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George Andrew Reisner on Archaeological Photography

Edited by PETER DER MANUELIAN

EDITOR'S INTRODUCTION

Field photography has long since become an indispensable part of the archaeological process. Few would doubt its significance in documenting every phase of the excavator's craft.¹ Many Egyptian excavations from the earlier part of this century, however, suffered from inadequate photographic documentation, a fact that has rendered interpretation of these sites all the more difficult today. A fortunate exception to this rule is the forty-year Harvard University-Museum of Fine Arts, Boston, Expedition, due to the photographic expertise of its leader, George Andrew Reisner.

Born in Indianapolis in 1867, Reisner earned B.A., M.A. and Ph.D. degrees at Harvard University (fig. 1).² In 1893 he became a Travelling Fellow of Harvard and studied Semitics in Berlin. Eventually, he was drawn away from Assyriology and over to Egyptology and briefly served as an assistant in the Berlin Museum from 1895-96. After he returned to Harvard as Instructor in Semitics, his work in Egypt was financed by Phoebe Apperson Hearst, mother of the renowned newspaper publisher. From 1902-1905 the Hearst Expedition excavated at the Giza necropolis. In addition, Reisner excavated at Deir el-Ballas (in Middle Egypt),³ at Naga ed-

Deir,⁴ Mesheikh, Mesa³eed, El-Ahawaih, and even in Nubia (fig. 2).⁵ The expedition was subsequently transferred from California to become the Joint Expedition of Harvard University and the Museum of Fine Arts, Boston. Excavations continued at sites as diverse as Giza,⁶ Kafr Ghattati,⁷ Zawiyet el-Aryan,⁸ Deir el-Bersheh,⁹ Coptos, Gebel Barkal, Kerma, Begarawiyeh, El-Kurru, Nuri, Meroë, Uronarti, Shalfak, Mirgissa,

el-Ballas Expedition, 1980-1986, American Research Center in Egypt Reports, vol. 12 (Winona Lake, 1990); "The Riddle of Egypt's Ancient Settlements," *Archaeology* (July-August, 1988), 62-66, and "The Hearst Excavations at Deir el-Ballas: The Eighteenth Dynasty Town," in W. K. Simpson and W. M. Davies, eds., *Studies in Ancient Egypt, the Aegean, and the Sudan. Essays in Honor of Dows Dunham* (Boston: Museum of Fine Arts, 1981), 120-24.

⁴ This work will be published by Edward Brovarski, Research Curator, Department of Egyptian and Ancient Near Eastern Art, in *The Inscribed Material from Naga ed-Deir* (forthcoming).

⁵ Reisner's Nubian work has been expanded since 1986 by Timothy Kendall, Associate Curator of the Department of Egyptian and Ancient Near Eastern Art, primarily at the site of Gebel Barkal; see his *Kush: Lost Kingdom of the Nile* (Brockton, 1982), and "Discoveries at Sudan's sacred mountain of Jebel Barkal reveal secrets of the Kingdom of Kush," *National Geographic Magazine*, vol. 178 no. 5 (November, 1990), 96-124.

⁶ In addition to older publications by Reisner and William Stevenson Smith, more recent authors of publications on the Giza necropolis include William Kelly Simpson (editor of the *Giza Mastabas Series* and author of its first four volumes), Zahi Hawass, Edward Brovarski, Kent Weeks, Christiane M. Zivie, Michael Jones, Angela Milward, Mark Lehner, and Ann Macy Roth.

⁷ See Drew R. Engles, "An Early Dynastic Cemetery at Kafr Ghattati," *JARCE* 27 (1990), 71-87.

⁸ See Dows Dunham, *Zawiyet el-Aryan. The Cemeteries Adjacent to the Layer Pyramid* (Boston: Museum of Fine Arts, 1978).

⁹ Excavations here have recently been reopened by a joint expedition from the Museum of Fine Arts, Boston, and the Universities of Pennsylvania and Leiden.

¹ A few reference works include Elmer Harp, Jr., ed., *Photography in Archaeological Research* (Albuquerque: University of New Mexico Press, 1975); Thomas R. Hester, Robert F. Heizer, and John A. Graham, *Field methods in Archaeology*, 6th ed., (Palo Alto, 1975), chapter 12, 233-48.

² See the entry on Reisner by Eric P. Uphill, *Who Was Who in Egyptology*, 2nd ed. (London, 1972), 244.

³ The excavations at Deir el-Ballas were reopened and carried to a successful conclusion by Peter Lacovara, Assistant Curator, Department of Egyptian and Ancient Near Eastern Art; see his *Deir el-Ballas. Preliminary Report on the Deir*

and Semna¹⁰ (fig. 2). By 1910 Reisner was or had been Archaeological Director of the Nubian Archaeological Survey by the Egyptian Government (1907–9), Director of the Harvard Excavations at Samaria, Palestine (1909–10), assistant Professor of Semitic Archaeology (1905–10), Director of the Harvard-Boston Egyptian Expedition, Professor of Egyptology, and Curator of the Egyptian Department of the Museum of Fine Arts, Boston (1910–42). He died at “Harvard Camp” at the Giza Pyramids and was buried in Cairo in 1942.

Reisner was not only one of the pioneers of scientific archaeological methods but was also a photographic expert. He took many of the Museum Expedition’s photographs himself,¹¹ and he always applied state of the art photographic technology to his development of a strategy for thorough, fully documented and conscientious archaeological methods.

Always interested in methodology, Reisner could not refrain from writing his own manual on archaeological fieldwork. The manuscript is stored in the Department of Egyptian and Ancient Near Eastern Art of the Museum of Fine Arts, Boston, and is currently being prepared for publication by Peter Lacovara. One section which might be seen to deserve separate treatment is Reisner’s short chapter on archaeological photography, and it is the text of this chapter that is reproduced below. Although it was written in 1924, it contains many principles and tips on photographing sitework that are, due in no small part to the unchanging climatic conditions in Egypt and the Sudan, still relevant and valid today.

The present writer has resisted the temptation to cut and edit those sections which are clearly obsolete today, such as Reisner’s comments on how many photographic glass plates to pack per crate. While some of these descriptions are no longer relevant to currently practiced archaeological method,¹² they nevertheless en-



Fig. 1. George Andrew Reisner (1867–1942); June 15, 1938 (negative B 8968).

lighten us as to Reisner’s overall excavation strategy, as well as to many aspects of the records left (or not left) behind. Anyone engaged in publishing portions of the Museum Expedition might benefit from this background material on the methods and daily operations of the Museum Expedition. In addition, the chapter as a whole makes a useful and interesting period piece on the history of photography, especially as applied to two countries (Egypt and the Sudan) whose climates are openly hostile to photographic techniques and equipment.

Reisner first lays down his rules of photographic procedure, then goes on to discuss some of the problems involved and the solutions he has found. The reader will note the same preference for consistency, development, and sequential documentation that marks the author of such works as *The Development of the Egyptian Tomb down to the Accession of Cheops*.¹³ It is thus perhaps no surprise that he spares few

¹⁰ For a description of the earlier years of the Museum Expedition, see Dows Dunham, *The Egyptian Department and its Excavations* (Boston: Museum of Fine Arts, 1958).

¹¹ Most of the photography on Reisner’s expeditions was done by Egyptian members of his staff.

¹² See, for example, Reisner’s comments on the uses of color photography.

¹³ Cambridge, Mass.: Harvard University Press, 1936.



Fig. 2. Nuri, Sudan; workmen sorting royal shawabti figures of Taharqa in front of the expedition house with the pyramids of Nuri in the background (March 19, 1917; detail of D 335).

words on subjects such as photographing decorated surfaces, or grouping discrete wall scenes within a single frame.

The Museum Expedition brought back 60,000 glass plate negatives, currently stored in the Egyptian Department. In general, the images are of excellent quality; large-sized negatives allow for good resolution at enlarged printing sizes. In the case of wall reliefs and paintings, the photographs are even suitable for epigraphic facsimile drawings along the lines of the "Chicago House method." The earliest photographs date to the first decade of this century, and the time is ripe to rescue them from chemical decomposition and the effects of climatic shifts. Conservation and conversion to digital or analog storage media would not only help rescue the images, many of which show monuments and decorations long since destroyed in Egypt and the Sudan, but allow new high-speed sorting and browsing capabilities. In short, with the help of computers, such archives may be

converted into research tools in their own right, allowing scholars to pose and answer new questions about the ancient world.

In an effort to make Reisner's words clearer, I have searched the photographic negative archives and printed images which I hope will illustrate the points he tries to make. Most of the photographs are from the excavations at Giza, but suitable examples could be found from all the Museum Expedition sites. In some images, the reader will see the effects of chemical decomposition in the form of spots, cracks, and unintelligible areas.

Only the slightest of editorial hands has been applied to the original text. All of the footnotes are my editorial additions; there are no footnotes in this chapter in Reisner's original typescript. All that remains by way of introduction is to thank Rita Freed, Curator of the Museum's Egyptian Department, for permission to publish this chapter, Timothy Kendall (Associate Curator), Peter Lacovara (Assistant Curator), and

Edward Brovanski (Research Curator), for sharing their expertise on Reisner's archaeological methods, Rus Gant, staff photographer of the Giza Mastabas Project, for providing me with a photographic education, and Janice Sorkow and Marty Wolfand of the Museum's Photographic Services Department, for providing their expertise and encouragement. All photographs are reproduced here courtesy of the Museum of Fine Arts, Boston. The pages that follow below begin on p. 195 of Chapter VI of Reisner's original typescript, and end on p. 215. Reisner's original heading numbers and letters have been retained. It should be remembered that Reisner wrote this manuscript in 1924, after nineteen years of excavating in Egypt and the Sudan (1905-1924); this report therefore omits some thirteen years of work that followed up until the expedition stopped digging in 1937 and officially closed down in 1947.

Peter Der Manuelian
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REISNER'S TEXT

6. Photographic Record

When I first began work in 1899, I laid down the principle that every observation should be supported as far as possible by a mechanical, that is photographic, record of the facts observed. Now in 1924, I would lay down the same principle. But it is necessary to define the limits of usefulness of photography, to explain precisely the manner in which it should be used, to mention the difficulties which may be encountered and the methods by which they can be wholly or partly overcome.

