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Eight years at the Giza Archives Project: past experiences and future plans for the Giza digital archive

Peter Der Manuelian

(PLATES LXVII–LXIX)

In quarant'anni di scavi meticolosi e di documentazione in ventitré siti diversi, la missione dell'Harvard University - Museum of Fine Arts di Boston, diretta da George A. Reisner (1867–1942), ha lasciato un enorme archivio archeologico alla posterità egittologica. A partire dal 2000, il Giza Archives Project al MFA, con il supporto finanziario della Fondazione Andrew W. Mellon, sta convertendo gli archivi della missione di Giza in formato elettronico e, fatto ancora più importante, sta creando dei legami e dei riferimenti incrociati tra i diversi documenti per facilitarne l'accesso tramite Internet (gizapyramids.org). Questo contributo illustra la storia del Giza Archives Project, alcune delle decisioni strategiche adottate per sostenere la ricerca egittologica, i problemi risolti e i progetti futuri relativi alle sfide della gestione delle informazioni archeologiche.

1. Background history

George A. Reisner, director of the Harvard University - Boston Museum of Fine Arts Expedition, passed away at « Harvard Camp », just west of the Khafre pyramid, in June 1942. One of the leading pioneers of his generation in archaeological method, he left behind an immense archaeological archive gained over forty years from twenty-three different sites in Egypt and Nubia. While thousands of ancient objects had already been transferred over the years to the museums of Cairo, Khartoum and Boston, the excavators' archival documentation of the work remained largely in the mud-brick cluster of buildings at Harvard Camp, Giza. Owing to the logistical challenges of the Second World War, Museum of Fine Arts officials were not able to reach the site until 1946. At that time William Stevenson Smith and Dows Dunham left Boston for Cairo to assess the status of the Harvard - MFA Expedition. Their decision to formally close the dig and ship the archives to Boston ended one of the longest-running and most successful expeditions in all of Egyptian archaeology (pl. LXVII, 1).¹

Among the principal contents of the crates (aside from the actual antiquities) that eventually reached Boston were (numbers are in some cases approximate):

1. Although the Harvard-MFA Expedition was shut down in 1946–47, the desire to continue some sort of American archaeological presence in Egypt remained strong. Debates ensued about moving the Expedition headquarters from Giza to Cairo, creating a field school, or forming an umbrella organization to supervise American digs. These talks eventually resulted in the creation of the American Research Center in Egypt (ARCE), founded in Boston on May 14, 1948. While that is a subject for another paper, there is a direct legacy from Harvard Camp at Giza to the creation of ARCE; see < <http://www.arce.org/main/about/historyandmission> >.

- 45,000 glass plate photographic negatives;
- photographic register ledger books containing descriptive metadata;
- object register ledger books describing thousands of finds (including 20,000 Giza objects);
- 3,000 pages of expedition diaries (English versions);
- more than 4,000 pages of unpublished manuscripts;
- thousands of archaeological plans, sections, and epigraphic drawings;
- miscellaneous note cards and filing systems;
- expedition correspondence, excavation contracts, and other documentation.²

Most of this documentation went unstudied until the early 1970s, when MFA curator William Kelly Simpson returned to Giza to initiate the tomb-by-tomb publication series that Reisner had always envisioned but did not live to see realized. Since that time, eight volumes of the « Giza Mastabas » series have appeared,³ and more are in preparation. However, sifting through the vast archaeological archive for specific data relevant to a single tomb has proved a daunting challenge at best. Archival research proved even more frustrating for non-local scholars whose limited time and budget in Boston hindered the location of the pertinent Giza data. These problems, plus the threat of deterioration of portions of the archive (such as emulsion on fragile glass plate negatives), created a dire situation by the start of the twenty-first century.

II. The Giza Archives Project

Beginning in 2000, with the support of the Andrew W. Mellon Foundation, the Museum of Fine Arts started converting the Giza portion of the Harvard-MFA Expedition archives to electronic form and to link and cross-reference the diverse materials for ease of access via the Internet.⁴ While Giza materials are strewn all over the world, the logical starting

