the east. Four ashlars with minimum trimming have been sunk into a pocket near the south-eastern corner. Their outer sides are below the surrounding desert surface. The first has a boss – the second an indent, whilst the others are buried and, at present, are invisible to the eye. On this side, a boat-pit had been neatly dug into the space between G I-a and -b.

The south-western corner of G I-a originally had an ashlar on the surface of a levelled part of the bedding. After a short distance on both sides, pockets with inclined bedding reappear. The lower courses of pyramid nucleus are preserved.

The west side of G I-a is more level than the other sides, the pockets not stepping down all the way. In fact, three of them step upwards.

The bedrock off the north-west corner of G I-a was left at a height above the levels of the bedding of the outer facing and the neighbouring temple of G I. This bedrock support two raised pavements on the north and west sides, both sloping away to the east and south down to the level of the surrounding bedrock (pl. II.7)<sup>19</sup>. Originally, facing ashlars that have now been removed had been placed on levelled bedding between the rock pavements and the nucleus. After a short distance, pockets are sunk into the levelled surface with sloping bedding on the east and south sides. The lower courses of the pyramid nucleus have been preserved.

The pyramid G I-b preserves more outer-facing ashlars than its northern neighbour. It had also been built on a sloping area prepared by removing the weathered surface and exposing a nummulitic limestone. The weathered surface, however, surrounds the monument.

Only on the north side of G I-b, were the ashlars set on inclined bedding, probably for the same reason as G I-a, the slope – however – falling short of the corners. The first course of ashlar fills a pocket up to the desert level at the pyramid entrance. These ashlars had received their initial trimming. The ashlars of the second course had been trimmed and dressed.

18. Maragioglio, Rinaldi, *op.cit.*, 78.

19. Lying by the west rock pavement is a heavy dislodged casing block with crowbar indents. It had been partly worked to create a rectangular hollow –

perhaps a sarcophagus – compared with an ashlar at the northwest corner of G I-c; see below. On the east side of G I-b near the mastaba of Kawab number G 7120 is a third stone object of the same nature.

The casing at the north-eastern corner of G I-b is missing, thus exposing the levelled rock bedding with a well-defined square mark on the corner stone. The preserved ashlar on the eastern side are closer to this corner than those on the northern side. The lower courses of the pyramid nucleus are intact.

On the eastern side of G I-b there are preserved trimmed and dressed ashlar starting from the missing north-east corner to the preserved south-east corner. In-between, the number of courses goes up to five, all with trimmed and dressed ashlar. Ruins of the east temple are still standing.

On the south-eastern corner of G I-b there is one preserved course of outer-facing ashlar (pl. I.2). To the north, after short distances the number of courses increases, and to the west after a longer distance, the number of courses increases. The lower courses of the pyramid nucleus are intact.

Very close to south side of G I-b is a smaller boat-pit, which extends westwards. To the east the top-weathering surface of the bedrock was not completely worked and remains rough. Here the space between G I-b and -c is much smaller than that on the north side. On that side there are 5 courses of ashlar, the lower course of which is lower than the desert level; its ashlar are partly-trimmed preserving bosses and indents.

At the south-west corner of G I-b the outer facing is missing. The lower courses of the pyramid nucleus are intact. On the west side the weathered surface of the plateau rises a little above the first course of the ashlar. These ashlar are preserved in two courses in the middle part. The face of lower course shows erosion on the upper part, incomplete trimming on the lower part and dressing which had reached the final surface in-between.

The ashlar at the north-west corner of G I-b are missing. The exposed bedding is level and slightly sunken in the bedrock. The marking cut on the north side deviates slightly and is not squared. The general decline of the terrain to the south is mild. The lower courses of the pyramid nucleus are intact.