(a) The Limitations of Photography

The chief use of photography is to record mechanically the facts revealed by skillful excavation and correctly observed by a trained excavator. If the excavator understands what he is doing and reads correctly the indications of the archaeological formations which he is uncovering, he can make a photographic record which will enable him to produce visible proofs of the facts he has observed. But he cannot, for ex-

ample, photograph a foundation trench unless he has seen it, nor a floor unless he has swept it clear. The fault of the unskillful or inexperienced excavator is that he does not know how to find the evidences concealed in his mass of debris, that he destroys them unseen and cannot possibly record them by photography except by accident. This fact must always be borne in mind: *the excavator as a general rule can only photograph what he has observed*. It is futile for an inexperienced man to hope to redeem his faults of excavation and observation by a copious photographic record. He may succeed in proving his incompetence and may occasionally by chance deliver some bit of evidence which can be read by a more experienced man, but his photographs can never be much more than a very fine record of a bad piece of excavation. However, that is the best he can do, and if he must excavate, it is incumbent on him to make that record. It is his duty conscientiously to deliver such record as he can of the materials he has destroyed.

Even in the hands of the experienced and skillful archaeologist, photography has its limits. It can only differentiate shadows and colors. There are other things like consistency, perceptible to the eye or the touch, but practically imperceptible to the lens of the camera. Photographs of such things serve as reminders to the eye of the excavator but are not much better than blank paper to one who has not seen the object photographed. And there are conditions which prevent even the registering of differences of light and color:

1) When the deposits are very wet, all have the same dark color, and even the shadows do not show distinctly against the black background.

a) In a place like the MVT¹⁴ it was impossible to photograph details on a uniform background by a long exposure; but general views which included part of the dark, wet background in the excavations and part of the dry desert surface, failed invariably to record satisfactorily one or the other (fig. 3).

b) The best remedy is to let the place dry and photograph it dry (fig. 4); if this is impossible, then use orthochromatic plates and a yellow filter on the lens.

¹⁴ This is Reisner's abbreviation for the Mycerinus Valley Temple at Giza.

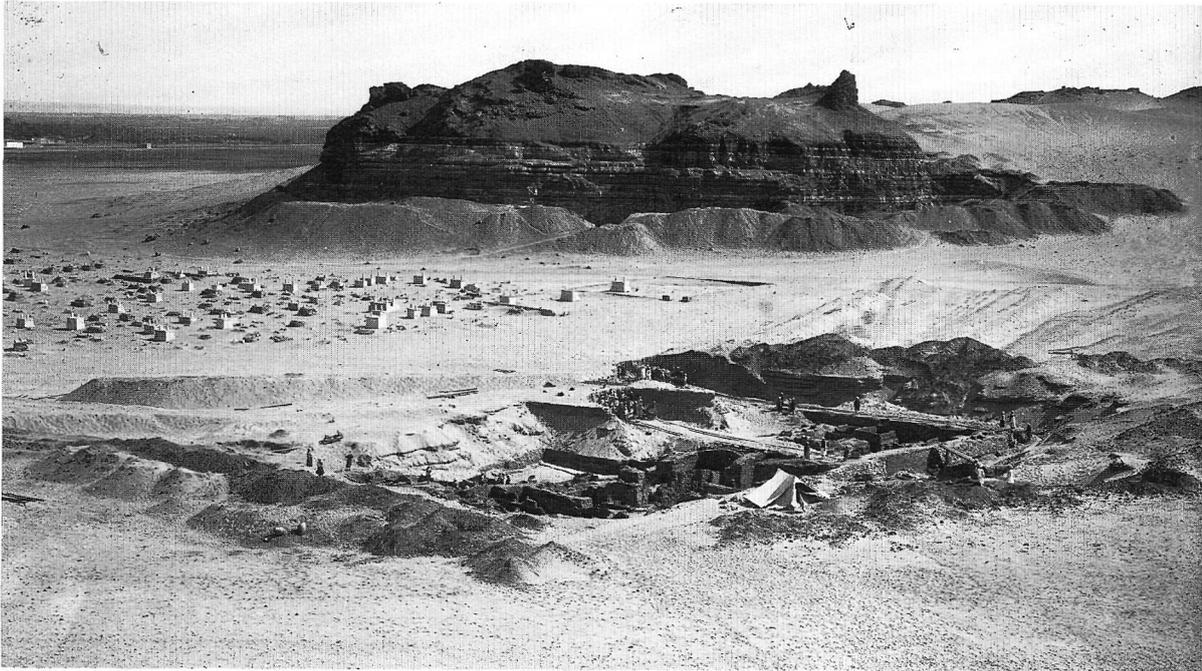


Fig. 3. Excavating the Mycerinus Valley Temple at Giza (February 9, 1910; A 329).



Fig. 4. Temple III-c, Mycerinus satellite pyramid complex at Giza; looking southwest (July 31, 1923; A 3208).



Fig. 5. Giza; Western Cemetery, tomb G 2407D, looking west; standing statue of Khui-en-Khufu (MFA 37.638) lying in poorly lit shaft below meter stick (April 19, 1936; B 8650).



Fig. 6. Giza; Western Cemetery, tomb G 2407D, looking south; detail of standing statue of Khui-en-Khufu (April 19, 1936; C 13754).

2) Walls of crude-brick embedded in their own debris of decay are difficult to follow even with the eye and are in practice distinguished from the debris by their consistency.

a) On the surface of decay, the eye can sometimes follow the walls by picking up the checkered pattern produced by the brickwork, when the surface has dried. But even then, the difference in consistency can hardly be distinguished in the photograph except by the experienced eye.

b) The best means to photograph the fact exposed [is] to clear away the mud debris from the line of the wall sufficiently to mark clearly the masonry from the debris.

The same difficulty occurs in the photographing of cross sections of deposits of debris to show filling of foundation trenches, etc.: and the remedy is the same with emphasis laid on the necessity of letting the debris dry out.

3) Pits and other subjects which show a great variation in the lighting of the parts present a difficulty frequently arising in excavations (figs. 5-6).

i. a) The open pit-grave with a burial in the bottom, not exceeding about one meter in

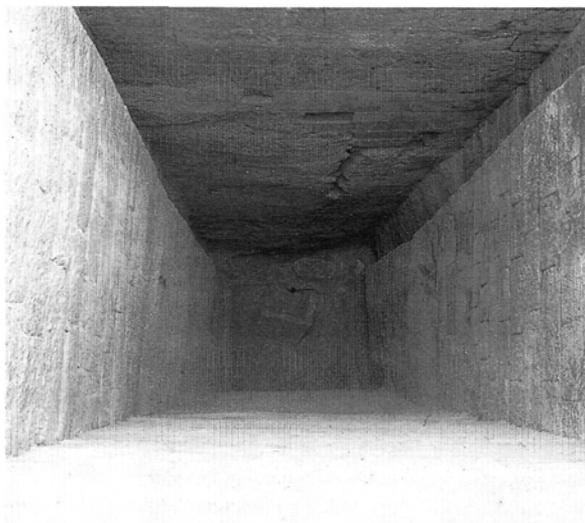


Fig. 7. Giza, tomb of Nofer, G 2110, shaft A (1905-06; C 1533).



Fig. 8. Giza, tomb of Nofer, G 2110, shaft A; reserve head and bulbous ends removed from sarcophagus lid in situ at the bottom of the shaft (1905-06; C 1469).

depth; the mouth of the pit is strongly lighted and the bottom is in shadow.

b) Photograph in shadow in the late afternoon (or early morning); very shallow graves after sunset (or before sunrise).

If rapid work is necessary, the grave may be photographed in the shade of a tarpaulin at any time of day; it is often necessary to reflect light across the grave to get relief in the negative.

ii. The open pit from 1-3 meters deep, generally requires reflected lighting; but the best of the red-backed (or antihalation) plates permit a passable photograph to be made without reflected light: beyond three meters, reflected light is necessary and it is advisable to have the lens of the camera below the top of the pit (fig. 7).

iii. Objects at the bottom of deep pits (door-blocks, etc.) may be satisfactorily photographed without reflected light, but the camera must be supported in the pit at a height of less than four meters above the object (fig. 8).

iv. Similar differences in the lighting of objects occurs in the chambers at the bottom of pits, where the parts near the door-way are strongly lighted while the corners lie in obscurity. These difficulties can also be equalized by reflecting light more strongly or longer in the

corners than in the middle ground and not at all in the foreground (figs. 9-10). Inner chambers can usually be reached by a glass mirror throwing the direct sunlight on a polished metal disc which gives a more diffused light to throw on the object. Two glass mirrors and a disc have occasionally been necessary, but we have as yet not needed more than these three reflections. If electricity is available, or other smokeless actinic light, it should be employed. We have used acetyline with no great success. Flash-light powders fill the room with smoke, which sometimes takes a day to clear, and they give a very hard picture.

4) Objects which are lighted from the only direction from which they can be photographed lack modelling and are photographed only with difficulty.

a) One of the most difficult subjects is a one-color relief opposite a doorway from which alone it can be photographed. And in excavations, this lighting *en face* occurs every now and then in the photography of deposits of debris and objects in the debris.

b) If there is time, the lighting must be varied in some way, by shading with tarpaulins, by casting cross light with a reflector, or otherwise (fig. 11).



Fig. 9. Giza, tomb of Meresankh III, G 7530–7540; corner lighting in one of the rock-cut chambers (May 8, 1927; A 4675).