2. I am grateful to Rita E. Freed, John F. Cogan, Jr. ad Mary L. Cornille Chair of the Art of the Ancient World Department, Museum of Fine Arts, Boston, for her support and encouragement in our efforts to make this archival material accessible to the world community, and for permission to reproduce some of the photographs illustrated here.
3. D. DUNHAM - W.K. SIMPSON, *The Mastaba of Queen Mersyankh III, G 7530-7540*, « Giza Mastabas » 1, Boston 1974; W.K. SIMPSON, *The Mastabas of Qar and Idu, G 7101-7102*, « Giza Mastabas » 2, Boston 1976; ID., *The Mastabas of Kawab, Khafkbufu I and II, G 7110-20, 7130-40, and 7150 and subsidiary mastabas of street G 7100*, « Giza Mastabas » 3, Boston 1978; ID., *Mastabas of the Western Cemetery, I, Sekhemka (G1029); Tjetu I (G 2001); Iasen (G 2196); Penmeru (G 2197); Hagy, Nefertjentet, and Herunefer (G 2352/53); Djaty, Tjetu II, and Nimesti (G 2337X, 2343, 2366)*, « Giza Mastabas » 4, Boston 1980; K.R. WEEKS, *Mastabas of Cemetery G 6000, including G 6010 (Neferbaupth); G 6020 (Imymer); G 6030 (Ity); G 6040 (Sbepseskafankb)*, « Giza Mastabas » 5, Boston 1994; A.M. ROTH, *A Cemetery of Palace Attendants, including G 2084-2099, G 2230+2231, and G 2240*, « Giza Mastabas » 6, Boston 1995; E. BROVARSKI, *The Senedjemib Complex, I, The Mastabas of Senedjemib Inti (G 2370), Khnumenti (G 2374), and Senedjemib Mehi (G 2378)*, « Giza Mastabas » 7, Boston 2001; P. DER MANUELIAN, *Mastabas of Nucleus Cemetery G 2100, I, Major Mastabas G 2100-2220*, « Giza Mastabas » 8, Boston 2009. Additional publications are in preparation by Edward Brovarski, Ann Macy Roth, and Peter Der Manuelian.
4. I would like to express my gratitude to officers of the Mellon Foundation, for their many years of advice and support: Angelica Zander Rudentstine, Donald J. Waters, and Helen Cullyer. For descriptions of the project, cf.

point was clearly Boston, since the MFA is keeper of a collection that dwarfs the Giza holdings at almost all other institutions. The intellectual challenge lay in discerning how to link diverse data intelligently so that scholars could locate the items sought and see the critical relationships between them. The focus was on using technology to build structural relationships between different types of data that were previously unavailable to researchers: photographs, epigraphic, archaeological and architectural drawings, written documents, object information, etc. The technology itself was never the end-goal of the project, but simply the vehicle of delivery. The best digital solutions are those that seamlessly « disappear », allowing researchers to focus on the results, rather than on complex search engines, inscrutably parsed database fields, or unfamiliar terminology.⁵

Two general datasets are relevant to organizing the archaeological legacy of Giza: 1) the physical remains of the material record at Giza itself; 2) all of the derivative materials now in museums and universities in Boston and elsewhere.

The overlap between the two datasets is somewhat random: smaller, portable ancient objects landed in collections far from Egypt, while of course entire tomb chapels — with five exceptions in Europe⁶ — remain at the site. A decorated relief fragment now in Europe might derive from an otherwise intact wall still at Giza,⁷ or two statues from the same serdab might be housed in Cairo and Boston.⁸ While these ancient primary sources form, of course, our most valuable corpus, it is often the secondary sources, the excavation photographs, drawings, notes, etc., that today have as much, if not more, to tell us. Many of the ancient monuments are now reburied, inaccessible, deteriorated beyond recognition, or otherwise in a less complete state than that captured in the secondary source documentation (pl. LXVIII, 2-3).

P. DER MANUELIAN, *The Giza Archives Project*, in « Egyptian Archaeology » 28 (Spring 2006), pp. 31-33; ID., *Virtual Pyramids—Real Research: The Giza Archives Project Goes Live Online*, in « KMT » 16/3 (Fall 2005), pp. 68-80; ID., *Das 'Giza-Archiv-Projekt.' Interview mit Peter Der Manuelian*, in « Sokar » 10 (2005), pp. 10-17.