Like its two northern neighbours G I-c was built on an unlevelled area without being aligned with either of them. The space between G I-b and G I-c is much smaller than that between the former and G I-a and it is right there that a smaller boat-pit was cut into the western part that sprawls beyond the boundaries of these pyramids,

On the north side of G I-c two courses exist for most of the western half, and are fairly level and well-preserved. The lower one is a foundation course with initial trimming, some bosses and indents. The second course was dressed. At the entrance area the preserved courses become five, the top two courses bridge over the entrance<sup>20</sup>. The eastern part of the north side tapers off with the terrain and the outer facing is reduced to two courses at the corner. On the north side there are areas where the dressed surface had weathered badly.

20. An anchor-like stone object lies on the blocks west of the doorway. It has two holes in the middle – not in the semicircular part. A little to the east are two neatly cut cavities in the outer facing, one rectangular and the other egg-shaped. They are unlike the holes in the bedrock at the entrance of G I-a.

At the north-eastern corner of G I-c two courses of the outer facing are well-preserved (pl. I.3). The lower courses of the pyramid nucleus are intact.

To the eastern side of G I-c are attached the remains of the eastern temple and some Twenty-first Dynasty buildings in stone and brick<sup>21</sup>. The two courses mentioned at the north-east corner continue south up to the brick ruins and the north of the temple. As a result of the decline of the terrain that continues southwards, the outer-facing courses go up to five at the temple area and go back down to three on the south-eastern corner. The first and second courses along this portion show initial trimming.

Three courses are found at the south-east corner of G I-c, the cornerstone of the first course is a heavy foundation block set on the bedrock, above it is the second course where a smaller one is set. They are indented on both sides. Above comes the third course: an outer-facing corner ashlar that is badly weathered. The lower courses of the pyramid nucleus are intact (pl. II.8).

The south side of G I-c is very interesting with four visible courses of ashlar preserved near the south-east corner – three coming from that corner and the fourth appearing after a short distance. Ashlars 1-11 of the first course maintain a uniform height that suddenly increases with the 12<sup>th</sup> ashlar and keeps a new height as far as ashlar 35. Actually, after this block, the 1<sup>st</sup> course is covered and I believe that it does not go as far as the south-western corner because the bedrock rises rapidly. There are signs of initial trimming on each of these ashlars.

The difference in height between ashlar 11 and 12 is occupied by the second course which only 11 ashlar from coming the south-eastern corner. They were at the initial trimming stage.

The third course above them continues from the south-eastern to the south-western corner where it is seen at ground level. This one has approximately 46 ashlar. The trimming had almost reached the facing on at least 16 ashlar (pl. I.6). Ashlars 16-24 show that the trimming had been gone on to an advanced stage, but was still incomplete. There are only signs of initial trimming on all ashlar 25-46.

The fourth course – with the 36-odd ashlar left – and the fifth courses – with seven-odd ashlar left – show that the trimming had almost reached the facing.

There are no visible ashlar at the south-west corner of G I-c. The present course from the east runs at ground level and continues northward. There are two heavy blocks at desert level south of this corner. The lower courses of the pyramid nucleus are intact.

On the west side of G I-c, the terrain slopes away gently from the boat-pit to the line of the south side of the neighbouring G I-d, then sharply dips southwards. A continuous plane of courses bending from the northern side has been preserved, stepping down with in a broken line to end flush with the south-western corner at ground level. There are well-illustrated examples of trimming and dressing. Some of the initial trimming had not had the effect of removing some of the bosses (pl. 4).

21. S. Hassan, *The Sphinx. Its History in the Light of Recent Excavations*, Cairo 1949, 216; M. Jones, A. Milward, «Survey of the Temple of Isis. Mistress of the Pyramid at Giza 1980 Season, Main Temple Area», *JSSEA* 12, 1982, 139 figs. 1, 2 and 4.

Ashlars of the north-western corner of G I-c are missing; but a foundation block retains an incision indicating the position of the corner. This block is a few centimetres away from the boat-pit and the surrounding cap of the weathered surface of the plateau.

To the east a casing ashlar, with crowbar indents, had been partly re-used to create a sarcophagus or basin. It is a long, continuous block that crosses over into the nucleus. This stone object is similar to the other two mentioned above. The lower courses of the pyramid nucleus are intact.

