

# **SAQQARA GEOPHYSICAL SURVEY PROJECT**

## **PRELIMINARY REPORT**

**2007**



**GLASGOW MUSEUMS  
GLASGOW CITY COUNCIL  
20 TRONGATE, GLASGOW G1 5ES  
SCOTLAND**

## **SAQQARA GEOPHYSICAL SURVEY PROJECT 2007**

**Jon Dittmer, Ian Mathieson and Campbell Price**

**Abstract:** An interim report on the work carried out during the 2007 season covering the use of the model 256 Geoscan Gradiometer equipment to test previous geophysical results and record archaeological features on the east side of the Step Pyramid of Djoser and across the access road to the Teti Pyramid in the north. Further notes from the 2006 surveys showing the probable location of the Tomb of Imhotep.

Project Director  
Ian J Mathieson

Glasgow Museums  
Glasgow City Council, 20 Trongate, Glasgow G1 5ES  
SCOTLAND



# THE SAQQARA GEOPHYSICAL SURVEY PROJECT

## PRELIMINARY REPORT OF THE SAQQARA SURVEY PROJECT 2007

By Jon Dittmer, Ian Mathieson and Campbell Price

The aims of the Saqqara Geophysical Survey Project have been:

a) To produce an up-to-date archaeological and subsurface geophysical map of an interesting and relatively little-studied area of Saqqara, the great necropolis of Memphis, this was the major city of Egypt from c.3000 BC to Hellenistic times. The area concerned comprises the Gisir el-Mudir ‘the Great Enclosure’ in the south; the structures lying to the west of the mastabas of Ptah-Hotep known as the L-shaped enclosure; the Serapeum and its dependencies; part of the Archaic necropolis; and the Sacred Animal Necropolis complex near the village of Abusir in the north and the area to the east of the Step Pyramid.

b) To adapt and combine a series of well-known geophysical techniques to the special problems of plotting large monuments, cemeteries, catacombs and natural features in desert conditions where unexcavated and previously excavated monuments are buried either under drift-sand or under the dumps of former excavations. These techniques incorporate resistivity survey, electro-magnetic impulse profiling, ground conductivity, proton magnetometer survey, sonic profiling, field inspection, archival research and test-excavation (for descriptions see 1992/3 Report pp. 1-4).<sup>1</sup>

The Glasgow Museums, Scotland, acknowledge with gratitude the help and co-operation of the Supreme Council for Antiquities with whose permission the Museum’s work is carried out; the Chairman Dr Zahi Hawass, Mr Magdy El Ghandour at the Secretariat, at Saqqara, the General Director of Antiquities, Mr Osama El Shami, the Chief Inspector Sabri El Farag, and the inspector appointed to the Project, Mr Ashraf Mohii El Din.

The October – November 2007 season was undertaken with the generous financial support of grants from the Museums of Glasgow, The Friends of the Museums of Glasgow, Egyptology Scotland, The Russell Trust, The Binks Trust, and The Harris Trust, private and corporate donors.

The Glasgow Museums of Scotland field team comprised Ian Mathieson-field director, Dr Jon Dittmer-geophysicist, Campbell Price-archaeologist. The 2007 season opened on the 20<sup>th</sup> October until the 29<sup>th</sup> November.

---

<sup>1</sup> See I. J. Mathieson et al., *JEA* 85 (1999), 21-43.

***Previous fieldwork carried out by the project - 1990 through 2006.***

During the 1990 season resistivity work was completed along the length of the concession area and four of the proposed cross-sections covering the large enclosure known as the Gisir el-Mudir were surveyed (fig. 1). In 1991 the complete concession area was field-walked and all visible surface indications of structures and old excavations were located for inclusion on the base maps. Work was completed in 1992 on the observation of the resistivity data covering the southern two-thirds of the original concession area, from the northern access road to the Serapeum to the southern limit of the concession, some 100m south of the southern boundary of the Gisir el-Mudir<sup>2</sup>. In 1993 sondage trenches were opened on anomalies in the southwest corner of the Gisir-el-Mudir to confirm the structures the resistivity data had shown at these points. A mud-brick platform was discovered inside the enclosure at the SW corner and the construction of the enclosure walls was investigated (1993 Report, Map Sheet 1, A7 & A8). In the 1994 season sondage trenches were opened to confirm the geophysical findings on profiles taken over the North Wall (1994 Report, Map Sheet 1, GMNWXS2). The construction of the wall was found to extend to the North with a buttress formation on the North face. Several graves were found on the South side of the wall, one of which had a stela of the Persian period deposited in the sub-structure (Reports 1990 - 1994)<sup>3</sup>.

