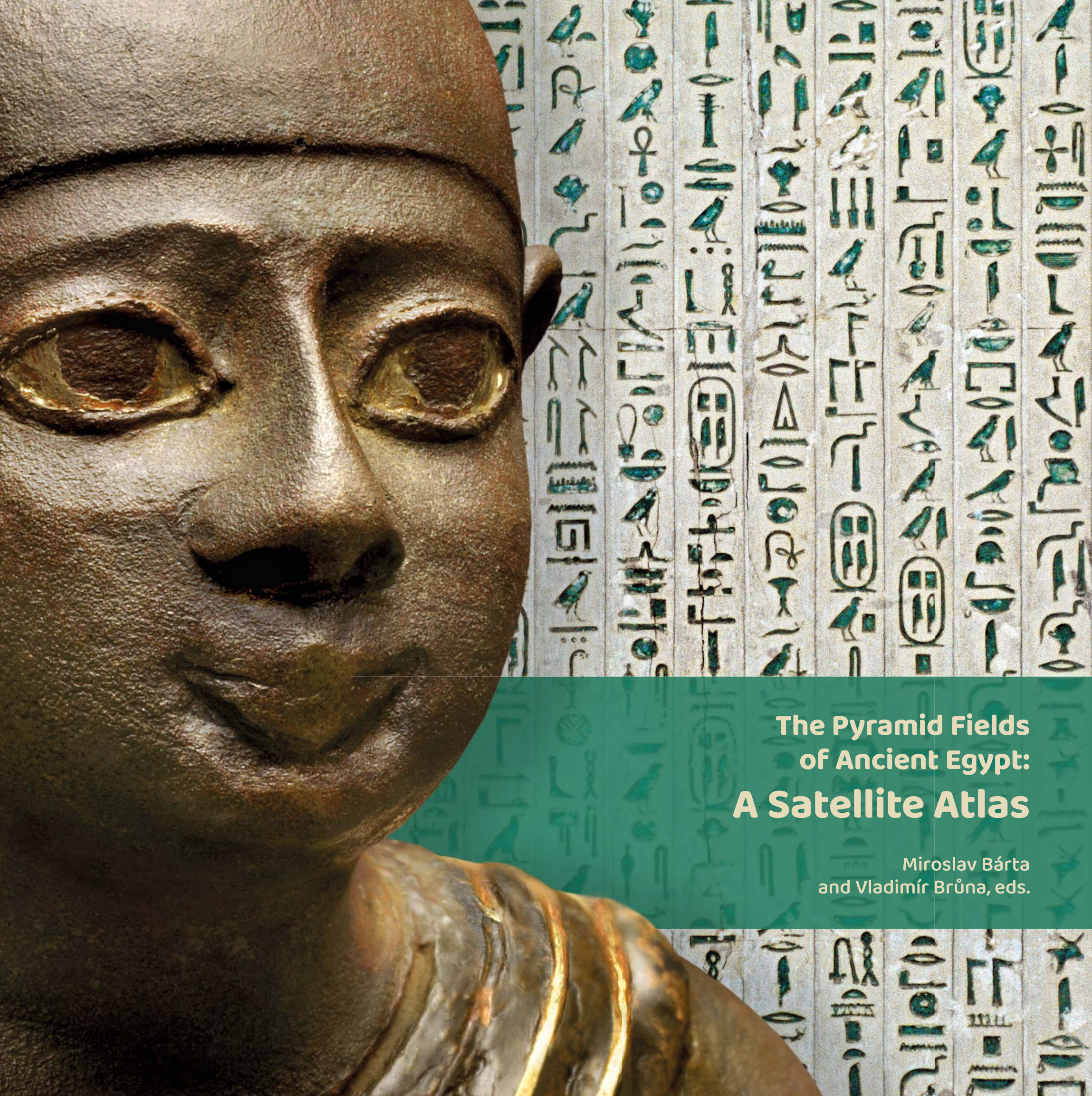

The Pyramid Fields of Ancient Egypt: A Satellite Atlas

Miroslav Bárta
and Vladimír Brůna, eds.