5. Examples of research results made possible by the Giza archives work include the author's « Giza Archives Gleanings » series: P. DER MANUELIAN, *Penmeru Revisited—Giza Mastaba G2197 (Giza Archives Gleanings V)*, in « JARCE » 45 (2009), forthcoming; ID., *A Dig Divided: The Giza Mastaba of Heti, G5480 (Giza Archives Gleanings IV)*, in *Festschrift Edward Brovarski*, « CASAE » 40, forthcoming; ID., *On the Early History of Giza: The 'Lost' Wadi Cemetery (Giza Archives Project Gleanings: III)*, in « JEA » 95 (2009), pp. 105-40; ID., *Hemiumu, Pebenptah, and American/German Collaboration at the Giza Necropolis (Giza Archives Project Gleanings: II)*, in A. SPIEKERMANN (Hrsg.), « Zur Zierde gereicht »: *Festschrift Bettina Schmitz zum 60. Geburtstag am 24. Juli 2008*, « HÄB » 50, Hildesheim 2008, pp. 29-57; ID., *A 'New' Slab Stela for Nefer from G 2110? (Giza Archives Project Gleanings: I)*, in S.E. THOMPSON - ID. (eds), *Egypt and Beyond. Essays Presented to Leonard H. Lesko upon his Retirement from the Wilbour Chair of Egyptology at Brown University, June 2005*, Providence 2008, pp. 227-36.
6. Giza mastaba chapels removed more or less completely to Europe include G 2100-1 (Merib; Berlin); D117 (Wehemka; Hildesheim); G 2155 (Kaninisut I; Vienna); G 5170 (Seshemnefer III; Tübingen); Iyefret (Karlsruhe).
7. Cf., for example, reliefs from the east and west walls of the chapel of Nefer (G 2110) in Copenhagen (AEIN 937 and AEIN 819); M. JØRGENSEN, *Catalogue Egypt 1 (3000-1550 B.C.)*, Ny Carlsberg Glyptotek, Copenhagen 1996, cat. nr. 9-10, pp. 44-47, and MANUELIAN, *Mastabas of Nucleus Cemetery G 2100*, pp. 157-58, figs. 6.59-6.62, 6.74-6.75, 6.83.
8. Statues from the serdab of Penmeru (G 2197) are in Cairo (pair statue, JE 43753) and Boston (pseudo-group statue, MFA 12.1484; triad, MFA 12.1504); cf. SIMPSON, *Mastabas of the Western Cemetery*, esp. pl. 48b, and MANUELIAN, *Penmeru Revisited*.

III. Goals

The MFA's Giza Archives Project commenced in late 2000 with a vision of four broad goals as part of a comprehensive strategy to preserve and present Giza's past, present and even future archaeological activity.

The first goal consisted of converting to electronic form, processing and linking together all the local (MFA) Giza documentation. This task has absorbed the vast majority of the Project's time and resources, and is only now, some eight years later, nearing completion. This first goal represents perhaps 60% of all Giza excavation data from the first half of the twentieth century.

The second goal represents an attempt to capture the remaining 40% of Giza data located outside the Harvard University - Boston Museum of Fine Arts Expedition dataset. No serious comprehensive Giza research can succeed if the sample studied is skewed by the random nature of an individual excavation's concession. Primary and secondary source material from the major excavations at Giza came to be housed in fewer than fifteen institutions, all of which are now formal collaboration partners in our Giza Archives work (cf. *infra*).

The third goal, still to be pursued systematically, involves assembling Giza data that lies outside the purview of any of the major excavations at the site. This refers primarily to museums that, through coincidences in their acquisition history, possess small numbers of Giza objects (or, less likely, secondary source Giza documentation), but have otherwise no direct archaeological connection to the site.⁹

The fourth goal consists of keeping abreast of emerging developments and new discoveries at the site,¹⁰ and ensuring that the apparatus is in place to absorb and present our evolving knowledge about Giza.

Taken together, these four goals represent one approach to include all of Giza's archaeological legacy in one location on the Internet. At this writing, our focus is on the collection and presentation of the Giza data, rather than on its analysis and interpretation. The overwhelming numbers of items, which at present are approaching 100,000, make it virtually impossible to reassess all tomb dates, translate all the inscriptions, or add thesaurus terminology to every last image. But these all remain long-term goals of the Project, and it is encouraging to see that others are now attempting to fill in some of these gaps, either in collaboration with us or by means of their own research projects (cf. *infra*).

9. Some examples of museum collections with objects, but no direct archaeological activity, at Giza include the Metropolitan Museum of Art, the British Museum, the Hermitage, and the Louvre.