In G I-d, we see the most ruined pyramid monument of the G I group. Surprisingly the limestone pyramidion and part of the course below its base have survived. They have been studied and reported on in depth<sup>22</sup>. The smaller boat-pit between G I-b and -c is very close at the northern part of the eastern side of this pyramid.

The bedrock slopes slightly off to the south and, whilst partly exposing a number of building blocks on the northern side, on the southern side it preserves a single partly-dressed course of bulky ashlar (pl. I.5).

The eastern side runs from a heavy corner-block built on top of the bedrock at the north-eastern corner to another one built on bedrock at a lower level on the south-east corner. These courses house remains of initial trimming and initial dressing. The top of the desert surface lifts up slightly onto the lower course, but neither covers it up, nor runs to the south-eastern corner. The western side, like the southern one, preserves one course of initially trimmed ashlars. Some of the ashlars have preserved bosses and indents.

Ashlars in the initial mastaba of Netjerykhet were set horizontally. In subsequent enlargements that resulted in the layered monument, the ashlars were set at a back-sloping angle.

The dressing of the lower sides of the outer-facing ashlars that are suspended at the Bent Pyramid and G II is brought to light by removing the courses below.

At G I, four flush socket beddings were cut in the bedrock at the four corners of the pyramid where the corner ashlars were set.

At G III, there are exposed sides and tops of some granite facing ashlar. The dressed surface of their planes is exposed, whilst their outer sides are untrimmed.

At the pyramid of Udjebten and others of the Sixth Dynasty, the corner facing-ashlars show mortise and tenon settings.

22. Z. Hawass, «The Discovery of the Pyramidion of the Satellite Pyramid of Khufu [GI-d]», in: *Jubilate Conlegae. Studies in Memory of Abdel Aziz Sadek*, VA 10, pt. I 1995, 105-124.

## 2. ANALYSIS

The pyramids G I a-c were built on unlevelled areas sloping east and south. The fourth pyramid G I-d was built on a level area in the north that dips away to the south. Investigations so far have not revealed information about the presence of pavements, platforms or enclosure walls surrounding them, apart from the temple areas of the first three monuments. Consequently, we cannot decide whether the lower courses were orthostates and were meant to be left below an added pavement level or if they were supposed to be trimmed and dressed down to the desert level.

The initially trimmed ashlar had been prepared with one or two bosses or with one or two indents. Most puzzling, as mentioned above, is that the outer sides of the ashlar are intricately dressed and, hitherto, there seems hitherto to be no practical reason for this dressing.

The bosses project approximately 10 centimetres, 15 centimetres wide and 20 centimetres high. They are found 10-15 centimetres above the lower front edge of the ashlar. The bosses have no groove for a rope. Moreover ropes lifting such heavy blocks of 1-2 tons have to be thick. Such a boss projection cannot accommodate a thick rope. I believe these bosses were for levers, their position designed to keep the lower side of the ashlar clear of the lifting facilities.

Some bosses on partly-trimmed outer-facing ashlar of G I a-d are dissimilar. For example, on the southern side of G I-c, the lower side of two bosses of an ashlar is cut at roughly 80° rather than the commoner angle 90°, as in the case of block 5 of the second course (pl. I.1).

Bosses are found also at G I on granite blocks of the burial and five relieving chambers<sup>23</sup>. They are also found at an initially trimmed but destroyed granite ashlar on the east side of the pyramid of Djedefra at Abu-Rawash.

The initially trimmed granite ashlar *in situ* at G III preserve bosses on their outer sides<sup>24</sup>.

The north side of G III-a shows the first course of ashlar to be of initially-trimmed granite with bosses.

Bosses are found on partly-trimmed diorite blocks on the upper temple of G III and at the ends of Old Kingdom sarcophagi lids, starting with the one in the unfinished pyramid at Zawiyet el-Aryan, Mastaba 17 at Meidum and many later monuments.