THE PYRAMID FIELDS OF ANCIENT EGYPT: A SATELLITE ATLAS

THE PYRAMID FIELDS OF ANCIENT EGYPT:
A SATELLITE ATLAS

Miroslav Bárta and Vladimír Brůna, eds.
Reviewed by Jozef Hudec and Anthony Spalinger
Designed by N.A.F. PRAHA s.r.o.

ISBN 978-80-7671-053-5

The publication was compiled within the framework of the Charles University Progress project Q11 – "Complexity and resilience. Ancient Egyptian civilisation in multidisciplinary and multicultural perspective", and non-investment subsidy 1-VEG2021, No. MŠMT-227/2021-8

CZECH INSTITUTE OF EGYPTOLOGY
Faculty of Arts
Charles University

CHARLES UNIVERSITY

newman+friends

Pyramid Fields of Ancient Egypt

Abu Rawash
A. Ćwiek ____ 16
A necropolis dominated by the pyramid of Djedefra and featuring several Old Kingdom cemeteries and perhaps also the pyramid of Huni.

Giza
M. Lehner ____ 24
One of the most impressive necropoleis of the Old Kingdom with dozens of non-royal tombs and with some of the largest pyramids ever built in history – the Fourth Dynasty complexes of Khufu, Khafra and Menkaura.

Zawiyet el-Aryan
M. Verner ____ 54
One of the least understood pyramid sites of the Old Kingdom with two poorly explored royal monuments.

Abu Ghurab
M. Nuzzolo ____ 60
A site north of the Abusir necropolis with so far two discovered sun-temple complexes belonging to Userkaf and Nyuserra of the Fifth Dynasty.

Abusir
M. Bárta ____ 70
Principal pyramid necropolis of the Fifth Dynasty with the pyramid complexes of Sahura, Neferirkara, Ranefereref and Nyuserra and with several cemeteries, in the south merging with Saqqara.

Saqqara
M. Bárta – V. Dulíková – M. Megahed ____ 88
Most important Memphite cemetery of the whole third millennium BC, featuring the first stone-built complex of King Djoser, and many Early Dynastic and Old Kingdom monuments.

Dahshur
A. Oppenheim – D. Arnold – S. J. Seidlmayer ____ 122
Principal cemetery with two complexes and pyramids of the Founder of the Fourth Dynasty Snofru and several Middle Kingdom royal monuments.

Mazghuna
M. Bárta ____ 142
Next to Zawiyet el-Aryan, another poorly explored royal cemetery with the pyramids of Sobeknofru and Amenemhat IV.

Meidum
P. Jánosi ____ 146
This is the cemetery where the history of the Fourth Dynasty begins. It is dominated by a single pyramid, that of of Snofru, with a huge cemetery of large mastabas of several members of his family.

Lisht
D. Arnold – A. Oppenheim ____ 152
This is a site of key importance for the beginning of the Twelfth Dynasty, as it contains the pyramid complexes of Amenemhat I and Senusret I.

El-Lahun
P. Jánosi ____ 168
Another Middle Kingdom cemetery with the complex of Senusret II, many largely unexplored cemeteries and a historically unique city.

Hawara
P. Jánosi ____ 176
One more spectacular site of the Middle Kingdom with the pyramid complex of Amenemhat III and the famous Labyrinth.

Abydos
J. Wegner ____ 184
This is one of the most famous cemeteries of ancient Egypt since the Predynastic Period which also features the final resting place of Senusret III.

Small pyramids
R. Bussmann ____ 192
A set of seven small pyramids of the early Old Kingdom represent another enigma of the history of third millennium BC Egypt.

Acknowledgement

The editors wish to thank all the authors and many individuals and institutions who made this project happen.

First of all we extend our heartfelt thanks to the authors for their dedicated work and patience during the difficult and demanding stages of this ambitious project – Adela Oppenheim and Dieter Arnold, The Metropolitan Museum of Arts, New York; Richard Bussmann, University of Cologne; Andrzej Ćwiek, University of Poznan; Veronika Dulíková, Czech Institute of Egyptology, Charles University, Prague; Peter Jánosi, University of Vienna; Mark Lehner, Ancient Egypt Research Associates and "Associate" at the Oriental Institute, University of Chicago; Mohamed Megahed, Czech Institute of Egyptology, Charles University, Prague; Massimiliano Nuzzolo, Institute of Mediterranean and Oriental Cultures, Polish Academy of Sciences; Stephan Seidlmayer, German Archaeological Institute, Cairo; Miroslav Verner, Czech Institute of Egyptology, Charles University, Prague, and Josef Wegner, University of Pennsylvania, Philadelphia.

