بسم الله الرحمن الرحيم


# شبكة المعلومـــــات الجامعية

# التوثيق الالكتروني والميكروفيلم

شبكة المعلومات الجامعية

# جامعة عين شمس

## التوثيق الالكتروني والميكروفيلم

## ﴿ قـــسـم ﴾

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها
علي هذه الأفلام قد اعدت دون آية تغيرات

## يجب أن

تحفظ هذه الأفلام بعيداً عن الغبار

في درجة حرارة من 15 – 20 مئوية ورطوبة نسبية من 20-40 %

**To be kept away from dust in dry cool place of**
**15 – 25c and relative humidity 20-40 %**

# بعض الوثائق الأصلية تالفة


# بالرسالة صفحات

# لم ترد بالأصـــل

AIN SHAMS UNIVERSITY
FACULTY OF SCIENCE

# MAGNETIC PROSPECTION FOR SOME ARCHAEOLOGICAL SITES IN EGYPT

*A Thesis*

**Submitted To the Geophysics Department,
Faculty of Science, Ain Shams University,
Cairo, Egypt**

*for*

***The degree of Doctor of Philosophy of Science***

*By*

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***CAIRO, EGYPT, 1998***

# بسم الله الرحمن الرحيم

قال تعالى ﴿أو لم يروا أنا نأتي الأرض ننقصها من أطرافها والله يحكم لامعقب لحكمه وهو سريع الحساب﴾ ٤١ الرعد.

قال تعالى ﴿ويسألونك عن الروح قل الروح من أمر ربى وما أوتيتم من العلم إلا قليلا﴾ ٨٥ الإسراء.

قال تعالى ﴿ألم تر أن الله أنزل من السماء ماء فأخرجنا به ثمرات مختلفا ألوانها ومن الجبال جدد بيض وحمر مختلف ألوانها وغرابيب سود، ومن الناس والدوآب مختلف ألوانه كذلك إنما يخشى الله من عباده العلماء إن الله عزيز غفور﴾ ٢٧،٢٨ فاطر.

قال تعالى ﴿وترى الجبال تحسبها جامدة وهى تمر مر السحاب صنع الله الذي أتقن كل شئ إنه خبير بما تعملون﴾ ٨٨ النمل.

# ACKNOWLEDGEMENTS

*In the first place, praise be to **GOD** and gratitude is due to almighty **GOD** who ided and guided me to bring forth this thesis to light. Thanks **GOD**.*

*I would like to express my great indebtedness and deep gratefulness to **Prof.Dr.A.M.Sabri**,Professor of Geophysics, Geophysics Department, Faculty of Science, Ain Shams University, Cairo, Egypt, for his kind supervision, doing his best in solving all the problems which I'd faced during the long run of research work, the interpretation and guidance in the preparation of this thesis.*

*My heartfelt gratitude to **Prof.Dr.N.M.Abu Ashour**, Professor of Geophysics and Head of Geophysics Department, Faculty of Science, Ain Shams University, Cairo, Egypt, for offering the facilities for this work.*

*I have great pleasure in expressing my deep gratitude to **Prof.Dr.A.G.Hussain**, Professor of Geophysics and Head of the Department of Geomagnetism and Geoelectricity, National Research Institute of Astronomy and Geophysics (NRIAG), Helwan, Cairo, Egypt, who suggested this point of research, for his joint supervision, valuable scientific discussion, comments and continuous and effective moral assistance which encourage me to complete this work.*

*I am also grateful to **Prof.Dr.F.M. Ahmed**, Professor of Geophysics and Head of laboratory of Geomagnetism, National Research Institute of Astronomy and Geophysics, for his generous supervision and offer to accomplish this work, continuous encouragement and providing me with all possible facilities during the preparation of this thesis.*

*My deep thanks to **Dr.H.Becker**, Geophysicist in Bayerisches Landesamt fur Denkmalpflege, Department of Archaeological Prospection and Aerial Archaeology, Munchen, Germany, for his kind supervision, excellent field experience, valuable scientific discussion,*

*comments, and providing me with all requirements for completing this work.*

*My heartfelt gratitude to* ***Dr.H.Odah****, lecturer of geophysics, Lab. of Geomagnetism, NRIAG, for his valuable scientific helping, good efforts, and continuous moral assistance.*

*My gratitude also extends to* ***Dr.J.Fassbinder****, Bayerisches Landesamt fur Denkmalpflege, Munchen, Germany, and* ***Dr.T.Herbich,*** *Manager of Polish Center for Archaeology, Egypt, for their valuable scientific discussion, comments and cooperation.*

*Special thanks for* ***Mr. Atef.A.M.Ismail****, Assistant lecturer, Exploration Division, Nuclear Materials Authority for his valuable assistance in this thesis.*

*The author expresses his thanks and gratitude to the staff members of the Laboratory of Geomagnetism,* ***Dr.M.Noshi, Dr.M. Abdalaal, Dr.A.Salah, Mr.T.T.Rabeh, Mr.A.Bakr, Mr.M.Mekkawi, Mr.A.H.Said, Mr.E.Abboud, Mr.A.Al-Qotb*** *for their assistance in the field work.*

*Many thanks are also for the* ***Authority of Archaeology****, Abbasiya, Cairo, Egypt, and all its managers and inspectors in Fayoum, Abydos, Saqqara, and Qantir, Egypt, for offering their facilities during this field work.*

*Finally, from all my heart, I feels indebted to* ***My Family*** *for their great help and permanent care.*

# *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 X0.5 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 ditchs, 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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