During 1995 further sondage trenches were opened (1995 Report, Map Sheet 1, A9-14), to inspect anomalies over the southwest corner of the monument where the inside corner was located and surveyed<sup>4</sup>. In 1996 electro-magnetic impulse equipment, kindly loaned by ERA Technology of Leatherhead, Surrey, was used for the first time in Saqqara. Many scanning profiles were taken over existing resistivity surveys and the results confirmed the previous findings and gave a much-enhanced interpretation of the sub-surface conditions (Report 1996). In 1997 conductivity surveys were carried out using the Geonics EM 31 covering half of the Gisir el-Mudir and a portion of the L-shaped structure (Report 1997). In 1998 the conductivity survey of the Gisir el-Mudir was completed and several auger holes were drilled to determine the elevation of the bedrock. Sondage excavations examined the structure of the East Wall (Report 1998). In 1999 the project was fortunate to obtain the loan of Global Positioning Satellite equipment from The Natural Environment Research Council and surveyed all the main triangulation stations in the Saqqara area. The position of the South Wall of the Gisir el-Mudir and the southeast corner were located (Report 1999). In 2000 the Gradiometer was used for the first time and the results obtained showed this to be an ideal instrument for tracing mud brick structures. On the northern boundary of the L-shaped enclosure a line of rectangular anomalies was found and these formed the area for sondage excavation in 2001. In 2001 small sondages at the north side of three of the anomalies showed that they were probably temple casement foundations with entrance stairways on the north sides. In 2002 the project was sponsored by the Glasgow Museums and further geophysical findings

---

<sup>2</sup> See I. J. Mathieson and A. Tavares, *JEA* 79 (1993), 17-31.

<sup>3</sup> See I.J. Mathieson et al. *A Stela of the Persian period from Saqqara*. *JEA* 81 (1995), 23-41.

<sup>4</sup> See I.J. Mathieson et al. *The National Museums of Scotland Saqqara Survey Project 1993-1995*. *JEA* 83 (1997)



showed more temple type structures and many tombs on the North side of the Serapeum and a study of the pottery from the 2001 sondage. During 2003 the entrance to one of the northern temple sites was excavated and proved to be similar to the southern temples in pointing directly at the Serapeum site. Geophysics was extended to the limit of the concession at the village of Abusir with many more tombs and structures located. A geological borehole survey was carried over the site of the assumed Lake of Abusir and showed that the lake had fluctuated between dry and wet conditions over the centuries. In 2004 the geophysical coverage was extended south towards the Step Pyramid and the ancient route of the burial of the Apis bulls, The Serapeum Way, was discovered along with attendant chapels and tombs. In 2005 the survey of Serapeum Way was completed from the Dromos to the tomb of Mereruka and extended north towards Abusir and in 2006 the survey was extended to cover the Old Kingdom tombs of east Saqqara where many new mastabas were found<sup>5</sup>.

***The Objectives of the 2007 season under the sponsorship of Glasgow Museums were:***

1. To continue the geophysical survey in the area to the east of the Step Pyramid of Djoser, using the Geoscan Gradiometer instrument to measure the apparent influence of the surface material to a depth of approximately 5 metres.

**Fieldwork**

**Geophysical field work: (Fig. 1)**

Following our extensive geophysical coverage of North Saqqara and the subsequent discovery of many tomb structures, it was decided to extend this survey to the east and south covering areas of very disturbed ground where excavations during the past had uncovered many structures. Extending from the Teti pyramid in the north to the Unas causeway in the south and from the Djoser step pyramid car park in the west to the main access road in the east the results had not been accurately surveyed and the structures were now covered by windblown sand and therefore lost to records.