This project would not have been possible without the kind support of the Egyptian Ministry of Tourism and Antiquities and our dear colleagues and friends at the inspectorates of the individual sites included in this publication.

Individual authors would like to acknowledge help and support from several institutions and acknowledge various grants. Richard Bussmann would like to thank Egypt Exploration Society (pilot funding), Uschebti e.V. (private donor), Deutsche Forschungsgemeinschaft (project grant BU 3521/3-1 "Sozialisierung der Landschaft im frühen altägyptischen Staat: der Friedhof des frühen Alten Reiches von Zawyet Sultan"), Inspectorate of el-Minya, University of Cologne, University of Pisa and University College London.

Massimiliano Nuzzolo thanks the following projects: *Virtual Reconstruction of the Sun Temple of Niuserra at Abu Ghurab* (project number 893: years 2010 – ongoing), funded by the Italian Ministry of Foreign Affairs and L'Orientale University of Naples (project scientific responsibility: Dr. Andrea D'Andrea). *The rise and development of the solar cult and architecture in Third Millennium BC Egypt* (project no. 17–10799S: years 2017–19) funded by the Czech Science Foundation – Grant Agency of the Czech Republic (project scientific responsibility: Dr. Massimiliano Nuzzolo) and *Sun Temples Project. Religious spaces, ideological patterns and social dynamics of constructing the sacred landscape in Third Millennium BC Egypt* (project no. 2019/34/E/HS3/00438: years 2020–24), funded by the National Science Centre of Poland (project scientific responsibility: Dr. Massimiliano Nuzzolo).

Stephan Seidlmayer would like to thank the Deutsche Forschungsgemeinsachft (project grants SE 719/4 „Die Residenznekropole von Dahschur in Ägypten" and SE 719/8 „Ein Gräberbezirk des Mittleren Reiches bei der Pyramidenanalage Amenemhets II. in Dahschur in Ägypten") as well as the Institute of Physical Geography of the Freie Universität Berlin (Prof. Dr. Britta Schütt and Prof. Dr. Wiebke Bebermeier).

The editors would like to express their gratitude for the generous help and assistance of Jolana Malátková (graphic designer at the Czech Institute of Egyptology), Martina Bardoňová, Veronika Dulíková, Alexandra Pastoreková and Martin Odler (Czech Institute of Egyptology). They were always there for us. Zahi Hawass, Mark Lehner, Mohamed Megahed, Sandro Vannini with Giulia De Dominicis (Laboratoriorosso) kindly provided help with some badly needed photographs as did Hratch Papazian, Cambridge University and Gregory Marouard, Yale University. Petr Košárek, Czech Institute of Egyptology, kindly went to several pyramid sites to obtain recent photographs.

Jaroslav Kroužek (Truskavna) supported the work on this book in many ways. Marie Háková from the GISAT company, Prague, never failed to provide advice and support when looking for the best satellite images available. Jiří Šustera amply edited individual satellite images for publication.

Janka Gregorcová, Marek Novák and the whole team of the N.A.F. PRAHA graphic design studio were absolutely essential in every step of the preparation of this publication and always full of ideas about how to improve individual chapters and the book overall. Anthony Arias carefully edited most chapters of the manuscript.

Despite all our efforts, any mistakes remain the responsibility of the editors.

The publication was supported within the framework of the Charles University Progress project Q11 – *"Complexity and resilience. Ancient Egyptian civilisation in multidisciplinary and multicultural perspective"* and by a grant provided by the Czech Ministry of Education, Youth and Sports (MŠMT Grant VEG 2021, MSMT- 227/2021–1).