10. Excavations and/or re-clearance missions at Giza have been undertaken in recent years by Zahi Hawass (SCA), Mark Lehner (AERA), Edward Brovarski and Tohfa Handoussa (Brown University - Cairo University), Günter Dreyer (DAI), and Eleonora Kormysheva (Russian Archaeological Mission in Giza).

IV. *Tasks & Procedures*

The Giza Necropolis presents certain advantages over other Egyptian sites as far as a structured approach to organizing archaeological data is concerned. Two individuals, Khufu and George Reisner, account for, first, the ordered layout and, later, the systematic numbering of the major cemeteries. Khufu's original nucleus cemetery scheme, with regular streets and avenues of similarly proportioned mastabas, constitute one of the largest prefabricated necropoli in Egypt.¹¹ Millennia later, Reisner's four-digit tomb-numbering system (example: G 7510) provided an excellent grid for representing the cemetery's monuments in parsed database fields and schematic graphical layouts. Our Giza strategy is built on these two features, using the individual mastaba tomb at Giza as the principal ID, or central database record to which related data should be linked. For each mastaba, then, there should be x number of objects, photographs, drawings, plans, diary entries, ancient Egyptians and modern individuals, publications and unpublished manuscripts, that bear a relation to that mastaba and whose database records should be linked to it (pl. LXIX, 4). Searching for any particular tomb, or indeed any related items, should provide a gateway to locating all related records. Conversely, any photograph, document, or object record should provide a path back to the tomb of origin. This approach does not account for every possible scenario at Giza; a problematic example would be an unnamed statue fragment found in the street *between* mastabas and unassignable to any particular one. Nevertheless, it does provide an archaeological context for the vast majority of objects (and their secondary sources) excavated at the site.

Between 2000 and 2004, the major MFA Giza collections processed included all 21,000 glass plate negatives, along with data entry recording and improving upon the original Expedition Photographic Register descriptions; 30 Object Register volumes containing data on about 20,000 Giza objects discovered and sent either to Boston or Cairo;¹² 3,000 English-language expedition diary pages; and the beginnings of a comprehensive « Giza digital library », an online collection of PDF files of Giza-themed publications scanned and text-processed using optical character recognition (OCR) technology. In most of these cases, individual records were created for each item in one of several relational database modules, and then these records were linked to all other

11. Cf. G.A. REISNER, *A History of Giza Necropolis* 1, Cambridge 1942, p. 85; H. JUNKER, *Giza*, 1, Wien - Leipzig 1929, p. 38; P. JÁNOSI, *Giza in der 4. Dynastie: die Baugeschichte und Belegung einer Nekropole des Alten Reiches*, 1, *Die Mastabas der Kernfriedhöfe und die Felsgräber*, Wien 2005, p. 281, nr. 1784; P. DER MANUELIAN, *A Case of Prefabrication at Giza? The False Door of Inti*, in « JARCE » 35 (1998), pp. 115-27.

12. I would particularly like to thank Diane Victoria Flores for her untiring efforts since 2000 to validate and improve the data prepared by the original expedition. Countless errors had crept into Reisner's numbering systems over forty years, and to Dr Flores we owe the tedious labor of researching, analyzing, and correcting these legacy errors, in addition to improving, standardizing, and enhancing the data in general.

appropriate records. In the case of a diary page, all tomb numbers, object numbers, or ancient or modern individuals mentioned on the page were linked to the corresponding tomb, object, or people records in other modules of the relational database.¹³ A similar process is followed for other types of documentation. The record for a sketch of burial shaft A from mastaba G 4140 is linked to mastaba record G 4140. A photograph of the false door from mastaba G 1123 is linked to the mastaba record G 1123, as well as to the object record for that false door (MFA 31.782). In recent years, this process has even been applied to Reisner's 4,463 pages of unpublished manuscripts for *Giza Necropolis* II, III, and IV,¹⁴ such that every scanned page is now linked online to every occurrence of a tomb, individual, photograph, or object that is mentioned on that page. These pages provide unprecedented, detailed data on every Harvard-MFA-excavated tomb, and are now available online to the public for the first time (« Unpublished Manuscripts » section).