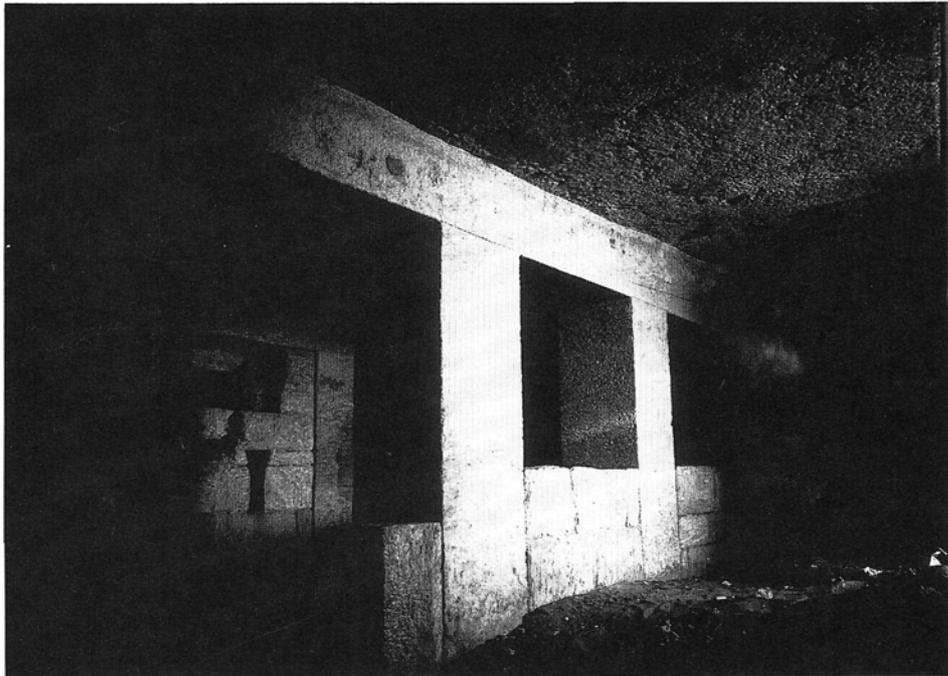


Fig. 10. Giza, Mycerinus Quarry Cemetery; rock-cut chamber of the tomb of Prince Khunera, from the southeast corner, showing inadequate lighting (August 22, 1931; A 6699).



Fig. 11. Giza, tomb G 1457, false door (February 8, 1937; A 7736).

5) a) Distortion in the photograph is produced when the camera is pointed askew at the object, as happens when the only available stand for the camera is in an unpassable place (fig. 12).

b) Means for correcting this distortion, to a certain extent, lie in the movable back of the camera; but when the object is close it is sometimes difficult to avoid all traces of distortion, and other defects creep in—blurring and distortion in other directions less obvious to the eye. Usually by taking time and pains, gross distortion can be eliminated.

(b) Practical Rules for the Use of Photography

The principle that the camera should be used to register the observations of the excava-

tor affords a guide to the practical use of photography in the field. When the excavator is his own photographer, the selection of the object to be photographed results as a matter of course from the excavator's observations. When the photography is done by a separate person the liaison between the excavator and the photographer must be close. I myself have the photographer at my side when I go through the works in order to call his attention on the spot to the objects to be photographed. But there is much which can be done as a matter of routine, by the photographer acting alone. For example, in cemetery work in which the graves are of one or two general types, specific directions can be given for the photography of each grave from a fixed position, under fixed conditions, and at specified stages; and it may not be



Fig. 12. Giza, tomb of Meresankh III; distorted view of entrance jamb due to lack of sufficient camera room (June 8, 1930; A 5587).

necessary for the excavator to issue special instructions for more than one or two graves out of a hundred. Even in complicated sites, a certain proportion of the objects of the photographs can be selected by the photographer according to permanent standing instructions and acquired habit, but the number of special instructions increases until in some town sites, nearly every photograph is taken on direct order of the excavator.

The rules for routine photographs can be most easily made clear, and will serve to give some idea of the number of negatives and use of the camera:

Standing Orders

1) On beginning work at a new site, large photographs (18 × 24 and 13 × 18 cm.) must be

taken from those points round about from which characteristic aspects of the site are visible (fig. 13).

2) On approaching a field of excavations, photographs must be taken of the proposed field before the work is opened (fig. 14), from at least one point of view, preferably from as many as are necessary to show (a) the formation of the surface and (b) the topographical situation of the field.

3) During the progress of the work, photographs of the field should be taken from these same points, or approximately the same, to show the general aspect at each stage (fig. 15–16).

During the excavation of the pyramid temple of Mycerinus, a large photograph (18 × 24 cm) was taken every evening from the pyramid overlooking the whole work.

4) In cemeteries of small graves, a photograph should be taken of every grave which contains anything at all, always from the foot-end of the grave or from the same side (whichever side may be selected to be constantly used; fig. 17). When this uncovering of the burial consists of more than one stage, then every stage should be photographed (figs. 18–20).

5) In cemeteries of large graves, every burial is to be photographed. When as in the case of mastabas, the entrances of the burial chambers are blocked with rubble, brickwork, or masonry, the door-block must be photographed before it is removed.

In mastaba G 1206 B, the door-block at the bottom of the pit was photographed, then the outer chamber showing the plastered entrance of the inner burial chamber; then the masonry blocking this entrance after removing the plaster; then the slabs covering the resting place of the body; and finally the skeleton in the receptacle hollowed in the rock.

6) In general, every deposit of objects must be photographed before touching, so as to show (a) the objects (fig. 21), (b) the position of the objects with relation to the surrounding walls, etc. (fig. 22). This rule holds both for objects found in undisturbed and in disturbed deposits and even for objects found in debris if they are of any importance.

Of special importance is the photography of composite objects such as necklaces in the

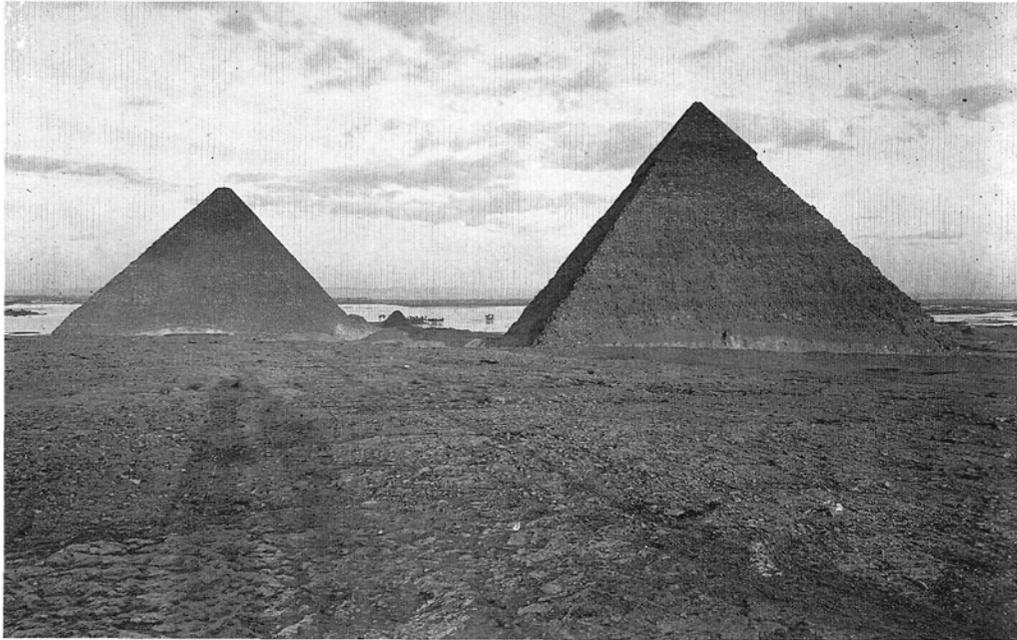


Fig. 13. Giza, general view looking east of the as yet unexcavated Western Cemetery in 1904 (A 11638). Note the long shadow of the photographer's tripod, indicating a late afternoon shot.



Fig. 14. Giza, Mycerinus Pyramid Temple before excavation (December 1, 1906; A 011); cf. fig. 15.



Fig. 15. Giza, Mycerinus Pyramid Temple after excavation (May 18, 1907; A 221).



Fig. 16. Giza, general view of the Senedjem-ib family complex (G 2370, 2378, 2381-82 etc.) taken from up on the northwest corner of the Great Pyramid (1913; A 1071).



Fig. 17. Zawiyet el-Aryan, grave Z 218 (1910-11; C 1910).



Fig. 18. Giza, tomb G 2601. Figures 18-20 show sequence of clearing uninscribed pair statue (39-3-19) (March 28, 1939; B 9080, 9081, 9082).



Fig. 19. Giza, tomb G 2601.



Fig. 20. Giza, tomb G 2601.

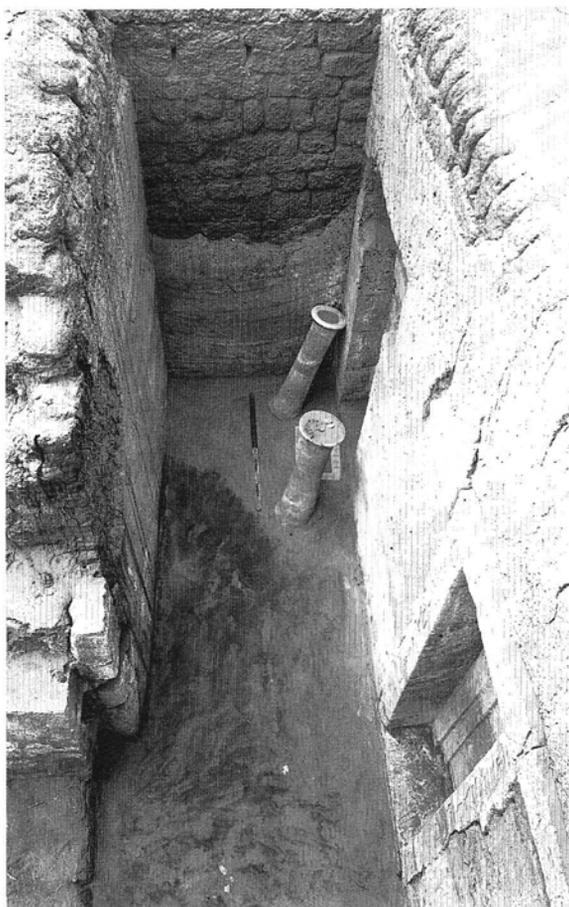


Fig. 21. Giza, tomb of Djed-wa, G 1453; offering stands and offering table (now in Cairo and Berkeley) in position before the false door (1905–06; B 11816).