Fig. 1 shows the present extent of the survey, which has again revealed many new tombs and structures though not of the same size as those discovered in 2006 to the north of the access road. The area to the south consists of many small stone shafts and very few mud brick structures.

Fig. 2 is an enlargement of the magnetic data in the area of the car park above the VIP house belonging to the SCA Saqqara office. The main Bubastieion walls can be seen and the temple of Bastet enclosure with some of the internal structure is visible under the car park.

---

<sup>5</sup> I. J. Mathieson and J. K. Dittmer, *The Geophysical Survey of North Saqqara, 2001-2007*, JEA93 (2007), 28 – 93.

A geophysical survey of the east wall of the Gisir El Mudir was carried out to see if any mud brick structures were indicated as part of the wall construction which would help in the location of the entrance to the enclosure. The magnetic data recorded showed that there were no significant mud brick structures and the survey will be extended in 2008 to cover the north wall.

The geophysics team have surveyed a total of 215 x 30m squares and using our new FM256 gradiometer continue to record the position of mud brick structures and produce excellent results.

### Conclusions

The geophysical survey was extended from the Teti pyramid in the north to the Unas causeway in the south and from the Djoser step pyramid car park in the west to the main access road in the east. The results show that there are no large mastaba type structures similar to those discovered in 2006 to the north of the Serapeum Way and that most of the tombs were stone built shafts.

Our work this year has once again proved the value and accuracy of the geophysical and topographic surveys. The use of the gradiometer to delineate sub-surface features has been amply proved by the small-scale *sondage* trenches excavated in 2001, 2002, 2003 and 2006 to test the anomalies. In all cases the accuracy of the topographic survey has enabled the *sondage* to be opened exactly over the anomaly shown by the geophysical data. The saving of labour time and the ability to keep the excavation to strict size limits means the environmental damage is controlled and at the same time the archaeological interpretation of the site is enhanced.

### The Quest for Imhotep (Fig. 3)

The Saqqara Necropolis is famous for many reasons, the burial of some of the most important figures in Egyptian history, the location of the Sacred Animal Galleries and most importantly the site of the first pyramid, the Step Pyramid of King Djoser of the Third Dynasty (2649-2575 BC) and the burial location of the pyramid's architect Imhotep.

Imhotep held many court titles but is usually referred to as the builder, sculptor and architect of King Djoser. His name has always been associated with the construction of the Step Pyramid and his name appears on the base of a statue of Djoser. In later years he was deified and associated with wisdom, writing and medicine. The Greeks actually identifying him with Asclepius, their god of medicine, which still survives in the rod and snake of the present medical world. Many archaeologists consider finding his tomb as the next great discovery after the tomb of Tutankhamun.

The area surveyed by the Saqqara Project (fig.1) incorporates previous excavations by the French archaeologists A. E. Mariette and J. de Morgan in the 1890s and the British archaeologists J. E. Quibell, C. M. Firth and W. B. Emery during 1912 to 1956, all of whom had the hope of discovering the tomb of Imhotep as background to their excavations. The work of the project has shown that a very large number of

previously unidentified structures exist under the sand, and many of them are the largest magnetic data plots of tombs so far found in the Saqqara necropolis.

Following the layout of previous royal burials it is apparent that court officials wished to be buried near to their king so we must assume that Imhotep would follow the trend and be buried close to or within sight of his King Djoser especially if he was the architect of the Step Pyramid. Looking at the area surrounding the Step Pyramid we find that there were already massive structures to the west and south belonging to kings of the 2<sup>nd</sup> Dynasty (2890-2686 BC) and the eastern topography was not suitable for the size of structure we assume that Imhotep would command. Indeed our recent work has shown the area to be full of small stone built shaft graves.

This leaves us with the north and north-east section of the necropolis and it is here that we find many clues as to the whereabouts of Imhotep. In the Early Dynastic period (3000-2686 B.C.) the kings and courtiers of the 1<sup>st</sup> and 2<sup>nd</sup> Dynasties built tombs along the eastern edge of the necropolis followed by the nobles of the 3<sup>rd</sup> Dynasty including Imhotep. In later years Imhotep was associated with the worship of Thoth, the ibis-headed god of learning and therefore temples and sanctuaries built later would have a logical association with the burial place of Imhotep, the Sacred Animal Necropolis is located in the north-east quarter of the site and this is where most references to Imhotep are found.