Abbreviations

ACER	The Australian Centre for Egyptology Reports (Sydney)
ASAE	Annales du Service des Antiquités de l'Égypte (Cairo)
ASOR	The American Schools of Oriental Studies (Boston)
AV	Archäologische Veröffentlichungen (Wiesbaden)
BARCE	Bulletin of the American Research Center in Egypt (San Antonio, Cairo)
BdE	Bibliothèque d'Étude (Cairo)
BCE	Bulletin de Liaison de La Céramique Égyptienne (Cairo)
BES	Bulletin of the Egyptological Seminar of New York (New York)
BIE	Bulletin de l'Institut égyptien, Bulletin de l'Institut d'Égypte (Cairo)
BIFAO	Bulletin de l'Institut français d'archéologie orientale (Cairo)
BMSAES	British Museum Studies in Ancient Egypt and Sudan (London)
BSAE	British School of Archaeology in Egypt (London)
CAJ	Cambridge Archaeological Journal (Cambridge)
CRAI	Comptes rendus de l'Académie des Inscriptions et Belles-lettres (Paris)
EA	Egyptian Archaeology (London)
EDAL	Egyptian & Egyptological documents, archives, libraries (Milano)
GM	Göttinger Miszellen. Beiträge zur ägyptologischen Diskussion (Göttingen)
IFAO	Institut français d'archéologie orientale (Cairo)
JARCE	Journal of the American Research Center in Egypt (Columbus, GA)
JAS	Journal of Archaeological Science (Elsevier)
JEA	Journal of Egyptian Archaeology (London)
JFA	Journal of Field Archaeology (London)
JSSEA	Journal of the Society of the Study of Egyptian Antiquities (Toronto)
MDAIK	Mitteilungen des Deutschen Archäologischen Instituts Abteilung Kairo (Berlin, Wiesbaden)
MIFAO	Mémoires publiés par les membres de l'Institut français d'archéologie orientale (Cairo)
OLA	Orientalia Lovaniensia Analecta (Leuven)
OMRO	Oudheidkundige Mededelingen uit het Rijksmuseum van Oudheden (Leiden)
Orientalia	Comment. periodici Pontif. Inst. Biblici (Rome)
PA	Památky Archeologické (Prague)
PES	Prague Egyptological Studies (Prague)
P.O.B.	Point of Beginning (Troy, Mi)
RdE	Revue d'égyptologie (Paris)
RecTrav	Recueil de travaux relatifs à la philologie et à l'archéologie égyptiennes et assyriennes (Paris)
SAK	Studien zur Altägyptischen Kultur (Hamburg)
SASAE	Supplement of ASAE (Cairo)
ZÄS	Zeitschrift für ägyptische Sprache und Altertumskunde (Berlin)

Chronological table

Based on Hornung, Erik – Krauss, Rudolf – Warburton, David A., 2006 *Ancient Egyptian Chronology*, Leiden – Boston: Brill *[Handbook of Oriental Studies. Section One. The Near and Middle East 83]*, pp. 490–498.

Predynastic Period	c. 4500–3150 BC
0 Dynasty	? – c. 3150
?	?
Ro (?)	?
Sereq	?
Qa	?

Early Dynastic Period	c. 2900–2545±25 BC
First Dynasty	c. 2900–2730±25 BC
Narmer	c. 2900–?±25 BC
Aha	?–2870±25 BC
Djer	2870–2823±25 BC
Wadji (formerly Djet)	2822–2815±25 BC
Den	2814–2772±25 BC
Anedjib	2771–2764±25 BC
Semerkhet	2763–2756±25 BC
Qa-a	2755–2732±25 BC
Second Dynasty	c. 2730–2590±25 BC
Hetepsekhemwy	2730–?±25 BC
Raneb	?–2700±25 BC
Nynetjer	2700–2660±25 BC
Peribsen	2660–2650±25 BC
Sekhemib	2650–?±25 BC
Sened	?–2610±25 BC
Khasekhemwy	2610–2593±25 BC