Fig. 22. Giza, Mycerinus Valley Temple, four triads as discovered (1908; A 247).

original order, and of decayed objects of wood, ivory, cloth, etc., which cannot be moved without treatment (fig. 23).

7) Again, in general, but proper to complicated sites, every surface and floor is to be photographed together with the walls or other surroundings (fig. 24).

This is nearly as far as standing orders can go. Photographers soon become accustomed to carrying out these orders as a matter of routine and learn even to photograph special features without waiting for special orders. But it is essential that the photographer be accustomed to all the difficult situations which occur, and be able to apply the solution to the difficulty *at once as a matter of habit*.

(c) Photographic Equipment¹⁵

The particular make of camera and lens which is employed must be matter of taste and of opportunity. In every large city, certainly in every civilized country, cameras and other photographic equipment may be obtained which are suitable for archaeological field work. But the archaeologist must know what he needs in order not to waste his money on inadequate equipment. For money must not be spared in this particular. It is futile to imagine that any expedition can make a successful record with a snap-shot camera. To attempt such a thing

¹⁵ Here Reisner's discussion is the most out of date.



Fig. 23. Giza, tomb of Hetep-heres, G 7000X, showing the queen's jewel box with silver butterfly bracelets, gilded chair leg elements, vessels and other objects as found in the burial chamber (August 7, 1926; detail of A 4048).



Fig. 24. Giza, tomb G 7946, looking east; statues of Tjenty (MFA 31.776) and Nefu and Khenmet-setju (MFA 31.777; and 31.777, now in Kansas City) as found in pit G (January 1, 1931; A 6088).

shows an unpardonable lack of conscience on the part of the leader. The minimum equipment is as follows:

a) A heavy camera for glass plates (films may be used in some countries, but I do not recommend them), with adjustable back and focusing rack-pinion, spirit level, and braces sufficient to hold the parts rigid in the wind.

The size should be large enough to take half-plates 13×18 cm. in size. I would not advise an expedition, however, to take less than a whole-plate camera or one 18×24 cm. Larger sizes than these are impracticable except for very special work. Anything smaller than 4×5 inches is insufficient for general photography in Egyptian work.¹⁶

The carrier for the plates (of films) may be a magazine (for 4×5 inch plates) or the ordinary double-back carriers; but whichever it is, the carriers must be of first class material and workmanship. I would recommend six double backs.

If the camera used is one of the larger sizes (13×18 or 18×24) then wooden frames should be provided so that plates of the smaller sizes can be used with the camera. These frames fit in the double-backs and may be had with most good cameras.

b) A heavy tripod with a broad head so that the camera when set up in the open air will not shake in the wind. The screw by which the camera is fastened to the tripod head must be very broad, broader than usually supplied.

c) A contrivance by which the whole camera can be tilted to photograph at any angle between vertically downward and vertically upwards. There are several types of this contrivance on the market, which are practicable. The ball and socket type is not, however, to be recommended for field work because of its in-

security. The form consisting of two heavy wooden plates joined on one edge by a hinge, with braces at the side which can be adjusted and locked, is satisfactory. As far as my experience goes, the best tip-table ready-made on the market is a metal one of this type (supplied by A. Stegemann of Berlin), which consists of a brass tripod head to which is hinged an aluminum plate; to the back edge of the plate are attached two brass rods which slide through lock-blocks at the back of the brass tripod head and may be locked by thumb screws in any position. The lens can be pointed at any angle in front of the tripod from directly down to directly up, by tilting the table and turning the camera on the aluminum plate. But as a matter of fact, the chief use of the table is to photograph downwards in front of the stand—a grave or a group of objects. Special tip-tables can easily be devised if anyone wishes to go to the trouble and expense.

d) The lens must be a good one fitted to the camera to be used. Personally I prefer the Zeiss Anastigmatic Lens for all work; but I have a Cook lens which I have used for twenty years to my entire satisfaction. And there are a number of first-class lenses on the market. The one point to remember is that it is a false economy to buy a cheap lens. A yellow color filter should be fitted to the lens.

e) A very stout and durable case made to fit the equipment.

This I would designate a minimum equipment. It would barely suffice for the work of a methodical scientific expedition. Our own expedition has the following equipment in constant use:

a) Two cameras, size 18×24 cm., with two tipping tables, two heavy tripods, and twelve double-backs with inlay-frames for 9×12 and 13×18 cm., two Thornton-Picard shutters, and other accessories.

A set for four Zeiss Anastigmatic Lenses giving a number of combinations of which we use three only; the advantage of these is that the picture can be adapted to the size of plate which is used.

A large Cook lens . . . and a still larger Bausch and Lomb (f., $12\frac{3}{4}$ inches), used for distant views, for life size photographs, and for

¹⁶ While the popular 35 mm film has replaced much large format camera field photography, Reisner's point here is quite valid. Large negatives with higher resolutions are still to be preferred, especially when images must be used as the base for epigraphic facsimile drawings, such as with the "Chicago House method." For a discussion of the latter, see Lanny Bell, "The Epigraphic Survey: The Philosophy of Egyptian Epigraphy after Sixty Year's Practical Experience," in J. Assmann, G. Burkhard and W. V. Davies, eds., *Problems and Priorities in Egyptian Archaeology*, Studies in Egyptology (London: Kegan Paul International, 1987), 43–67.

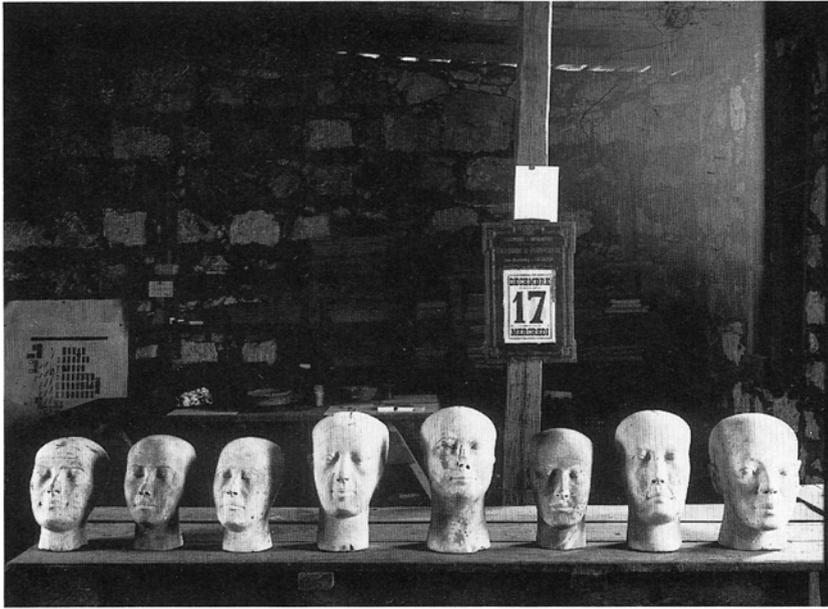


Fig. 25. Giza, Harvard Camp photograph of reserve heads discovered in the Western Cemetery (December 17, 1913; C 5441).

photographing objects in the camp (fig. 25). A Zeiss wide-angle lens for close work, in enclosed spaces, etc. One of these cameras is in constant use in the field and the other in the camp in taking photographs of objects (fig. 26).

b) Two cameras, size 9×12 cm., with magazines, double-backs, etc., with focal-plane shutter. Each provided with a Zeiss Anastigmatic lens. Both fitted with boards for use on tip tables of the big cameras. One of these is used in the field and the other held in reserve.

c) A very well-made snap-shot camera, taking a picture quarter-size, focal-shutter. This was presented to the expedition by Mr. Dows Dunham, and has been used exclusively for taking pictures of the men at work, of people and scenes encountered on our travels, and among the local inhabitants where we have worked.

We have three other cameras but they are never used except in emergencies and we could easily dispense with them. One of them is the first camera I ever bought, and was discarded after the first year as too light, although the lens is still in use. By the end of the war, all our cameras were so dilapidated that only one of the large cameras and the snap-shot camera were in use, and all our work was done with the one large camera, using three sizes of plates and various lenses.

As part of the photographic equipment must be reckoned the scale staff placed in the field and included in the picture to give its proportions:

a) A plain wooden rod, one meter long (or one yard long) subdivided into decimeters, (or quarter feet), (or inches), painted alternately white and black. This is laid in or beside the grave or along the object to be photographed (figs. 27–28).¹⁷

b) Prof. Junker at Turah used an arrow painted in alternate black and white centimeter stripes with a compass set in the feathered end so that the arrow being placed to point towards the north, served at the same time as a scale for the photograph. He also placed in the grave a board about 27×15 cm. bearing the name of the cemetery, the number of the grave, its depth, and a scale 25 cm. long. Thus the photography bore its own record, so to speak, and prevented mistakes in registration. It sounds very practical, but the pictures of arrow and board in numberless attitudes are disturbing to anyone who wished to look at the evidence. The information conveyed must in any case be

¹⁷ Reisner neglects to mention here that the meter stick is best placed parallel to the film plane, in order to avoid distortion and give an accurate impression of scale.