What style of structure should we associate with Imhotep's possible burial? Imhotep built a large rectangular enclosure for his king containing a pyramid structure made of several extensions of a mastaba-type tomb and various cult chapels located round the perimeter with an entrance in the south-east corner. As we have no reason to doubt the fact that he would be high in the king's favour a similar large enclosure might be expected to be found within sight of the Step Pyramid and near the other burials of the 3<sup>rd</sup> Dynasty.

Remembering that the pyramid of Userkaf (2494-2487 BC) of the 5<sup>th</sup> Dynasty was yet to be built there is a clear line of sight between the Step Pyramid and the largest mastaba-type structure yet found on the Saqqara Necropolis which lies in the north-east area under consideration.

In 2005 and 2006 our geophysical survey was extended to the north and east where we hoped to link our work with the existing 1<sup>st</sup> and 2<sup>nd</sup> Dynasty tombs excavated by J. E. Quibell and W. B. Emery during 1912 to 1958. The survey proved to be extremely rewarding in that many previously unrecorded mastaba tombs were found which extended across the site and indeed linking up with the above excavations.

It was during this survey that the two largest structures yet discovered in the Saqqara Necropolis were recorded (Fig. 3). The largest unit appears to be a mud brick enclosure which measures approximately 90metres in length and 40 metres in width with walls over 5m thick with an entrance in the south east corner of the east wall. There appears to have been a mound in the centre where an attempt at excavation is apparent, otherwise the remainder of the structure appears untouched, almost a copy of the Step Pyramid enclosure.