Bosses separated from stone objects have been found lying by the pyramid of Djedefra at Abu-Rawash and in the finds from the excavation of the pyramid of Senusert I at Lisht<sup>25</sup>.

Granite walls in the burial chamber of Mentuhotep I at Der el-Bahari had bosses<sup>26</sup>.

Indentations in the faces of ashlar measure approximately 10 centimetres in depth, width and height. They are found 10-15 centimetres above the lower edge; e.g. ashlar four

23. W.M.F. Petrie, *Egyptian Architecture*, London 1938, 37, 57, 58, pl. X.

24. I investigated the fallen ones at G III and saw no bosses on the backs of them.

25. At Abu-Rawash seen around the temple area and at Lisht shown to me by Dieter Arnold.

26. Arnold, *Building*, fig. 4,54.



of the second course (pl. I.1). Orthostates ashlar, especially at the corners have one or two indents, cut into their two faces. Interestingly ashlar four of the first course on the east side of G I-c has two sets of indentations; although there is nothing unusual about this block.

These indents differ from the crowbar indents on the lower edge of the sides of the ashlar; at G I, Unas, the temples of G II and G III, etc.; by appearing on the outer side above the lower edge, not on the joining side of this masonry<sup>27</sup>.

Nevertheless, there are a few ashlar on the south side of G I-c which have crowbar indents at the lower edge of their faces; ashlar three of the first course (pl. I.1) and on the two stone objects re-used from blocks at G I-a and -c. So, while the crowbar indents were for compacting the joints between the ashlar, those indents – just like the bosses – were for lifting or aligning them without gripping or grabbing their undersides.

The damage caused to the outer surfaces whilst handling orthostates ashlar did not matter all that much. That is probably why many were indented. It seems that outer-facing ashlar had bosses to stop damage from the handling process reaching the top surface.

Ashlar were trimmed at all great monuments, some of which have been left unfinished, e.g. the first pylon at Karnak, the girdle walls at the temple of Kalabsha and temple of Philae.

Dressing was the final building phase at some monuments, other than pyramids, where the work was handed over to the artisans, e.g. the north side of the western gateway on the first pylon at Karnak, parts of the girdle walls at the temple of Kom Ombo and parts of the mamisi at the temple of Dendera.

Most of the fallen granite ashlar on the four sides of G III had been trimmed and dressed. Those *in situ* are partly-trimmed with projecting bosses<sup>28</sup>. On the northern side of the pyramid around the entrance – and also on the eastern side of the temple area – the process of trimming followed by dressing progressed apace *with expansion of the area*.

At G I a-d, the work began from top to bottom, as some of the blocks of the lower courses are partly trimmed.

The bulk of the protruding rock of the stepped courses that had a polished outer side and a boss or indent was trimmed to one centimetre across the final surface and then carefully dressed. In all instances, the workers paid careful attention as they came closer to *the joints* (pl. I.1-6).

The lower courses on the south side of G I-c show signs of initial trimming and of further trimming that had almost reached the top surface without dressing. The upper courses have been dressed (pl. I.1).

*Dressing by drafted bands* can be seen vertically on the south side of G I-c. They demonstrate a stage between the very last of the trimming and dressing (pl. I.6). On the west side of G I-c the method seen is *dressing ashlar by ashlar* (pl. I.4).

On the southern side of G I-d the top of a surviving course of ashlar shows that a method – midway between trimming and dressing – achieved a form of *dressing by graduated level* (pl. I.5).

27. Arnold, *Building*, 117, 270.

pyramid of Djedefra at Abu-Rawash.

28. They are very similar to a few fallen ones at the



1. The south side of pyramid G I-c.



2. The south-east corner of pyramid G I-b.



3. The north-east corner of pyramid G I-c.



4. The west side of pyramid G I-c.



5. The south side of pyramid G I-d.



6. The south side of pyramid G I-c.



7. The north-west corner of pyramid G I-a.



8. The south-east corner of pyramid G I-c.