In January 2005, an initial version of the Giza Web site (*mfa.org/giza*; *gizapyramids.org*) was launched. The Web site's design continues to evolve, and current totals are at this writing illustrated by the chart below (pl. LXIX, 5).¹⁵ The search options were conceived to serve a wide range of users, from professional Egyptologists to those unfamiliar with Giza or its terminology. We have provided three search portals: a basic « Google-like » search box (« Quick Search »), an « Advanced Search » option to narrow the hunt to specific categories of objects or specific time periods, photographers, authors, etc., and finally a « Visual Search » option. The latter provides an aerial photograph of Giza that allows users to zoom in close to the ground. Every tomb in the photograph acts as a « rollover » button that links to all of the related items specific to the tomb selected. The page also contains 1,400 Quicktime Virtual Reality (QTVR) panoramas that provide 360-degree interactive views from 1,400 different standpoints all over the site. Efforts to improve these various visual browsing methods are constantly in preparation.

13. In 2006, I was fortunate to discover the original Expedition's 72 volumes of Arabic diaries, containing thousands of pages, in the possession of descendants of Reisner's original *reises*. These have now been acquired in Boston, scanned, and translated. They will appear eventually on the Giza Web site. For their assistance with this project I thank Zahi Hawass, Hassan Diraz, Lauren Thomas, Ramadan Hussein, C.M. Pate, Christine End, Sara Waldheim, and David Pendlebury. More information on this discovery is available at: < <http://www.gizapyramids.org/code/emuseum.asp?newpage=pressrelease006> >.

14. For a description of Reisner's original publication plans for continuing volumes of the « Giza Necropolis » series (prevented by his death at Giza), cf. REISNER, *Giza Necropolis*, I, p. ix.

15. In the current layout of the Giza Web site, clicking simply on the « Go » button produces a page with the current totals in all categories of documentation.

V. *Additions and Improvements*

Once a research Web site is posted live, and used by colleagues, the *lacunae* and *desiderata* become rapidly apparent. In recent years additional features have been added in an effort to enhance its usability. Three features might be of particular interest to Egyptologists. One is the introduction of Multilingual Egyptological Thesaurus (MET) terminology to the online photographs. Located under « Advanced Search for Photos », this feature allows user to select METs categories, and search photographs *by content*. For example, all photographs depicting instances of « music and dance scenes » or « hunting scenes » (MET category 8) may be gathered, and multiple criteria may be searched simultaneously. The second feature is « My Giza Research », an option that allows users to create, edit and save collections of items for future reference or for sharing with colleagues. For example, a research collection called « slab stelae » might contain 321 photographs, 12 objects, 13 constituent (people) records, and 2 publications.

The third feature, enhanced bibliography, consists of linking all PDF-converted books and articles to the appropriate item-level records. Thus, instead of merely viewing a list of bibliography items for the Menkaure dyad (MFA II.1738), users may now click on any publication linked to the Menkaure dyad's online record to instantly open or download the text-searchable PDF file of the book or article in question.

VI. *Giza International Collaboration*

As stated above, other institutions besides Harvard University and the Museum of Fine Arts, Boston, contributed significantly to archaeological exploration at Giza. In 2006 formal collaboration agreements were signed with all of these institutions, and the first materials from our international partners are now beginning to appear on the Giza Web site. The consortium of « Giza institutions »¹⁶ includes at this writing:

Berkeley, CA:	Hearst Museum of Anthropology
Cairo:	Egyptian Museum; Supreme Council of Antiquities

16. I would like to thank the many colleagues at the institutions listed here who have generously provided their time, expertise and staff assistance for Giza collaboration. Berkeley: Joan Knudsen, Elizabeth Minor; Boston: Rita Freed, Lawrence Berman, Denise Doxey, Diane Victoria Flores, C.M. Pate, Rachel Aronin, Nicholas Picardo; Cairo: Zahi Hawass, Wafaa el-Saddik; Berlin: Stephan Seidlmayer, Stefan Grunert, Elke Freier, Dietrich Wildung, Klaus Finneiser; Hildesheim: Katja Lembke, Bettina Schmitz, Antje Spiekermann; Leipzig: Hans-Werner Fischer-Elfert, Friederike Kampp-Seyfried, Antje Spiekermann; Philadelphia: David Silverman, Josef Wegner, Jennifer Houser Wegner, Stephen Phillips; Turin: Eleni Vasilika, Giovanni Bergamini, Elisa Fiore Marochetti, Matilde Borla; Vienna: Manfred Bietak, Peter Jánosi, and Regina Hölzl.