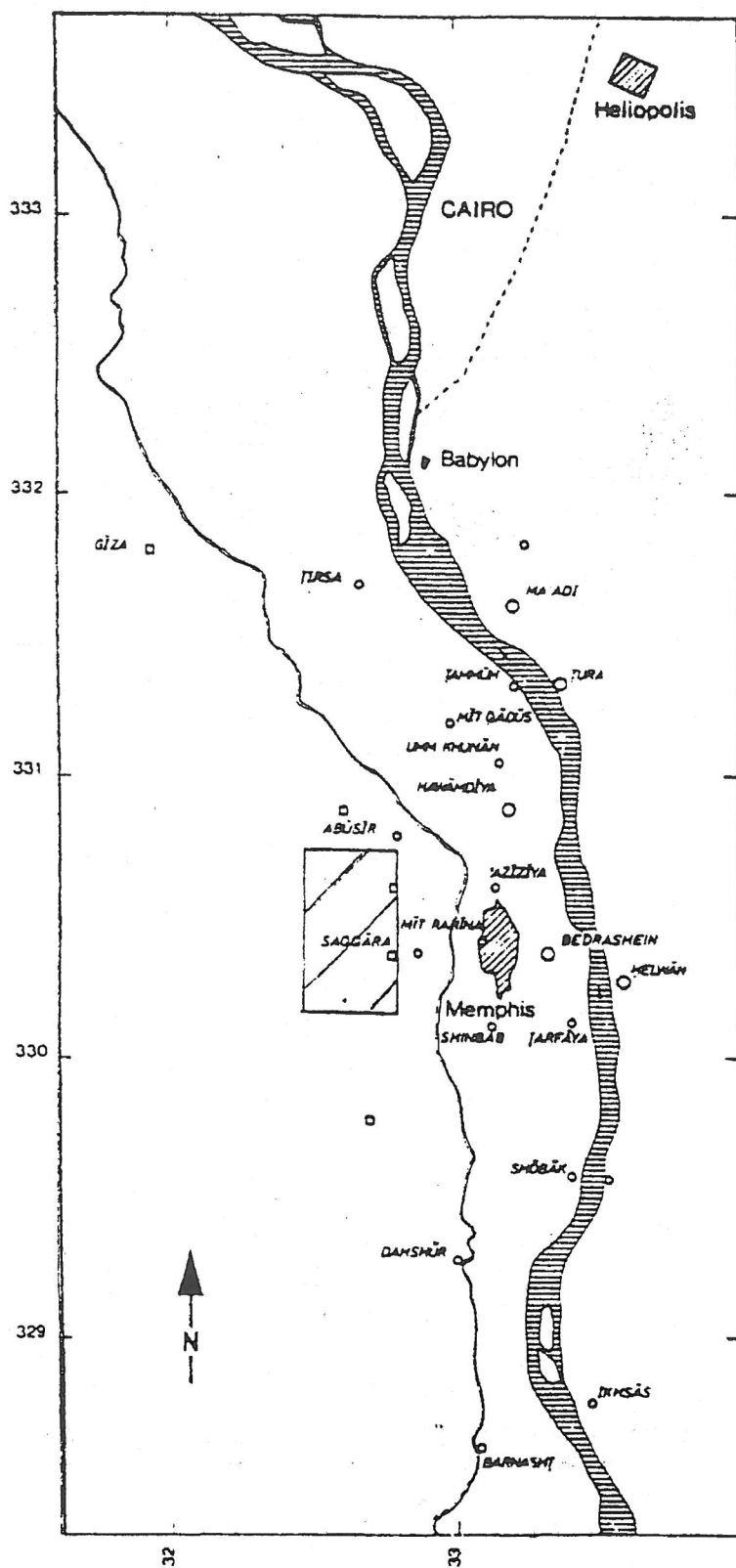


The second large enclosure lies some 20 metres to the east and is approximately 70 metres in length and 50 metres wide with very thick walls and a complicated internal structure which could point to a temple or courtyard with columns. An attempt at excavation is apparent in the north central area. A personage of the standing of Imhotep would command the artisans and labour needed to build such imposing structures and it is surely time we carried out further exploration.

With the permission of the Supreme Council for Antiquities the Saqqara Geophysical Survey Project plan to continue the work through 2008-2010 and complete the geophysical survey of the concession with particular reference to the area to the south of the Unas causeway and the tomb of Horemheb and to the east of the Sekhemkhet enclosure.

We also hope that permission will be granted to make some test pits to record and describe the construction details of mudbrick walls delineated by the geophysical results.

Ian J Mathieson  
Project Director



## SAQQARA

### Location map

- extent of Nile flood plain
- course of Nile
- course of Bahr Liberty
- course of Red Sea canal

