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# شبكة المعلومات الجامعية

## التوثيق الالكتروني والميكرو فيلم

# جامعة عين شمس

التوثيق الالكتروني والميكرو فيلم

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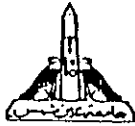
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بالرسالة صفحات  
لم ترد بالأصل



AIN SHAMS UNIVERSITY  
FACULTY OF SCIENCE

# MAGNETIC PROSPECTION FOR SOME ARCHAEOLOGICAL SITES IN EGYPT

*A Thesis*

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*for*

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*BONN*



## بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

قال تعالى ﴿أَوَلَمْ يَرَوْا أَنَا نَاتِي الْأَرْضَ نَنْقُصُهَا مِنْ أَطْرَافِهَا وَاللَّهُ يَحْكُمُ لَا مُعَقَّبَ لِحُكْمِهِ وَهُوَ سَرِيعُ الْحِسَابِ﴾ ٤١ الرعد.

قال تعالى ﴿وَيَسْأَلُونَكَ عَنِ الرُّوحِ قُلِ الرُّوحُ مِنْ أَمْرِ رَبِّي وَمَا أُوتِيتُمْ مِنَ الْعِلْمِ إِلَّا قَلِيلًا﴾ ٨٥ الإسراء.

قال تعالى ﴿أَلَمْ تَرَ أَنَّ اللَّهَ أَنْزَلَ مِنَ السَّمَاءِ مَاءً فَأَخْرَجْنَا بِهِ ثَمَرَاتٍ مُخْتَلِفًا أَلْوَانُهَا وَمِنَ الْجِبَالِ جُدَدٌ بَيَضٌ وَحُمْرٌ مُخْتَلِفٌ أَلْوَانُهَا وَغَرَابِيبُ سُودٍ، وَمِنَ النَّاسِ وَالدَّوَابِّ مُخْتَلِفٌ أَلْوَانُهُ كَذَلِكَ إِنَّمَا يَخْشَى اللَّهَ مِنْ عِبَادِهِ الْعُلَمَاءُ إِنَّ اللَّهَ عَزِيزٌ غَفُورٌ﴾ ٢٨، ٢٧ فاطر.

قال تعالى ﴿وَتَرَى الْجِبَالَ تَحْسَبُهَا جَامِدًا وَهِيَ تَمْرٌ مَرُّ السَّحَابِ صَنَّعَ اللَّهُ الَّذِي أَتَقَنَ كُلَّ شَيْءٍ إِنَّهُ خَبِيرٌ بِمَا تَعْمَلُونَ﴾ ٨٨ النمل.





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## **ABSTRACT**

***Tareq Fahmy Abdallatif Farrag.*** Magnetic Prospection For Some Archaeological Sites In Egypt. A thesis submitted to the Faculty of Science, Ain Shams University, Cairo, Egypt, for the degree of Ph.D. of Science in Geophysics, 1998.

Egypt possesses more than 33% of the discovered archaeology of the whole world. A lot of archaeology throughout the country are still hidden inside the earth and contain valuable treasures.

The aim of this study is to prospect these hidden archaeological treasures through different archaeological sites using magnetic methods.

Two magnetometers were recently developed especially for magnetic archaeoprospection. They were used for the first time throughout this study in Egypt. The first instrument is the fluxgate gradiometer, type FM36, with sensitivity of 0.1 nT, manufactured by Geoscan Company in England, 1987. It measures the vertical gradient of the geomagnetic field. The second one is the caesium vapour magnetometer, type Smartmag SM4G-Special, with sensitivity of 0.01 nT, manufactured by Scintrex Company Canada, 1996. It measures the total magnetic field of the earth.

For verifying the method, micromagnetic surveys were conducted through two archaeological sites containing known archaeological features. The first site is an ancient kiln found at the surface at Al-Lahun area in Fayoum, Egypt. The measurements were taken with the fluxgate gradiometer through a raster of 0.25 m X 0.25 m. The second site lies in an area where about 12 solar boats were discovered in Abydos, Sohag, Egypt, by an American Expedition in 1991. They were re-buried because of absence of the possibilities of overhauling and reservation. The measurements were taken by the fluxgate gradiometer through a raster of 0.5 m X 0.5 m. The results of prospecting through these two sites show excellent magnetic images of the buried bodies. They prove and verify the magnetic method, efficiency of the instruments, their sensitivity and the related softwares, where the two archaeological features were found to be very clear on the resulting magnetograms. According to these results, the fluxgate gradiometer was applied for archaeoprospection

through six archaeological sites containing probable, unknown, and undefined archaeological objects in different types of soils in Egypt. These sites are Al-Lahun (Fayoum), Abydos (Sohag), Madi (Fayoum), Hawara (Fayoum), Saqqara (Giza), and Qantir (Sharqyia), Egypt. These areas represent several types of archaeological objects buried in different types of soils, i.e., magnetic archaeological bodies (fired objects, firing places, mud bricks, and organic iron oxides) buried in non- or weakly-magnetic soils (sands) and non-magnetic archaeological objects (limestones) incorporated in magnetic soils (Nile mud, sand enriched with ceramic debris,...etc.). All measurements were taken by the fluxgate gradiometer through a raster of 0.5 m X 0.5 m except at Al-Lahun area, where the measurements were taken through a raster of 1.0 m X 1.0 m. The total number of magnetic readings is about 337000.

The magnetic data were corrected, processed and interpreted using recently-developed programs, that were produced especially for geophysical archaeoprospection. Seven magnetograms (magnetic images) show the pictures of the underground archaeological objects incorporated in these areas. Also, seven trace-plots for the hidden archaeological objects were constructed for all the surveyed archaeological sites. The results of the qualitative interpretation showed the presence of a lot of archaeological objects distributed throughout all the studied areas in the form of tombs, ancient walls, ring gullies, long ditches, parts of ancient cities, solar boats, kilns, and parts of ancient temples.

Comparison between the measurements using the fluxgate gradiometer and the caesium vapour magnetometer was done for the two archaeological sites (Saqqara and Qantir, Egypt). There is no significant difference between the results using the two instruments in locating the interesting archaeological features or structures.

Power spectrum method was used for estimating the depths of the interesting archaeological features. Twenty five samples were taken for this purpose throughout the studied areas. A sample is defined as all readings found within the grid including an interesting archaeological feature. The results of depth estimation show that all the detected archaeological objects are found at shallow depths that range from 0.15 to about 2.21 m.

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