Berlin:	Berlin-Brandenburgische Akademie der Wissenschaften (« Ägyptisches Wörterbuch Project »); Ägyptisches Museum
Hildesheim:	Pelizaeus-Museum; Stadtarchiv, Hildesheim
Leipzig:	Ägyptisches Museum, Universität Leipzig
Philadelphia, PA:	University of Pennsylvania Museum of Archaeology and Anthropology
Turin:	Museo Egizio di Torino; Ministero per i Beni e le Attività Culturali
Vienna:	Kunsthistorisches Museum; Ägyptologisches Institut der Universität Wien.

VII. *Lessons Learned*

After eight years of processing and linking diverse Giza data, a few notes on our experience might serve others planning similar online archaeological research or archival projects. First, one cannot overemphasize the advantages of full-time programmers and Web designers on the Project staff, as budgets allow. New data and new technologies put these skills in constant demand. In fact, the relatively easy posting of new data, such as thousands of object photographs from Vienna, or excavation diaries from Philadelphia, translates into massive amounts of data entry labor time, which requires adding thesaurus terminology, creating links to other items, and standardizing descriptive metadata. Another *desideratum* is for standardized hieroglyphic Unicode fonts, which are in development but at this writing still some time away.¹⁷ The ability to post Web-based hieroglyphic fonts that are universally readable, regardless of operating system or Web browser, rather than bitmapped images of hieroglyphs, would streamline operations, reduce file sizes, and facilitate all kinds of philological research at Giza, particularly into prosopography, administrative titles, and Old Egyptian grammar.

On the more logistical and practical side of Web-based archaeological project management, we still seek the best method of « marketing » our advances and additions to Egyptological colleagues and the world community. Where should such announcements be made, besides on the Giza Web site home or news pages? The International Association of Egyptologists Web site? The EEF email forum? Bulk email postings for

17. Cf. M. EVERSON, *Ȝd, Unicode, and future options for Egyptian encoding*, IAE Computer Group Meeting, July 8-11, 2008: < <http://www.newton.ac.uk/egypt/ie2008/abstracts.html> >.

those who subscribe to such notifications on the Giza Web site?¹⁸ Similarly, how should the Web site best stay up-to-date after the initial acquisition of data from collaboration partners? If new a color photograph of a Giza object is produced in Turin in 2009, mechanisms should be in place to alert Giza Archives Project staff to its existence. And finally, modern language issues and Egyptological abbreviations add another layer of complexity. Since funding is usually limited, should academic projects cater to a « scholars only » club, leaving data in the original English, French, German, Arabic, etc. and using traditional Egyptological « cryptography » as « JEA » and « MDAIK »? Or, for the benefit of the widest possible audience, should everything be translated to, say, English, and « JEA » converted wherever it appears to « Journal of Egyptian Archaeology »? Since the Giza Web site is available to the world community, additional efforts at outreach beyond the relatively small group of those with Egyptological expertise seems to make good sense. The issues touched on above apply not only merely to Giza, but to any collaborative project that must manage archaeological information from diverse sources.

Useful Web tools include the ability to magnify photographs and all other documents online. This feature separates serious research Web sites from random and amateur collections of images. Moreover, while general archival finding aids are useful starting points for research, we have found that individual item-level processing makes more sense for comprehensive access to Giza's archaeological legacy. Much Egyptological research is conducted from the « bottom up », rather than from the « top down », and such research cannot be conducted based on vague descriptions offered by finding aids.

Finally, it should be noted that all the efforts described above produce electronic *conversion*, or digitization, but not *preservation*, of the original archival materials. Beyond their own intrinsic value, the original photographic negatives, register books, maps, plans, and diaries etc, must be safeguarded for purposes of provenance tracking, solving data discrepancies and troubleshooting, and demonstrating legal claims to ownership and copyrights. Often the mentality prevails that once digitized, original materials lose their value or might even be moved off-site or disposed of. In many ways digital data are actually more fragile than the original paper documents. The one is not a replacement for the other. Furthermore, new technologies will inevitably require the recapture of original data, at, for example, higher resolutions than were previously available at the time of their original conversion.

18. Alerting a specific researcher that there are now 200 photographs, instead of merely five, linked to his or her object of interest, is a task that generally lies beyond the resources of archaeological projects.