TURA modern place name

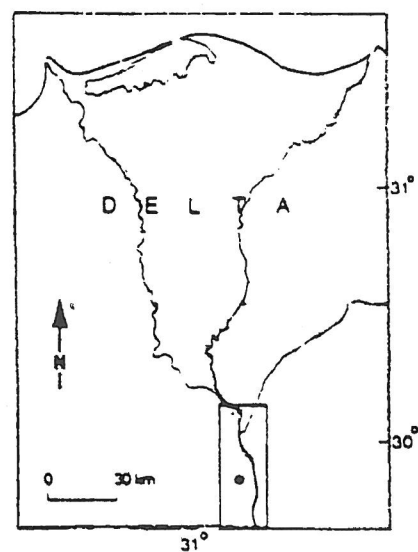
□ pyramid field

Babylon ancient place name

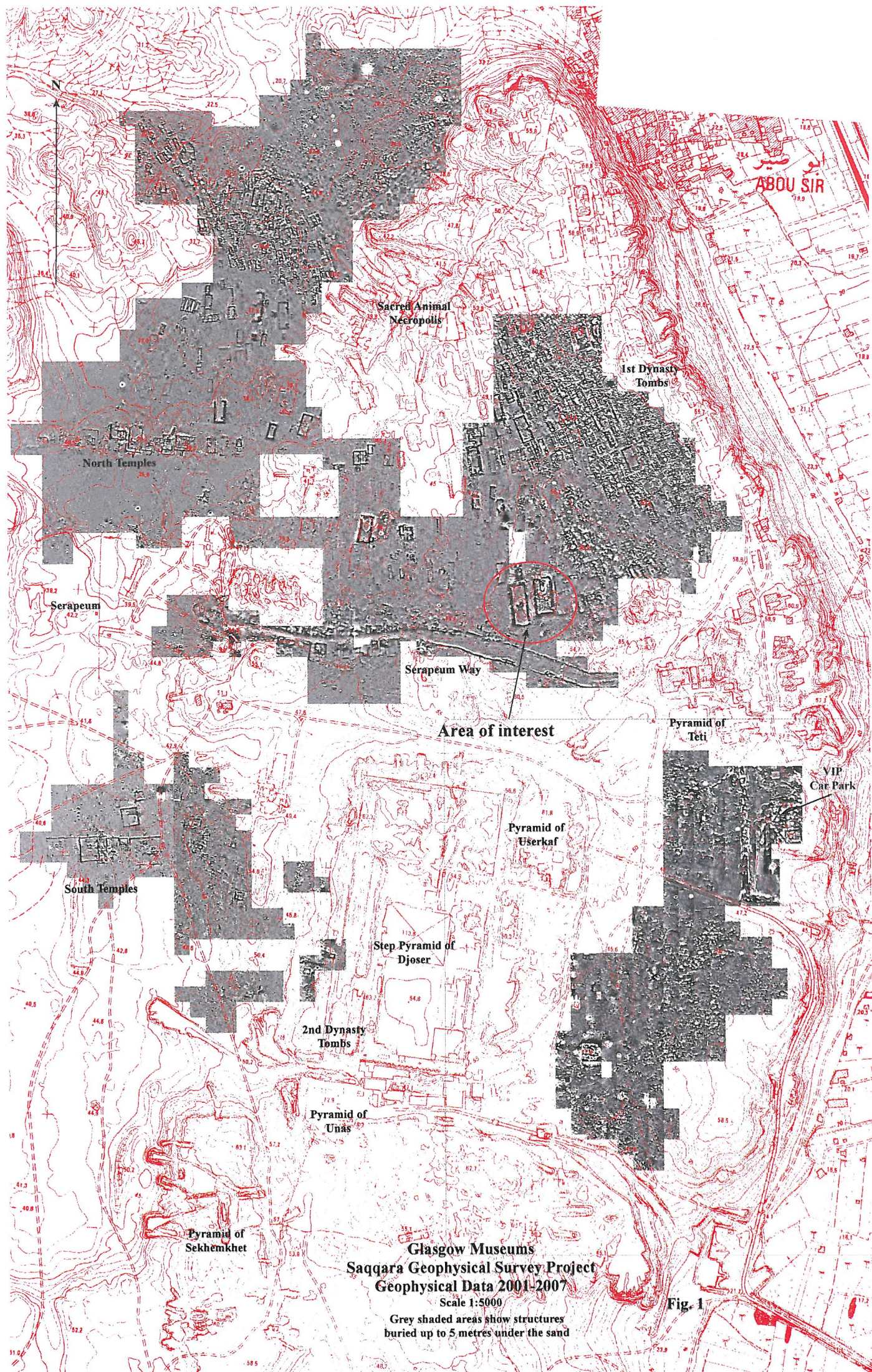
UTM GRID INTERVALS = 10 000 m

SOURCE SOE 1930