Old Kingdom	c. 2592–2120±25 BC
Third Dynasty	c. 2592–2544±25 BC
Djoser (Netjerikhet)	2592–2566±25 BC
Sekhemkhet	2565–2559±25 BC
Khaba	2559–?±25 BC
Nebka	?
Huni	?–2544±25 BC
Fourth Dynasty	c. 2543–2436±25 BC
Snofru	2543–2510±25 BC
Khufu	2509–2483±25 BC
Djedefra	2483–2475±25 BC
Baufra?	2474–2473±25 BC
Khafra	2472–2448±25 BC
Menkaura	2447–2442±25 BC
Shepseskaf	2441–2436±25 BC
Fifth Dynasty	c. 2435–2306±25 BC
Userkaf	2435–2429±25 BC
Sahura	2428–2416±25 BC
Neferirkara	2415–2405±25 BC
Raneferef	2404±25 BC
Shepseskara	2403±25 BC
Nyuserra	2402–2374±25 BC
Menkauhor	2373–2366±25 BC
Djedkara	2365–2322±25 BC
Unas	2321–2306±25 BC
Sixth Dynasty	c. 2305–2152±25 BC
Teti	2305–2279±25 BC
Userkara	?
Pepy I (Meryra)	2276–2228±25 BC
Merenra I	2227–2217±25 BC
Pepy II (Neferkara)	2216–2153±25 BC
Merenra II	2152±25 BC
Eighth Dynasty	c. 2150–2118±25 BC
Neferkaura	2126–2113±25 BC
Neferkauhor	2122–2120±25 BC
Neferirkara	2119–2118±25 BC

First Intermediate Period	c. 2118–1980±25 BC
Ninth and Tenth Dynasty	c. 2118–1980±25 BC
Local rulers from Herakleopolis Magna	

Middle Kingdom	c. 1980±16–1760 BC
Eleventh Dynasty	c. 2080–1940±16 BC
Mentuhotep I	1980–?±16 BC
Intef I (Sehertawy)	?–2067±16 BC
Intef II (Wahankh)	2066–2017±16 BC
Intef III (Nakhtnebtepnefer)	2016–2009±16 BC
Mentuhotep II (Nebhepetra)	2009–1959±16 BC
Mentuhotep III (Sankhkara)	1958–1947±16 BC
Mentuhotep IV (Nebtawyra)	1947–1940±16 BC
Twelfth Dynasty	1939±16–1760 BC
Amenemhat I (Sehetepibra)	1939–1910±16 BC
Senusret I (Kheperkara)	1920–1875±6 BC
Amenemhat II (Nubkaura)	1878–1843±3 BC
Senusret II (Khakheperra)	1845–1837 BC
Senusret III (Khakaura)	1837–1819 BC
Amenemhat III (Nimaatra)	1818–1773 BC
Amenemhat IV (Maakherura)	1772–1764 BC
Queen Sobekneferu (Sobekkara)	1763–1760 BC
Thirteenth Dynasty	1759–c. 1539 BC
Wegaf	1759–1757 BC
Amenemhat VII	c. 1753–1748 BC
Sobekhotep II	1737–1733 BC
Khendjer	c. 1732–1728 BC
Sobekhotep III (Sekhemrasewadjtawy)	c. 1725–1722 BC
Neferhotep I (Khasekhemra)	c. 1721–1710 BC
Sobekhotep IV (Khaneferra)	c. 1709–1701 BC
Sobekhotep V	c. 1700–1695 BC
Ibiya	c. 1695–1685 BC
Aya	c. 1684–1661 BC
Ini	c. 1684–1661 BC
Suadjtu, Ined, Hori, Dedumose	c. 1660–1659 BC

Second Intermediate Period	1759–c. 1630 BC
Fourteenth Dynasty	?
Fifteenth Dynasty (Hyksos rulers)	?–c. 1530 BC
Khyan (Seuserenra)	
Apepi (Auserra)	c. 1575–1540
Khamudi	
Sixteenth and Seventeenth Dynasty	?–1540 BC
Sobekhotep VIII, Nebiriau, Rahotep, Sobekemsaf I a II, Bebiankh	?
Intef (Nubkheperra)	?
Taa I (Senakhtenra)	?
Taa II (Seqenenra)	?
Kamose (Wadjkheperra)	?–1540 BC

General view of North Saqqara necropolis looking south (M. Bárta)

Introduction

Miroslav Bárta

The principal aim of this publication is to provide high-resolution satellite images of all Old and Middle Kingdom pyramid sites in Egypt. The sites included in this Atlas represent to a large degree the principal sites of the Third through the Thirteenth Dynasty. Their particular characteristics mirror the specific periods of Egyptian history and in a way may be considered as genuine time capsules that provide fascinating windows into the incredible story ancient Egypt once was.