VIII. Next Steps

We hope to make a number of improvements to the Giza Web site in coming months and years. Some of these focus on the space above Giza, and others on the surface, or even sub-surface level, for enhanced access to the entire Giza plateau. Satellite imagery will play an increasingly important role in pinpointing Giza tombs and object findspots, with GIS systems providing spatially organized access to a wide range of related data.¹⁹ With new, increasingly sophisticated 3D models of the plateau, real-time navigation around the site, with links to pertinent archaeological data, should dramatically improve users' research capabilities. And geophysical surveys (including methods such as radar, induction, resistivity, and magnetics) will aid in charting the complex interrelationships between the thousands of Giza burial shafts, as well as indicate unknown anomalies worthy of investigation. Giza Archives Project staff are at this writing in negotiation with a number of private sector companies concerning all three of these areas (space, surface, and sub-surface).

The Project also aims to be of assistance to the Egyptian Supreme Council of Antiquities (SCA) as it plans for the changes to the Giza Plateau that will be inevitable with the opening of the Grand Egyptian Museum to the northwest of the Pyramids. Eventually, handheld devices such as smart-phones should be able to provide on-site visitors with the entire archaeological history of a specific structure at Giza as they stand in front of it. Emerging technologies such as augmented reality could restore wall scenes, provide translations or display previous states of preservation on these handheld devices, based on GPS knowledge of the visitor's current location and the monument at which he or she points the device. All of these technological advances will only succeed if they incorporate the archival data gathered by generations of archaeologists at Giza.

Collaboration with other institutions, several with their own outstanding Old Kingdom projects already in progress, will also enhance future developments. Active projects that impact directly on Giza scholarship include, to name just a few, those directed by the Supreme Council of Antiquities (Zahi Hawass), Ancient Egypt Research Associates (Mark Lehner), the Oxford Expedition to Egypt: Scene-details Database (Yvonne Harpur), and the Leiden Mastaba Project « MastaBase », presenting daily life scenes (R. van Walsem).

19. For a Giza example of GIS use, cf. F. BROWN, *GIS: Digitizing Archaeology*, in « AERAGRAM » 8/1 (Fall 2006), pp. 4-7: < http://www.aeraweb.org/PDFs/aeragram8_1_2006.pdf >.

Perhaps the greatest challenge to all such undertakings as the Giza Archives Project lies in long-term sustainability of the work. Hosting a centralized online repository for all of Giza's archaeological and art historical heritage is a task that requires sustainable maintenance and growth in perpetuity. To that end, it is our hope that the Project will acquire endowment resources, or perhaps be institutionally or federally funded, in order to continue its mission well past the tenure of its current staff members.

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PLATES



Fig. 1. Comparison views of Cemetery G 2000, showing excavation progress, looking southeast. Above: 1905-1906, Albert Morton Lythgoe, (B 772 = B 7243). Below: April 4, 1936, Mohammedani Ibrahim (A 7558). Courtesy Museum of Fine Arts, Boston.



Fig. 2. Comparison views of painted raised relief of standing figure of Redi from G 2086a, chapel, entrance, north face of south pilaster. Left: May 6, 1938, Mohammedani Ibrahim (A 8014). Courtesy Museum of Fine Arts, Boston. Right: August 1987, Peter Der Manuelian (AAW 1496).

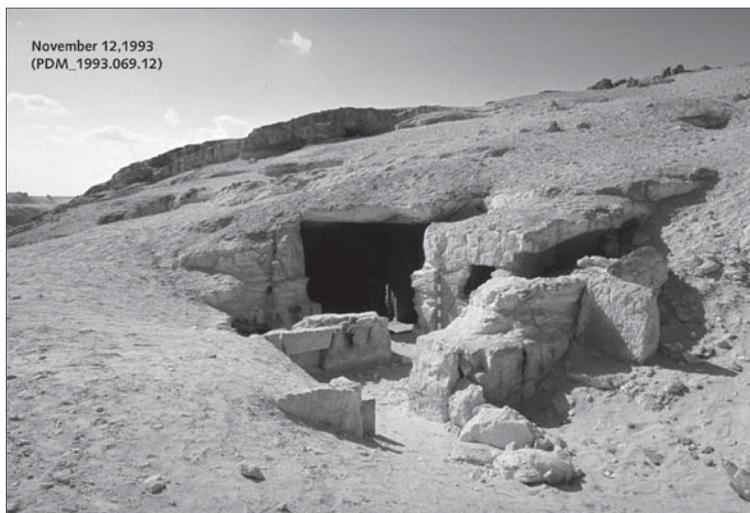


Fig. 3. Comparison views of exterior of rock-cut chapel of Kakherptah, G 7721, looking southwest. Above: November 12, 1993, Peter Der Manuelian (PDM_1993.069.12). Below: January 16, 2004, Peter Der Manuelian (PDM_01327).

