

MECHANICAL ENGINEERING IN ANCIENT EGYPT, PART 67: OSTRACA INDUSTRY

Prof. Dr. Galal Ali Hassaan*

Emeritus Professor, Department of Mechanical Design & Production, Faculty of Engineering,
Cairo University, Egypt.

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***Corresponding Author**

**Prof. Dr. Galal Ali
Hassaan**

Emeritus Professor,
Department of Mechanical
Design & Production,
Faculty of Engineering,
Cairo University, Egypt.

ABSTRACT

The ancient Egyptians used ostraca as one of the means for writing and drawing since the Predynastic to their Late Periods. The paper handles how they used this cheaper technique to authorize their different activities as a civilized nation. Shape, material, period or dynasty, script type, ink color, characteristics and features and present location (if known) are all aspects to be outlined by the paper.

KEYWORDS: Mechanical engineering, Ancient Egypt, ostraca industry, ancient writing media.

INTRODUCTION

This is the 67th paper in a series of research papers aiming at investigating the evolution of mechanical engineering during the ancient Egypt history. The paper handles the production of ostraca during the Predynastic and Dynastic Periods of ancient Egypt. The ancient Egyptians used pottery sherds and limestone flakes to produce ostraca for use as notepads for use by students in scribal schools, by administrators to write official notes, to record goods, to calculate taxation, to write scribal messages, to draw sketches for art works, to make votive offerings to gods and the deceased.^[1]

Maravelia, 2000 studied the principal love poem's in ostraca found in Deir el-Medina. This ostrakon had 31 fragments and still far from complete. She explained 13 poems in the stacon. She also studied the poem in the O. De M 1078 and O. De M 1079 ostraca.^[2] Hendricks and

Friedman, 2003 studied a Predynastic ostrakon from Hierakonopolis just before the first Dynasty from a temple at HK29A. They announced that it was a sherd of a red polished Nile silt bowl inscribed from both sides. The cow goddess Bat was inscribed on both sides of the ostrakon with another image on one of the sides.^[3] Samie, 2009 in his M. Phil. Thesis studied the hieratic ostraca of the Ramesside Period in the Egyptian Museum of Cairo. His work covered 31 ostraca from the Valley of the Kings with various texts. He presented the studied ostraca with hieratic and hieroglyphic texts.^[4] Babcock, 2012 outlined that ostraca were flakes of limestone used as notepads for private letters, laundry lists, records of purchases and copies of literacy works. He argued that the figured ostraca served as artistic drafts for the illustrated papyri.^[5]

Gregory, 2013 outlined that Heriho, the Theban Official under last Ramesside ruler did not appear in the inscription of one of the two ostraca of this period. He referred to the ostrakon of Nesamun and how it referred to Piankh as the fan bearer and first servant of Amun-Re.^[6] Cooney, 2013 in her study of the apprenticeship and figured ostraca from Deir el-Medina of Egypt presented limestone ostrakon for a standing Pharaoh from the New Kingdom wearing the Blue crown, a limestone ostrakon of two Pharaoh profiles from the 19th Dynasty and ostraca pair of a Pharaoh from Berlin Museum.^[7] Jennifer, 2014 in his Thesis about the anthropomorphized animal imagery on New Kingdom ostraca and papyri outlined that in his thesis, it was the first time the vignettes were given a full art historical treatment and it addressed the aesthetic value of the drawings in ancient Egypt. Also, his work discussed the narrative potential of the ostraca and papyri on which the anthropomorphized images were drawn.^[8]

Haring and Soliman, 2014 outlined that the ostraca of the 20th Dynasty combined marks, calendar dates and further types of information. They showed that some of these ostraca could be read sign by sign after comparison with corresponding hieratic sources. They presented photos for some of the 20th Dynasty ostraca.^[9] Hassan, 2015 presented a number of hieratic ostraca stored in the basement of the Egyptian Museum of Cairo written in black and red ink. According to the topics and palaeography of the texts, the author suggested that they were dated to the first half of the 18th Dynasty.^[10] Hassan, 2016 studied two hieratic ostraca from Late 20th and Early 21st Dynasties. One of them listed 22 names of workmen while the other one was an account of 87 workmen from various places.^[11]

Ali, 2017 presented nine ostraca from Elephantine in display in the Egyptian Museum of Cairo containing many texts from the second century AD.^[12] Wikipedia, 2017 wrote an article about Saqqara ostrakon dated to the period of King Djoser (2650 BC). It was a limestone flake of 150 x 175 x 50 mm dimensions and mentioned some of the measurement units (cubits, palms and fingers).^[13] Wikipedia, 2018 wrote an article about ostrakon and presented a figure ostrakon from the New Kingdom, a medical ostrakon from Deir el-Medina and Saqqara dream ostrakon of scribe Hor written in 65 demotic text on pottery and limestone.^[14]

Predynastic Ostrakon

Because the ancient Egyptians were a civilized nation they were keen to register their working and religious aspects from a very early times. The example we have from the Predynastic Period is a bowl sherd manufactured from Nile silt and used as a figuring ostrakon drawn on both sides for cow goddess 'Bat' produced during the time of Naqada III (3200-3000 BC) and shown in Fig.1.^[3] The dimensions nor the present location were not assigned.

Early Dynastic Ostraca

The Early Dynastic Period of the ancient Egyptian history covers both the 1st and 2nd Dynasties over a time span from 3150 to 2686 BC.^[15] We have one example from this period dated to the 1st Dynasty (3100 BC) from the tomb of Hemaka, an official during the reign of King Den (seal Bearer of the King) shown in Fig.2.^[16] It is a painted limestone ostrakon having a semi-rectangular shape of the figuring type depicting a bull and a baboon. The dimensions and present location of the ostrakon were not assigned. This more than 5100 years old ostrakon depicts the outstanding technology of the ancient Egyptians used in the pigments industry that could produce pigments sustained the environmental effects for more than 5100 years !!.