These sites are as follows (starting in the north): Abu Rawash, Giza, Zawiyet el-Aryan, Abusir, Saqqara, Dahshur, Mazghuna, Lisht, Meidum, Lahun, Hawara and Abydos. Also included is the site of Abu Ghurab with the two sun temples of Userkaf and Nyuserra of the Fifth Dynasty and the so-called minor step pyramids dating from the late Third – early Fourth Dynasty which start in Seila at the northeastern edge of the Faiyum Oasis and include, proceeding north to south, those of Zawyet Sultan, Nubt (Naqada), Abydos (Sinki), Hierakonpolis (el-Kula), Edfu (Ghonemeia) and Elephantine. The existence of the eighth minor pyramid at the Delta site of Athribis can no longer be confirmed.

It has been our aim to characterise individual sites on the background of their local topography and changing nature of their development over time as reflected by the position of individual monuments, including the principal ones – the pyramids of the Old and Middle Kingdom. Individual chapters focus on principal royal and non-royal monuments, their locations and their significance both within the site and with regard to neighbouring sites with pyramid complexes (see for instance Bárta 2005). Each chapter, each site provides a different story in terms of its structure and content. This reflects the simple fact that every site developed under different conditions, in a different local setting, had its own internal logic, its pace and its genuine characteristics. Each site also mirrors a specific historical situation and tells a different story of its development and rediscovery.

It is a welcome fact that the last few decades witnessed in Egyptology a quick rise in the application of remote sensing techniques, satellite imagery being one of the most important of them. Yet, despite the increasing effort

This table summarizes the basic characteristics of all the satellite images used for this publication. Some of them are from as early as 2002, 2004 or 2005; nevertheless, in a quality corresponding to the most recent ones commissioned during the years 2019, 2020 or even 2021

Area	Source	Catalog ID	Acq Date	Area Clouds	Area Off Nadir
Abu Rawash	QB	1010010004277207	Apr 07, 2005	0 %	26.0°
Giza	WV03	104001006D062E00	Oct 10, 2021	0 %	24.3°
Zawiyet el-Aryan	QB	1010010004FEF103	May 29, 2006	0 %	9.0°
Abu Ghurab	WV02	10300100B09AE900	Nov 30, 2020	0 %	17.1°
Abusir	WV02	10300100B09AE900	Nov 30, 2020	0 %	17.1°
North and Central Saqqara	WV02	10300100B09AE900	Nov 30, 2020	0 %	17.1°
South Saqqara	WV02	10300100B09AE900	Nov 30, 2020	0 %	17.1°
Dahshur North	WV03	104001005D314C00	May 28, 2020	0 %	25.7°
Dahshur Centre and South	WV03	104001005D314C00	May 28, 2020	0 %	25.7°
Mazghuna	WV03	104001005D314C00	May 28, 2020	0 %	25.7°
Meidum	WV02	1030010094370200	Jun 03, 2019	0 %	27.0°
Lisht	QB	10100100035EA701	Nov 04, 2004	1 %	19.0°
Lahun	QB	1010010004390001	May 08, 2005	0 %	14.0°
Hawara	QB	101001000EC02	Nov 12, 2002	0 %	8.0°
Abydos	WV03	104001005E13BE00	Aug 11, 2020	0 %	28.2°

Satellite data source table
(QB – QuickBird, WV02 – World View 2 – satellite sensor (0.46 m),[1] WV03 – WorldView 3 – satellite sensor (0.3 m)[2] (©2021 DigitalGlobe, Inc. and Maxar Company)

[1] https://www.l3harrisgeospatial.com/Data-Imagery/Satellite-Imagery/High-Resolution/WorldView-2.
[2] https://www.l3harrisgeospatial.com/Data-Imagery/Satellite-Imagery/High-Resolution/WorldView-3.

and intensifying use of various technologies, Egyptology still suffers from the lack of the most advanced research, isolated scholarship and the utter lack of conceptual approaches in which the latest technology could play an important and systematic role (for an overview, see now Zakrzewski – Shortland – Rowland, eds. 2015).

Aerial and satellite images have been applied in two different ways in Egyptology. The first, intra-site analysis, represents a detailed examination of a small, selected territory, for instance a cemetery or a settlement, covering just several square kilometers. This is also the case with this publication. The major issues addressed within this approach represent temporal and spatial analyses of the identified structures, their use of the local physical and symbolical landscape, the interaction between man and geomorphology and quite often the mutual relationship of sites lying next to each other.