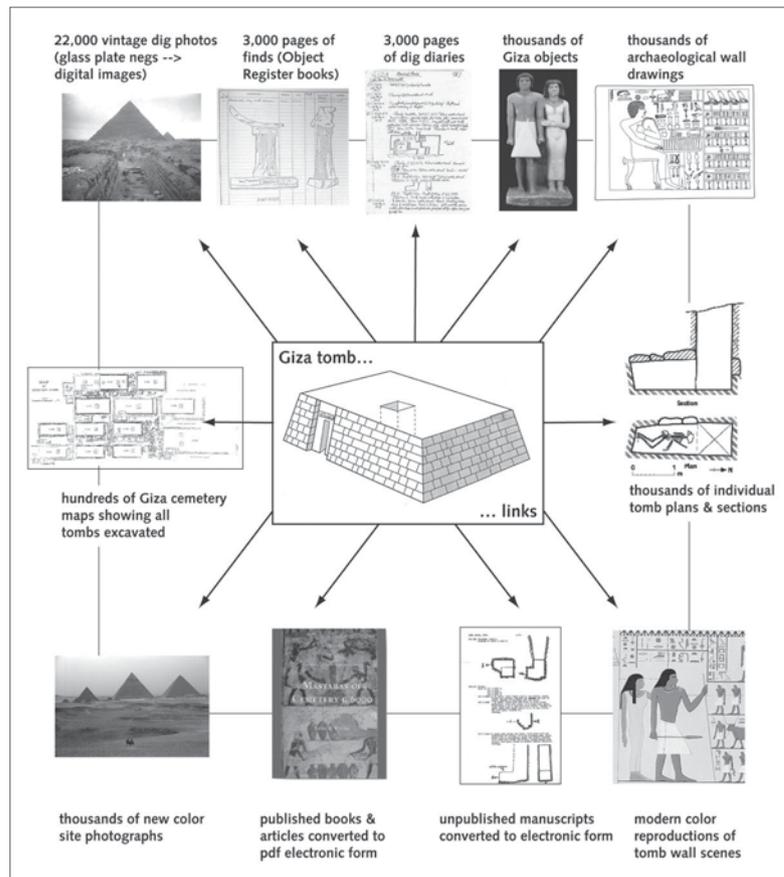


Fig. 4. Schematic chart showing the underlying Giza database structure, with a Giza mastaba as the central element around which diverse data records are linked.

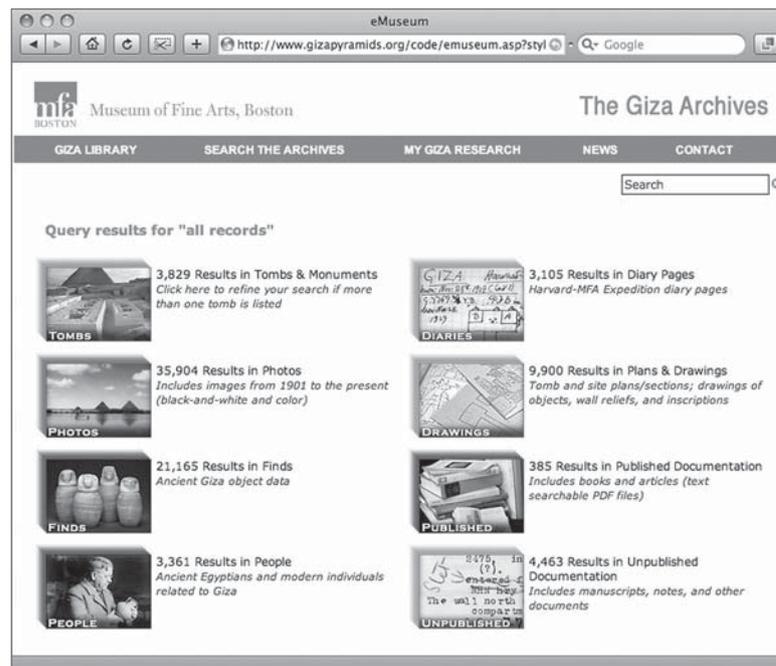


Fig. 5. Categories and total numbers of items posted on the Giza Web site (as of early 2009): gizapyramids.org.