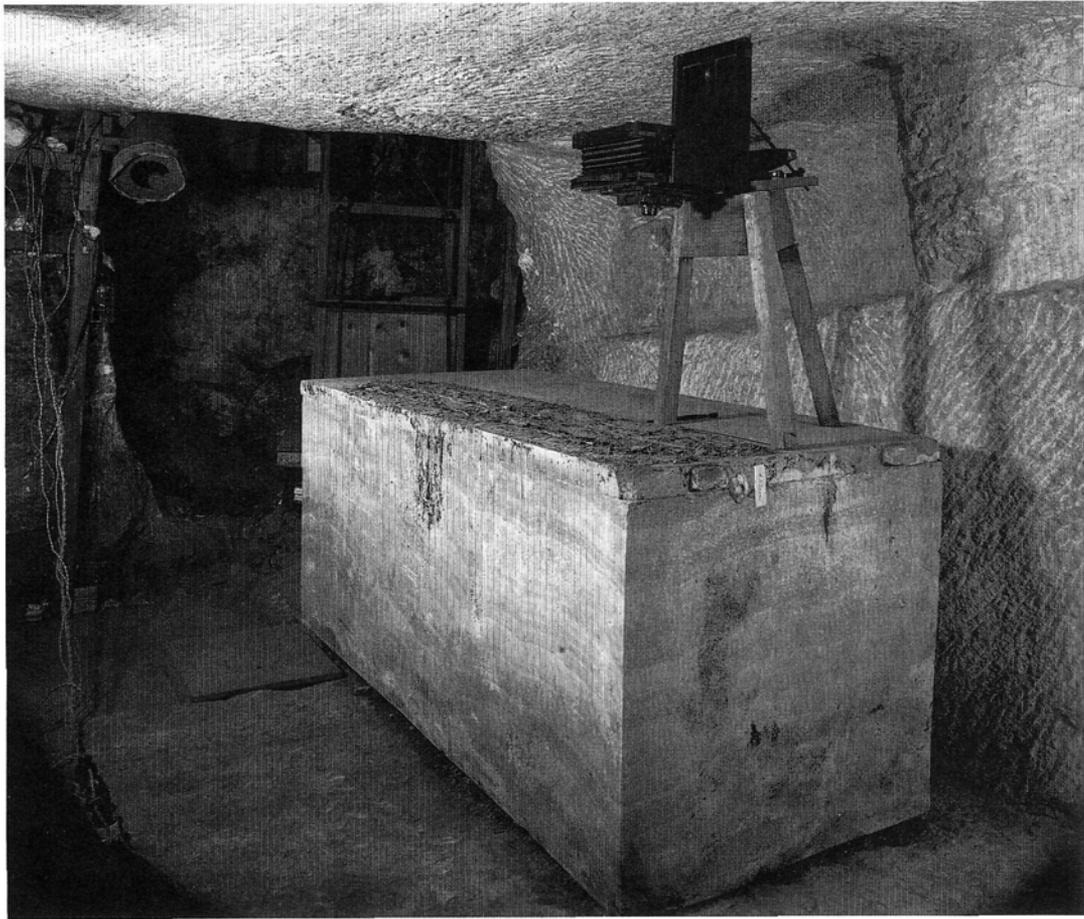


Fig. 26. Giza, tomb of Hetep-heres, G 7000X; one of the expedition cameras mounted on top of the queen's sarcophagus in order to photograph the inscriptions. Reisner "signed" this photograph by placing the tag with his name hanging over the edge of the sarcophagus lid (December 5, 1926; A 4500).

entered elsewhere. The function of the photograph is to record the archaeological evidence contained in the burial, as far as it may be photographed, and not to record those data which must be entered on the tomb card. The ordinary marker used to identify the grave during excavation is sufficient to identify the picture.

c) Another form of scale consists of a right angle with both arms marked in inches (or cm.) from the joint outwards. On each arm, is a sliding pointer which can be set to mark the length and width of a coffin, a skeleton, etc. In this case again, the photograph is used to duplicate roughly and approximately evidence which must be entered exactly on the tomb card.

d) For convenience in the ready identification of the photograph, it is also advisable that the identification number of a grave (or room) as well as a scale be photographed with the object. It should be the permanent number which is buried in the grave after the excavation is finished. Beyond that, the excavator must choose the material and form of the plaque or block to suit himself. Prof. Junker as mentioned above had a very elaborate rectangular plaque on which the numbers could be changed *ad lib.* as the plaque was shifted from grave to grave; but I do not know what permanent markers he used on the graves. Enamelled metal numbers of proper size would be extremely useful but we



Fig. 27. Giza, tomb of Ankh-haf, G 7510; view of the bust of the tomb owner (MFA 27.442) with accompanying meter stick (February 8, 1925; C 10885).

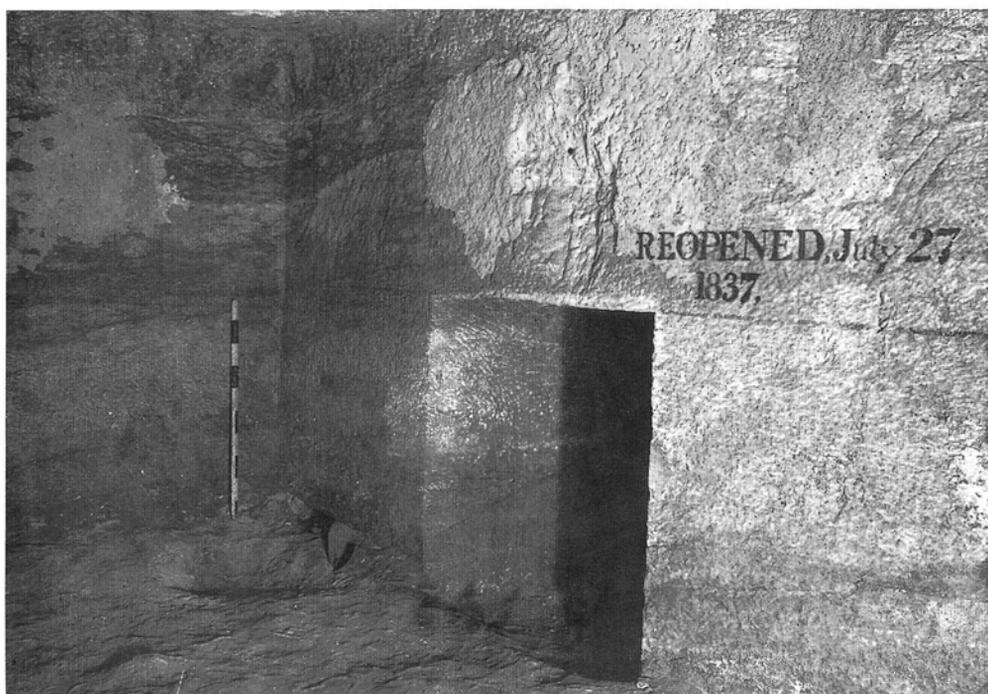


Fig. 28. Giza, satellite pyramid VI of the Mycerinus pyramid complex, outer chamber, looking southwest with meter stick in corner (April 5, 1907; B 141).



Fig. 29. Giza, tomb G 7511A, looking southeast; Late Period sarcophagi with expedition's limestone flake recording tomb number in left background (February 28, 1925; A 3594).

have not been able to obtain them at a reasonable price. We have used cardboard plaques with black numbers stencilled on them but these are usually destroyed by weather or insects. The easiest and most practical markers are chips of local stone with the numbers stencilled on them. They serve every purpose and are unobtrusive as a rule (fig. 29; see also fig. 24). But they do not look very well when they are too prominent in the picture.

In general it may be said that the object of the photograph is to reproduce the aspect of the grave or other object to be recorded, and that the less there is of recording apparatus

shown in the picture, the better the record. The scale staff is an absolute necessity, but should be as unobtrusive as possible. The number of the grave is a convenience, especially when there are many similar graves; but is not a necessity. A proper system of recording excludes mistakes:

When the grave has been uncovered and photographed, the photographic print is delivered to the tomb-card recorder. When he goes to a grave to prepare the tomb-card he identifies the print as the first step and marks the number of the grave on the print, before preparing the tomb-card. The print is registered as



Fig. 30. Giza, general view of excavations in the Eastern Cemetery, looking east, with photographic tower in the background. The large superstructure at left is the tomb of Ankh-haf, G 7510 (April 3, 1929; B 6722).

described hereunder, and the negative marked with the number of the print in due course.

In addition to the usual photographic equipment, there are a few special appliances which serve particular purposes:

a) Photographic ladder tripod: A large tripod with the back leg replaced by a step ladder, and the tripod head by a platform with a tip-table, and sometimes with an arrangement for elevating and lowering the camera. This is used for obtaining a vertical view of burials, and similar purposes, or for photographing inscriptions and carvings high up on walls or rocks.

b) Photographic tower: A very large tripod giving an elevation of over five meters for taking general views of fields of excavation, strips,

units of excavation, etc. (fig. 30). We have constructed several at different sites, as they are too heavy to transport. The three legs were made of 7-meter joists or logs of the date-palm or the dom-palm, or of whatever wood could be obtained locally. The cross-ties (forming triangular ties) and the ladder steps were of $3 \times 1.5'$ wood, or saplings and branches locally available. The top was a square plate of wood to which the camera tip-table could be fastened.

c) Photographic scaffold: Several of these have been designed. The essential feature is that the camera can be moved horizontally and vertically parallel to a wall and always at the same distance from it. The purpose is generally to photograph section by section walls covered with reliefs, inscriptions, or paintings so that

the sectional prints can be joined together to form a reproduction of the whole wall, or of a whole scene or inscription. This is especially useful in temples and large tombs.¹⁸

During the war, another use of photography for archaeological purposes was brought into prominence—the aerial photographic survey. An observer in an aeroplane flying at a great height, photographs sections of a district and the prints are fitted together to form a great contour-map of the whole. I have seen such a map prepared by the British Air Force of the pyramid fields from Abu Roasch to Dashur with all the modelling so clearly defined as to form a wonderful record of this district. Whether anything is revealed which had escaped previous observation could not be settled in the short time I had to look at the composition, but I do not believe there is anything new in the parts of the field which I know personally. Mr. O. G. S. Crawford, of the English Survey, has however, discovered a special use of the highest importance for the aerial survey in country covered with vegetation. In such country the remains of ancient habitations, cities, roads, and cemeteries are often completely hidden by crops, and other plants. Now all plants are affected by the sub-soil, and so where they cover buried walls, trenches and mounds of different materials from the surrounding ground, they grow more or less vigorously or with a darker or lighter green according to the constituency of the buried constructions. Thus on examining aerial photographs, Mr. Crawford was able to detect the outlines of various ancient monuments, and among other things has, I believe, discovered an important series of ancient barrow-graves the existence of which was hardly suspected. Mr. Woolley also told me that he had secured an aerial survey of Syria before it was evacuated by the British Forces, and it is probable that this survey may also prove of inestimable value.

At present, an ordinary expedition cannot find the money to undertake an aerial survey.

¹⁸ This procedure is also crucial for producing photographs suitable for tracing and producing facsimile drawings of wall reliefs and paintings.