One of the best examples of such a project may be the Theban Mapping Project, which used fourteen 1979 airplane images supplied by the Egyptian Remote Sensing Center of the Egyptian Academy of Scientific Research.[3] To this, the publication offering an interpretation of three individual and neighbouring pyramid fields of Abusir, Saqqara and Dahshur may also be added (Bárta – Brůna 2006a). In this case, satellite images were used not only to provide as detailed a picture of the sites as possible but also to offer a diachronic interpretation of the development of these sites over the last two centuries using historical maps starting with Napoleon, Lepsius and de Morgan published during the 19th century and more recent maps. Interestingly, even some early maps provide attractive and often revealing insights into the history of exploration of these sites (see Bárta – Brůna 2006a, passim).

The second principal way of using satellite imagery is much broader in its range of cope and focus, representing considerably larger territories. This approach was successfully applied in the South Sinai by Sarah Parcak and Gregory Mummford (Survey and Excavation Projects in Egypt, SEPE), who used satellite imagery to identify contemporary water sources and relate them to the past history of the examined territory in order to recognise sites from different historical periods. This approach resulted in the discovery of several previously unknown sites (Mumford – Parcak 2003).

Similar in nature was the study of the ancient settlement networks of the Eastern Delta and Middle Egypt. Sarah Parcak carried out a temporal analysis of the selected territories and demonstrated, with the use of the 1968 Corona images, the quick reduction of areas with prehistoric and historic sites as a consequence of intensive agricultural, industrial and government settlement policies (Parcak 2004 and 2005).

The last example of the use of satellite imagery is its diachronic comparative ability to reflect all temporal changes of individual sites. One particular aspect is the various forms of looting and damaging of individual sites over time (Parcak et al. 2016). Similar, detailed projects were carried out by the Czech Institute of Egyptology for the eastern part of its Abusir concession following the several weeks of instability in Egypt as a consequence of the Arab spring. The satellite image commmissioned on June 24, 2012 showed that the concession was targeted by illicit excavations on more than 210 spots!

Satellite Imagery for the Pyramid Fields

Satellite mapping and analyses started to be widespread after 1995 when the former US president Bill Clinton signed a document making available more than 860,000 satellite images made during the Cold War era between 1962–1970. These photographs were made by Corona, Argon and Lanyard satellites with a varied resolution of 2–8 m per pixel (Richelson 1999). Rather surprisingly, until 2003 there were no satellite images available of the greater part of the pyramid fields, including some of the key sites of the third millennium BC, where Giza was the only exception. In 2002, it was only the QuickBird satellite, capable of providing scenes with a resolution 61 cm per pixel in nadir and operated by the DigitalGlobe™ company (Colorado, USA). At that time, it was the sole satellite commercially providing scenes with a resolution better than one meter.

This was the main reason why the Czech Institute of Egyptology commissioned this satellite and provided the UTM coordinates of the required area, which covered an area of 65 km^2 and included Abu Ghurab, Abusir, Saqqara and Dahshur. As a result, on February 23, 2003, at 8.45 am the set area was photographed, and thus the first commercial satellite image of the pyramid fields in such a resolution was made available. Subsequently, a series of analytical studies and a final monograph interpreting the data against all available earlier maps and geophysical results were published (Verner – Hašek 1981; Mathieson 2001; Bárta 2005; Bárta – Brůna – Křivánek 2003; Bárta – Brůna 2005, 2006a and 2006b). Some of the major advantages of the imagery become self-evident: it reflects the whole examined area as a single unit, with all surface features visible at one discrete moment. Thus, the spatial relationships of individual objects – pyramid complexes, tombs and the like become more transparent. Moreover, the structuring of individual cemeteries, the siting of recognizable archaeological objects and their interaction with the local geomorphology and their participation in modelling symbolical landscape can be examined with high precision.

The Future and the Past

The first results of the application of satellite imagery during the surveying and excavating processes in Abusir have proven extremely effective, especially when combined with 3D terrain models and the results of various geophysical measurement and analysed with the help of GIS software.