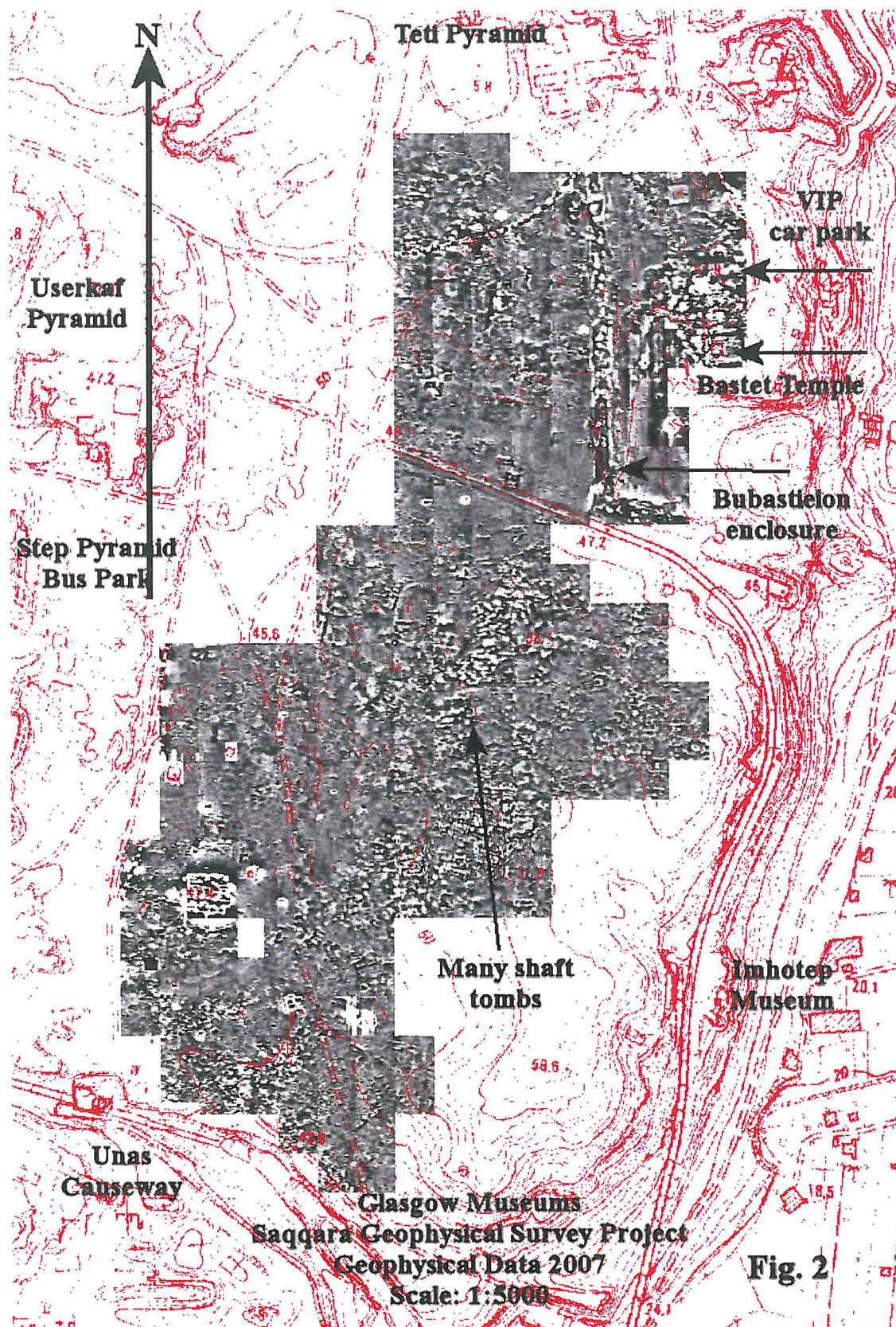
EES 1983









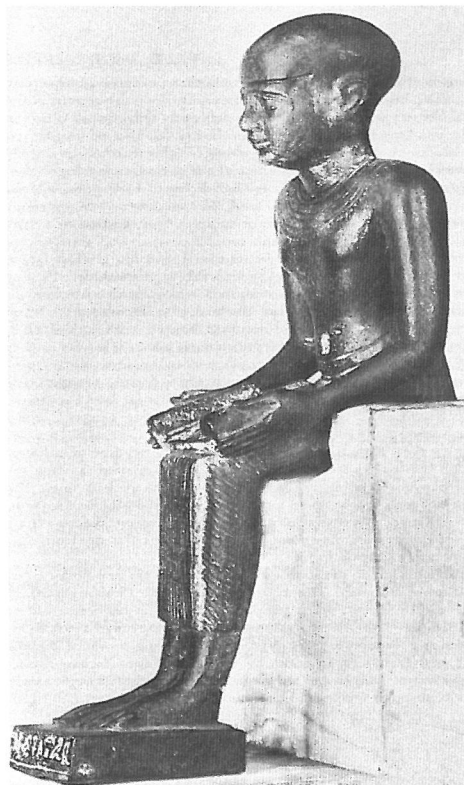


**Fig. 2**





Enlargement of area of interest shown in Fig. 1



Bronze statuette of Imhotep, Late Period. (Cairo Museum)

Fig. 3