Such surveys are the duty of the government concerned and can easily be carried out as part of the training of the military air forces, for whom such surveys provide a practice not far removed from that needed in military scouting. It would be of the highest interest to archaeologists if the American Government would undertake a survey of some part of the Middle States for the detection of ancient Indian remains, and another survey in one of the States of the southeastern [sic] desert. The British Air force in Egypt might also find most important material on the palaeolithic period by a desert survey of some selected part of the Middle or Upper Egyptian desert. I would suggest the Keneh-Qossier district as having at the same time a military value.¹⁹

The cinematograph has been used by several expeditions. We had a series of films taken of our works about 1912 and another series during the war. Mr. Wellcome had a cinematograph as part of his photographic equipment at Gebel-Moya, and I believe one or two other well-provided expeditions have also tried this instrument. But I am unable to perceive at present any scientific value in the films taken. They are, however, extremely interesting, and might be used as material for propaganda in raising funds.²⁰

The stereoscopic camera has also been used, but like the moving picture the stereoscopic picture has no scientific advantage over the ordinary photograph. The pictures are very interesting and have a high advertising value.

Color photography has not yet been sufficiently cheapened and simplified to permit the substitution of color photographs for the ordinary kind. The simplest and most effective process is that of the Paget Company (England). The object is photographed with an ordinary camera using a yellow filter and a special color screen laid over the plate. A beautiful negative

¹⁹ For several studies on the uses of aerial photography for archaeological work, see Harp, *Photography in Archaeological Research*, chapters 4, 5, 6, and 8.

²⁰ Reisner was ahead of his time here; several such films documenting the work of various Egyptological expeditions have proven successful in raising funds and reaching audiences beyond the scholarly one.

is obtained from which a positive print is made on a glass plate. The positive is then overlaid with another special color screen and when the two are correctly adjusted the original colors spring into view *on looking through the glass*. The colored positive may then be bound and used as a lantern slide. As many slides as desired may be made from the same negative. The adjustment of the color-screen on the positive is tedious and sometimes unsuccessful. I had just gained sufficient experience to perform the operation when the outbreak of war stopped our supply of plates and consequently all my experiments. It is to be noted that the production of colored prints on paper has not yet been perfected. The plates and materials are expensive. There are other single-process and three-process systems of taking colored photographs, but they are all impractical at present for archaeological field work.

It is advisable, however, to have a supply of orthochromatic or panchromatic plates—i.e., plates chemically so sensitized as to register colors in their visual values. These are used with a yellow filter attached to the lens. They register the colors of a flat surface which would not appear or appear only obscurely in an ordinary photograph, and in photographing classes of objects which present great contrasts of color (red and white).

As for plates, every country produces a number of first rate brands. Very rapid, or snap-shot plates, are to be avoided. Slow, deep plates and especially antihalation plates are most useful. Cheap plates are never satisfactory as records. In Egypt, films decay so rapidly that they should never be used for a permanent scientific record. The three brands of glass plates which we have used for the most part are—(1) Agfa plates (Berlin), (2) Paget Prize Plates (England), and (3) Lumière plates (France).

In general, the excavator, if he has not a professional photographer, should keep with him a good compendious handbook on photography.

Large supplies of plates brought to Egypt should be enclosed in tins, soldered or closed with airtight adhesive tape. We have packed in a tin three dozen 9×12 cm., or two dozen 13×18 cm., or one dozen 18×24 cm. The smaller sizes are used more rapidly and the number in

each tin is adapted to the rate which the plates are used, so that no size of plate has to remain long after the tin is opened.

(d) Dark Room and Development

It is possible at a pinch, and for short pieces of work, to develop plates at night in a tent or any closed room, and to change the plates in the carriers by daylight under a red blanket. But these are only makeshifts that hamper the work. Often the excavations will be held up because of the impossibility of developing a record in the daytime. We always manage therefore to provide a dark room. At times it has been a converted room in a native house, at times a rock-cut tomb, but more often we have built a special room at the camp where plates could be rapidly developed in the time and submitted for inspection (figs. 2, 31, 32).

The type of room which we use is the double "labyrinth dark-room" which remains open at both ends and is swept by a draught from end to end. Our first attempt at this type of room had a simple corridor at one end and was closed with a curtain. It was found necessary to add another turn to the entrance; and when I built the dark-room at the Giza Pyramids (figs. 33–34), I built the entrance with three turns, which proved to exclude the light without the use of a curtain (plan 1). But the ventilation was bad. For Mr. Wellcome's camp at Gebel Moya I designed a room with an entrance of three turns *at each end* and we found the ventilation perfect (plan 2).

At Semna, last year I built a room on the same plan and was equally satisfied with it. There the water jars were placed in the northern entrance and water cooled by evaporation in the draught of the dark room. In this room it was possible to work with open doors in the tropical heat of April and May without detriment to the plates.

An important point to be noted in hot countries is that the worst effect of heat in development is produced by the use of warm developer, warm fixer, and warm washing water. Adding alum or formalin is not much help. The water and the solutions must be cooled and kept cool (figs. 35–36). The developer takes the heat off



Fig. 31. Expedition camp at Deir el-Ballas, looking west (January, 1901; C 1777).



Fig. 32. Expedition camp at Begarawiyeh, Sudan, with Dows Dunham, his wife, and a workman standing outside (December 12, 1921; detail of D 715).

the plates placed in it and becomes rapidly warm. The plates should be cooled in water before going into the developer, and the developer changed for cooler solution as soon as it becomes warm. We make up several bottles full of the solution and cool them in the water jars, so that the warm solution can be rapidly changed for a cool one. The fixing solution is cooled in the same way, but as the plates are already cool by the time they reach the fixer, the necessity for changing the fixing solution

occurs less often. In extremely hot, wind-still weather, it is necessary to postpone the work of developing the routine plates until the night air has cooled the water, and in that case the development does not begin until 2 or 3 a.m. By 5 or 6, the washing is finished, and the plates have an hour or two to dry before the day becomes hot again.

The washing of the plates is a very important matter. In the desert, running water from a faucet is not easy to provide. We have found

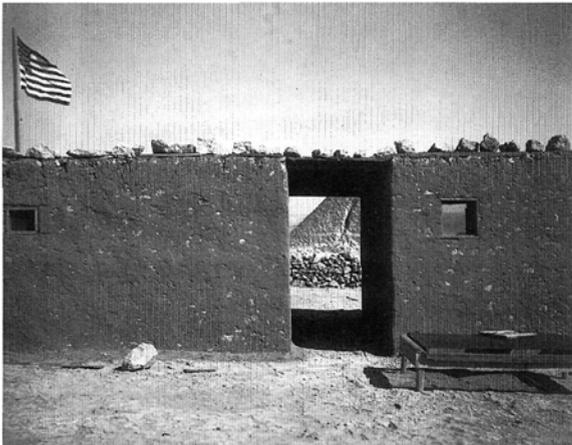
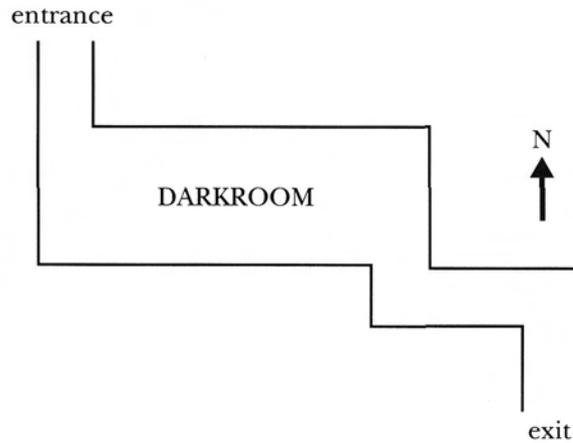


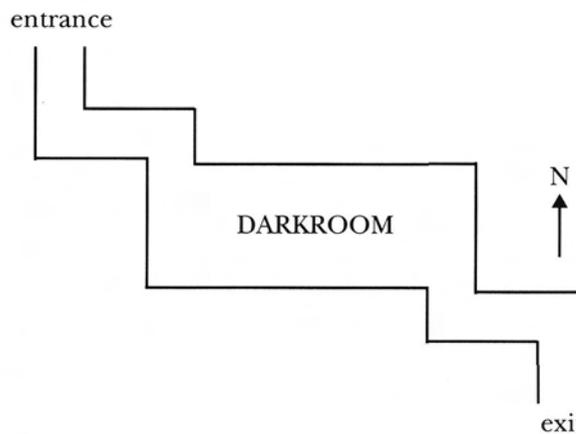
Fig. 33. General view of the entrance to Harvard Camp at Giza, looking southeast, with pyramid of Mycerinus visible through the doorway (1906; unnumbered negative).



Plan 1. Editor's interpretation sketch plan of Giza darkroom layout.



Fig. 34. General view of the courtyard of Harvard Camp at Giza, looking southeast, showing assorted pottery sherds and fragments of the colossal alabaster (calcite) statue of Mycerinus (MFA 09.204; 1907; C 462).



Plan 2. Editor's interpretation sketch plan of Gebel Moya darkroom layout.

that the most convenient system is to place the negatives face up in large dishes (holding one plate, 18 x 24 cm.; two 13 x 18 cm.; or four, 9 x 12 cm.; the plates are held apart by celluloid separators). A row of these dishes is set on a board (4 meters long and about 25 cm. wide) and the board is rocked by a small boy so that the water in the dishes is kept in constant motion. Every three minutes the water is poured

out of the dishes and fresh water poured in; and after 20 to 25 changes of water, the plates are finished. The three minutes are measured by means of a can of water with a small hole in the bottom; count is kept of the changes of water by throwing pebbles from a basket into a box.

(e) Registration of Photographs

The procedure which I use in dealing with the photographic record may be described as



Fig. 35. Developing trays on dining room table at Deir el-Ballas camp (November, 1900; B 1478).