In this way, new putative avenues of research may be launched, and we can expect new kinds of analytical tools to emerge in the near future. The potential of satellite imagery to monitor endangered areas must also be mentioned. In fact, all pyramid fields are located close to the cultivation zones. Thus, along these bordering settlement, agriculture and development areas and antiquities zones, the danger of conflicting interests becomes imminent. Modern cemeteries and settlements are constantly expanding, together with current development projects related to the economy and demographic curve, and these invade the antiquities areas from the east. From the western plateau of the desert, the garbage and waste disposal areas of modern Giza and Cairo are approaching and nearly descend onto these unique sites. Most recently, major communication arteries have cut through some of the most valuable zones of antiquities of South Saqqara and Dahshur, not to mention ancient Memphis.

It is strongly believed that the latest technological advances, including the employment of satellite imaging in Egyptology, will ultimately translate into their systematic use in the sites' protection and management, in site and landscape analyses and in the long-term strategies of both ongoing and future excavation and survey projects in Egypt. Currently, most pyramid fields are becoming more and more intensively endangered by the modern development and locally dominated neglect of the need for their preservation. Some of them, such as Mazghuna or Lisht are on the foremost front of this trend. Despite all the current outstanding odds, the pyramid fields of Egypt represent the very substance of ancient Egypt which has come down to us, and they deserve our attention, respect and care.

[3] Theban Mapping Project with Atlas of the Theban Necropolis: http://www.thebanmappingproject.com.

BIBLIOGRAPHY

Bárta, Miroslav
2005 "Location of the Old Kingdom pyramids in Egypt", *CAJ* 15(2), pp. 177–191.

Bárta, Miroslav – Brůna, Vladimír
2005 "Satellite imaging in the pyramid fields", *EA* 26, pp. 3–6.
2006a *Satellite atlas of the pyramids: Abu Ghurab, Abusir, Saqqara, Dahshur / Satelitní atlas pyramid : Abú Ghuráb, Abúsír, Sakkára, Dahšúr*, Pilsen: Dryada.
2006b "Egypt's pyramids from on high", *KMT* 16(4), pp. 43–49.

Bárta, Miroslav – Brůna, Vladimír – Křivánek, Roman
2003 "Resarch at Abusir South in 2001–2002 – methods and results", *PA* XCIV, pp. 49–82.

Mathieson, Ian
2001 "The National Museum of Scotland Saqqara Survey Project 1990–2000", in Bárta, Miroslav – Krejčí, Jaromír (eds.), *Abusir and Saqqara in the Year 2000, Archiv orientální Supplementa IX*, Prague: Oriental Institute, pp. 33–42.

Mumford, Gregory – Parcak, Sarah
2003 "Pharaonic ventures into South Sinai", *JEA* 89, pp. 83–116.

Parcak, Sarah
2004 "Finding new archaeological sites in Egypt using satellite remote sensing: case studies from Middle Egypt and the Delta", in Wang, C. (ed.), *International Conference on remote sensing Archaeology*, Beijing: Chinese Centre for Remote Sensing Archaeology.
2005 "Satellites and survey in Middle Egypt", *EA* 28, pp. 28–32.

Parcak, Sarah – Gathings, David A. – Childs, Chase – Mumford, Gregory – Cline, Eric
2016 "Satellite evidence of archaeological site looting in Egypt: 2002–2013", *Antiquity* 90(349), pp. 188–205. *doi:10.15184/aqy.2016.1.*

Richelson, Jeffrey T.
1999 "U.S. Satellite Imagery, 1960–1999", *National Security Archive Electronic Briefing Book No. 13 (April 14, 1999), https://nsarchive2.gwu.edu/NSAEBB/NSAEBB13/.*

Verner, Miroslav – Hašek, Vladimír
1981 "Die Anwendung geophysikalischen Methoden bei der archäologischen Forschung in Abusir", *ZÄS* 108, pp. 68–84.

Zakrzewski, Sonia – Shortland, Andrew – Rowland, Joanne (eds.)
2015 *Science in the Study of Ancient Egypt, Routledge Studies in Egyptology*, London: Routledge.

View of Abusir South with red dots marking illegal excavations during the so-called Arab spring (satellite image taken on June 24, 2012, WV02, Cat. ID 103001001ACBC800)