Fig. 36. The same table at Deir el-Ballas camp set for Thanksgiving dinner (November, 1900; B 1479).

an illustration of what is needed. In the morning, after breakfast (or just before) the plates are brought in on their drying racks (often still wet). I look them over and approve such as are sufficient and reject those which need to be done over again. The photographic boy notes the rejected pictures and turns the others over to the printing boy. The prints should be turned in the next day, with the date of the photograph and the number of the grave (or other object) pencilled in Arabic on the back by the photographer. There are two prints of each plate. The member of the staff in charge of the field recording has then to mark on the back of one print the description of object, direction from which photographed, and any other necessary notes. One set of prints may be taken into the field for this purpose, and in particular when there are tomb cards or room cards to be made. When a substantial number of dated and labelled prints has accumulated, these are arranged in chronological order as photographed, and numbered with running numbers. The description is then entered under the running number in the photographic register. Thereafter, the photographic boy identifies the print with its plate and numbers the plates with the same numbers.

The photographic book which we use is about the same size as the object register.²¹ In the left-hand column, the serial number is written; the second column, very wide, is for the general description and may cover as many lines as is necessary; the third column (narrow) records the place where the photograph was taken (not the provenience of the objects photographed); then come further narrow columns for the name of the photographer, the date, and the size of the plate; finally a wider column on the right is for remarks.

²¹ The photographic registers measure 40 × 44 cm., and are stored in the Department of Egyptian and Ancient Near Eastern Art, Museum of Fine Arts, Boston. They are read from right to left, Arabic style, since they were purchased in Cairo. Recently a project to microfilm the photographic and object registers, as well as all the expedition diaries was completed by Timothy Kendall of the Museum of Fine Arts. Such archives could be even more useful when converted to more modern, immediately retrievable storage media such as optical discs.

In our first register, the serial numbers ran through all sizes of plates; but as the plates of different sizes could not be conveniently stored together without breakage, we adopted a triple register—A for large plates (18 × 24 cm. and full-plates); B for middle-sized plates (13 × 18 cm. and half-plates); and C for small plates (9 × 12 cm. and quarter plates). Each of these letters has a series of numbers of its own beginning with 1. The plates, each in an envelope and marked with its number (the letter is obvious from the size of the plate), are stacked in wooden boxes with inclined ends. Thus the plates can be easily turned in boxes, leaning each one in turn forward against the sloping front of the box. Each letter-series has a box adapted to its size. As the plates are arranged according to the series numbers it is easy to find any desired plate, remove it for a time, and replace it in order. The boxes have the limits of their numbers stencilled on the outside and are protected by covers with drooping edges to keep out the dust. Plates cannot, however, be shipped in such boxes.

I have said that two prints of each plate were prepared and delivered. After the numbering and the registration is completed, one set of prints is placed in boxes with inclined ends like the plate-boxes and also of three sizes, A, B, and C, and constitutes a card catalogue of the negatives.

The other set of prints is used for the provenience and the classified object albums. They are sorted out into two groups, one containing all views of the excavations, and the other all objects photographed in the camp. The views of the excavations are further separated into general views of the site, and groups, each of which pertains to one separate field of excavation. The general views of the site are arranged in chronological order. The photographs of each field are further divided into those of a general character, which are arranged chronologically, and those of the units of excavation, which are separated into unit groups, and arranged in numerical order of unit-designation. The pictures comprising each unit group are arranged chronologically. When all the photographs of all sizes have been thus sorted out and placed in order, they are then pasted on sheets of white

cardboard, 28 × 36 cm. in size, which take two large size prints or four medium size or eight small size.²² The prints are arranged however as classified, and if only one small print falls on a card, the rest of the space is allowed to be wasted. The prints are pasted lightly to the cards by the corners only.

Below each print is written—on the left, the description as given in the photographic register; on the right, the letter, the serial number and the date. At the top of the page is written the name of the site and the year. The cards are then arranged in groups of about 50 each and placed in cloth-bound or pasteboard covers, with the label written on the back. The photographs of objects are then taken in hand. Photographs of objects are made for two purposes—(1) to complete the record of tomb-

groups or of the entries in the object-register and (2) to present the objects themselves in classified object groups for study and illustration. The photographs of objects taken purely for registration purposes are easily arranged in tomb groups in their numerical order or in registration groups in the order of the object register; and these are pasted on cards as before and placed in folders. The objects photographed in classified groups or for illustration are arranged in classified groups—bronze, including axes, adzes, tools, implements, weapons, mirrors, etc.; stone vessels; scarabs; and so on.

These albums are not bound and may be increased by the insertion of additional sheets from a second campaign, or entirely rearranged. They permit an immediate oversight of the photographic record of any site or any part of a site, or of the objects found therein.

²² These cardboard sheets are currently stored in the offices of the Department of Egyptian and Ancient Near Eastern Art, Museum of Fine Arts, Boston.

Examples of entries in the photographic register:

PHOTOGRAPHIC REGISTER

No.	Description		Date: 1918	Photographer
A 2714	Pyr. XXIV B "E" wall, "N" half.	Nuri	April 18	Mahmud Shaddûf
A 2715	Pyr. I, "ENE" from Pyr. IV	Nuri	April 19	Mahmud Shaddûf
A 2717	Pyr. VIII room C, "W" wall, "N" half	Nuri	April 21	Mahmud Shaddûf
A 2716	Pyr. field rom "SW" Barkal	Nuri	April 19	Mahmud Shaddûf
A 2831	Amulets from Ku 54 and 53 Reg. Nos. 19-3-Ku. 54: 1409, 1408, 1399, 1400, 1407 KU 53: 1214, 1339 (3, alab); 1189(2) 1194-1448(4); 1203; 1191; 1195; 1187, 1344(2); 1342; 1176(2); 1840; 1337; 1335. 1188.	El-Kur ² uw	April 27	Mahmud Shaddûf

PHOTOGRAPHIC REGISTER (*continued*)

No.	Description		Date: 1918	Photographer
	1343; 1379; 1378; 1380; 1377; 1376; 1376; 1381; 1382; 1338.			
A 3454	Cem G 7000 from G I about c 20, ENE over G I-a and N part cem.	Giza Pyr.	Oct. 28, 1924	Mohammedani Ibrahim
A 3455	ditto. E. middle field	Giza Pyr.	Oct. 28, 1924	Mohammedani Ibrahim
A 3456	ditto, SE, G I-c and southern field.	Giza Pyr.	Oct. 28, 1924	Mohammedani Ibrahim
A 3457	Cem. G 7000 southern part and G I-c from G II about c 15, NE	Giza Pyr.	Oct. 31, 1924	Mohammedani Ibrahim
A 3461	Street G 7000 SSE from G I-a	Giza Pyr.	Nov. 15, 1924	Mohammedani Ibrahim
A 3462	Street G 7000 and east face of G I-b from G 7130, NNW	Giza Pyr.	Nov. 15, 1924	Mohammedani Ibrahim
A 3463	Street G 7000 front of G I-b, NNE from G I-c	Giza Pyr.	Nov. 15, 1924	Mohammedani Ibrahim
B 5557	Cem. G 7000, ave. 2, E from G I-b, surface of decay, Old Kingdom	Giza Pyr.	Dec. 19, 1924	Mohammedani Ibrahim
B 5558	G 7132 A, chamber, W.	Giza	Dec. 25, 1924	Mohammedani Ibrahim
C 6045	K 333, burial, W.	Kerma	Feb. 10, 1914	Mohammedani Ibrahim
C 6046	K 332, gold ornaments, N.	Kerma	Feb. 10, 1914	Mohammedani Ibrahim
C 6047	K 328, burial, N.	Kerma	Feb. 10, 1914	Mohammedani Ibrahim
C 6048	K 329, burial, NE	Kerma	Feb. 10, 1914	Mohammedani Ibrahim
C 6049	K 336, burial, S.	Kerma	Feb. 10, 1914	Mohammedani Ibrahim
C 6050	K 334, burial, E.	Kerma	Feb. 10, 1914	Mohammedani Ibrahim
C 6051	K 333, burial, E.	Kerma	Feb. 10, 1914	Mohammedani Ibrahim
C 6052	K 334, pottery at foot of beds, N.	Kerma	Feb. 10, 1914	Mohammedani Ibrahim

(f) Number of Photographs Taken
by the Expedition

In order to afford an idea of the part that photography plays in the records of our expe-

dition, I present the following table, in which the numbers of photographs are given by years. The photographic unit (Photo.U., or Pu) is an area of 9 × 12 cm. so that A-plates contain 4 and B-plates 2 photographic units.

PHOTOGRAPHIC TABLE I

Season	Sizes of photographs			Totals		Site(s)
	A	B	C	Phot.	Phot.U.	
1) 1905/06	100	415	856	1371	2086	Giza, mastabas (5 mos.)
2) 1906/07	233	261	532	1026	1986	Giza, MPT ^a etc., (5 mos.)
3) 1907/08	305	613	2146	3064	4592	ASN ^b many small graves (6 mos.)
4) 1908	60	199	73	332	711	Giza, MVT ^c (2 mos.)
5) 1909	297	288	760	1345	2524	Samaria, town site (5 mos.)
6) 1909/10	145	221	1140	1506	2162	Giza, MVT (5 mos.); Mesa ² eed small graves
7) 1910	189	254	650	1093	1914	Samaria, town (5 mos.)
8) 1910/11	77	74	348	499	804	Zawiyet el-Aryan pyramid & small graves (5 mos.)
9) 1911/12	137	331	593	1061	1803	Giza mastabas; Mesheikh graves (5 mos.)
10) 1912/13	291	587	1598	2476	3936	Giza mastabas; Naga el-Hai; Mesa ² eed; Sheikh Farag; Kerma, small graves (6 mos.)
11) 1913/14	228	286	1262	1776	2746	Giza mastabas; Kerma, tumuli and graves (6 mos.)
12) 1914/15	106	226	435	767	1311	Giza mastabas; Kerma (3 mos.)
13) 1915/16	260	256	454	970	2006	Barkal pyramids & temples; Giza mastabas
14) 1916/17	141	582	789	1512	2517	Nuri, pyramids; kings (6 mos.)
15) 1917/18	40	146	423	609	875	Nuri pyramids, queens (5 mos.)
16) 1918/19	178	191	379	748	1473	Barkal temples and Kurru pyramids (4 mos.)
17) 1919/20	124	138	162	424	934	Barkal temples, deep debris (3 mos.)
18) 1920/21	45	77	208	330	542	Begarawiyeh, S. & N. Cem.; many empty graves (3.5 mos.)
19) 1921/22	40	192	269	501	813	Begarawiyeh, N. & W. Cem. (4.5 mos.)
20) 1922/23	99	415	506	1020	1732	Begarawiyeh, W. Cem.; Quft (5 mos.)
21) 1923/24	208	499	638	1345	2468	Sheikh Farag; Semna-Kumma (6 mos.)
TOTALS:	3303	6251	14221	23775	39935	
Average for 19 years:	174	329	748	1251	2102	

^a MPT is the abbreviation for the Mycerinus Pyramid Temple.^b ASN is the abbreviation for the Archaeological Survey of Nubia.^c MVT is the abbreviation for the Mycerinus Valley Temple.

The following table gives the division of the same photographs among the sites excavated. The second numbers in the two right hand boxes represent the average numbers of plates and

photographic units (PU) registers per month and eliminate the element of time from the comparison:

PHOTOGRAPHIC TABLE II

Site	Size A	Size B	Size C	Totals Totals/mo.		Phot. Unit PU/mo.	
1) GIZA (Dyn. IV-VI)							
a) Cem; 1905/06; 1911-16 (19 mos.)	519	989	2619	4127	217	6673	351
b) MPT; 1906/07; 1923/4 (7 mos.)	247	321	557	1125	161	2187	312
c) MVT; 1908; 1909/10 (7 mos.)	193	353	1002	1548	221	2480	354
Total for Giza (33 mos.):	959	1663	4178	6800	217	11340	351
2) ZAWIYET EL-ARYAN (DYN. I-IV; N.K.)							
Pyr. and cem.; 1910/11 (4.25 mos.)	77	74	348	499	117	804	189
3) DEIR EL-BERSHEH (M.K.)							
Rock-cut tombs; 1914/15 (2.5 mos.)	136	150	130	416	166	974	390
4) SHEIKH FARAG (O.K.-N.K.)							
Rock-cut tombs; 1912/13; 1923/4 (4 mos.)	111	266	345	722	180	1321	330
5) MESA³EED (Predyn.-Dyn. I)							
Pit graves; 1909/10; 1912/13 (1.5 mos.)	31	123	570	724	483	940	627
6) MESHEIKH (Predyn.; O.K.-N.K.)							
Pit graves; rock-cut tombs; 1911/12 (2 mos.)	35	162	271	468	234	735	368
7) NAGA EL-HAI (Predyn.)							
Pit graves; 1912/13 (1 month)	17	47	347	411	411	509	509
8) QUFT (Ptol.-Roman)							
Examination of illicit excava- tions; 1922/23 (.75 mos)	2	41	63	106	141	153	204
9) KERMA (M.K. to Nubian N.K.)							
Tumuli and pit graves; 1912/13; 1913/14; 1914/15; 1915/16 (8 mos.)	387	503	1228	2118	265	3782	472
10) GEBEL BARKAL (N.K.-Meroitic)							
Pyramids; temples; 1915/16; 1918/20 (8 mos.)	185	267	474	926	115	1748	218
11) NURI (Nubian)							
Pyramids; 1915-18 (12 mos.)	188	745	1197	2130	177	3439	286

PHOTOGRAPHIC TABLE II (continued)

Site	Size A	Size B	Size C	Totals		Phot. Unit	
				Totals/mo.		PU/mo.	
12) EL-KURRU (Nubian Dyn. 25)							
Pyramids; 1918/19 (4 mos.)	76	143	280	499	125	870	217
13) BEGARAWIYEH (Meroitic)							
Pyramids; 1919-23 (12.5 mos.)	168	651	892	1711	137	2866	229
14) SEMNA-KUMMA (M.K.; Nubian)							
Forts; cemetery; 1923/24 (3.5 mos.)	139	253	324	716	204	1386	396
MISCELLANEOUS PHOTO- GRAPHS OF OBJECTS	1	8	18		27		38
TOTALS, nos. 1-14 (97 workings mos.):	2512	5096	10665	18275	188	30905	319
15) ARCHAEOLOGICAL SURVEY OF NUBIA							
Pit graves; 1907/8 (6 mos.)	305	613	2146	3064	511	4592	765
16) SAMARIA (Israelite to Byzantine)							
Town site; 1909/10 (10 mos.)	486	542	1410	2438	244	4438	444
TOTALS, nos. 1-16 : (113 working mos.)	3303	6251	14221	23775	210	39935	353

The figures for the years 1899-1906, the Hearst Expedition,²³ can be obtained from the photographic registers but their compilation in sizes and photographic units would require an unjustifiable amount of labor. In these registers, all sizes of plates were entered together in the same numerical series. The figures for the number of plates alone, are as follows (monthly averages in . . .):

17) Quft (Predynastic; N.K.):	TOTAL P.
Work mainly experimental; 1899-1900 (2 months)	40 20
18) El-Ahawaih (Predynastic; N.K.):	
Cemeteries; fort; houses; summer of 1900 (3 months)	397 132

19) Deir el-Ballas (Predynastic; M.K.; N.K.): Palaces; houses; cemeteries; 1899-1901 (8 months)	2297 282
20) Naga ed-Deir (Predynastic to M.K.; Coptic): Open pit-graves and rock-tombs; 1900-1905 (ca. 25 mos.)	7352 294
21) Giza (Dyn. 4-6): Mastaba tombs; 1902/3; 1903-1906 (ca. 12 mos.)	2947 244
TOTAL for sites Nos. 17-21 (50 months)	13033 261
TOTAL for sites 1-16 (113 months), see Table II	23775 210
	<hr/> 36808 226

²³ This was the name of the expedition before sponsorship was transferred in 1905 from California, under Mrs. Phoebe A. Hearst, to Boston under Harvard University and the Museum of Fine Arts.

The higher monthly average for the earlier work, 261 plates as compared to 210 for the later

work, was due almost entirely to differences in the archaeological formations. Most of the early work was in cemeteries of small pit or small shaft graves, with a shallow layer of surface debris. The same kinds of cemeteries in the list of later sites also produced a high monthly average:

5) Mesa ³ eed	483 photos per month	= 627 PU
7) Naga el-Hai	411 photos per month	= 509 PU
15) Nubian Arch. Survey	511 photos per month	= 765 PU

The averages of these three sites exceed in fact that of any site recorded by the Hearst Expedition. The rapidity with which the small graves of these simple cemeteries may be excavated, permits from 5 to 25 such graves to be opened every day, an equal number to be prepared for photography and photographed, and another equal number to be registered and cleared of its objects. The variation in the number of graves depends on the proportion of quite empty graves to those more or less undisturbed. Empty graves take only a few minutes to record and are finished in a day or less; the average grave goes through in three days, while the full grave may take as high as ten or twelve days (depends on photography).²⁴ The process of recording proceeds regularly at a nearly constant rate. The astonishingly high average of the Nubian archaeological survey is due to the great number of laborers employed on that work, and would have been still higher except for the time spent in searching tracts of ground which contained only a few scattered patches of graves or none at all.

In sharp contrast to the simple cemeteries, those sites which contain large buildings, or deep underground chambers, or are covered with a heavy load of surface debris, may require weeks of clearing labor before anything of significance is revealed. At Nuri when we were opening the large stairways of the king's pyra-

mids, only 37 pictures were taken between October 26 and December 31 (about one every two days) while 519 were taken between January 1 and May 7 (about 5 every working day)—or ten times as many per day.

The greatest variations in the monthly averages of plates used at different sites are clearly shown in Table II. The averages of photographic units (PU) afford perhaps the fairest basis of comparison. The two sites which present the extreme limits are:

10) Gebel Barkal (pyramids and temples; 1 gang)	115 P = 218 PU
15) Nubian Arch. Survey (small graves; gang: over 300)	511 P = 765 PU

As I have already suggested, the variations in the monthly averages of the same recording staff at different sites are due to the number of workmen employed, the depth of the debris shifted, and the abundance of the evidences uncovered. The number of objects found, the most uncertain of all the factors which determine the number of photographs, may account for anything from ten to ninety percent of all photographs taken.

These figures taken from our photographic registers emphasize the variations in the numbers of plates required to record different kinds of sites. In ordering the plates for our expedition, I place the first order:

Size A (18 × 24 cm.)—10 dozen plates; one per tin;
Size B (13 × 18 cm.)—20 dozen plates; two per tin;
Size C (9 × 12 cm.)—51 dozen plates; three per tin.
TOTAL: 81 dozen = 1012 plates = 1572 PU

After the season has progressed, it becomes clear either that these numbers will suffice or that one or more of the sizes must be increased. In the latter case, a supplementary order is sent in time to permit the arrival of the plates before the need arises. In case of great urgency we order from Cairo, by telegram. Before the war, I had a code arranged with a European

²⁴ Compare this number with Petrie's description of *excavating* twelve to twenty-four tombs per day, at 20–30 minutes per tomb at Naqada: Sir W. M. Flinders Petrie, *Naqada and Ballas* (London: Bernard Quaritch, 1894; reprint: Warminster: Aris & Phillips, 1974), p. IX.

agent by which I could order any one of the above named lots of plates or the half of any one. The numbers of printing papers ordered is based on the numbers of plates—2 papers for each plate; and the amounts of chemicals are calculated according to the numbers of plates and papers.

There is one further warning to be given—regarding the wasting of plates. A certain wastage due to improper exposure or to accidents is unavoidable; but the most serious and unnecessary wastage is caused by taking two or three identical views of the same thing with different exposures. In our early days there were cases in which we had as many as five identical pictures with inappreciable differences in exposure. This is inexcusable in the ordinary course of work. An inexperienced photographer who is striving to gain an idea of the right exposure at a certain site (for the light at different sites varies greatly) may permit himself such an

experiment but the time should be doubled from plate to plate. Thus if his first exposure is 5 seconds, the second should be 10, and the third 20. Those three plates will show a manifest difference in correctness of exposure and the approximately true exposure can be judged from these three unless they are all over or all under exposed. But he should not allow himself more than six plates for such an experiment and that not more than twice at the same site. The best plan is to make one exposure and to judge by that the time of the second.²⁵

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²⁵ This ends Reisner's discussion of archaeological photography on page 215 of his unpublished manuscript. The page continues with a section, entitled "System of designating sites, fields, units and objects."