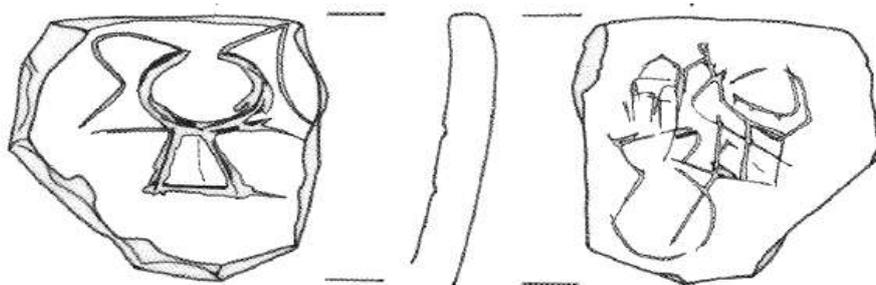


Fig. 1: Ostrakon from Naqada III.^[3]



Fig. 2: Limestone ostrakon from first Dynasty.^[16]

Old Kingdom Ostraca

- The Old Kingdom of ancient Egypt covers the Dynasties from the 3rd to the 6th over a time span from 2686 to 2181 BC.^[17] We have two example of the ostraca produced during this period presented as follows:
- The first example is a probably limestone figuring ostrakon from the 4th-6th Dynasties (2700-2200 BC) shown in Fig.3.^[18] The ostrakon shows a cat punishing a guilty ancient Egyptian under the supervision of a mouse wearing a human dress and holding a staff by both hands.

The dimensions nor the present location were not assigned.



Fig. 3: Ostrakon from 4th-6th Dynasties.^[18]

- The second example is a 180 mm height limestone hieratic text ostrakon from the Old Kingdom (2686-2181 BC) in display in Leiden Museum at Leiden and shown in Fig.4^[19]. The text was written in five rows using black ink.



Fig. 4: Limestone ostracon from Old Kingdom.^[19]

Middle Kingdom Ostraca

The Middle Kingdom of ancient Egypt covers the 11th and 12th Dynasties over a time span from 2050 to 1710 BC.^[20] We have two ostraca examples from the 12th Dynasty presented as follows:

- The first example is a 245 mm height limestone account ostracon from the 12th Dynasty, reign of King Amenemhat I (1981-1975 BC) in display in the Metropolitan Museum of Art and shown in Fig.5.^[21] It was written using a black ink and a hieratic font in mixed writing style (horizontal, vertical and inverted U styles). The ostracon records the wages of tomb workers and artists.

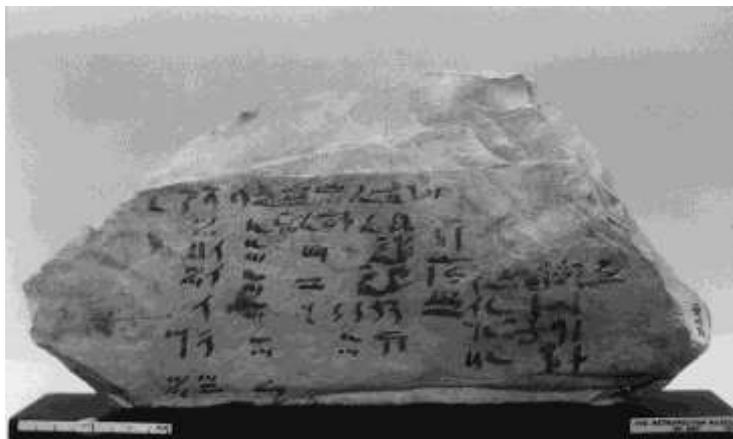


Fig. 5: Limestone ostracon from the 12th.^[21]

- The second example is a 105 mm height pottery ostracon from the 12th-13th Dynasties (1981-1640 BC) in display in the Metropolitan Museum of Art at NY and shown in Fig.6.^[22] It was written using the hieratic font and a black ink.
- The third example is a 78 mm pottery ostracon from the 12th-13th Dynasties (1850-1750 BC) in display in the Metropolitan Museum of Art and shown in Fig.7.^[23] It was of the figuring type predicting a sketch for three mummies set in parallel.



Fig. 6: Pottery ostracon from 12th-13th Dynasties.^[22] Fig. 7: Pottery ostracon from 12th- 13th Dynasties.^[23]

New Kingdom Ostraca

The New Kingdom of ancient Egypt comprised from the 18th to the 20th Dynasties over a time span from 1570 to 1069 BC ^[24]. As the strongest and most wealthy Kingdom in the ancient history of Egypt we expect to have a rich collection of the New Kingdom ostraca. In fact we have about thirty examples of different types of ostraca presented as follows:

- The first example is a 160 mm height limestone ostracon from the 18th Dynasty (1479-1458 BC) in display in the Metropolitan Museum of Art at NY and shown in Fig.8.^[25] It was of the figuring type presenting three ancient Egypt symbols: the Ankh, the Djed and the Was scepter. The artist made the ostracon as a modern graph paper to adjust the dimensions of the drawn objects on it. He used red grid and black drawings.
- The second example is a painted limestone figuring ostracon from the 18th Dynasty (1479-1425 BC) in display in the Metropolitan Museum of Art and shown in Fig.9.^[26] It depicts an image for a striding hippopotamus. It reflected a high caliper art produced in three colors could sustain the environmental effects for more than 3400 years.



Fig. 8: Limestone ostracon from 18th Dynasty.^[25]



Fig. 9: Limestone ostracon from 18th Dynasty.^[26]

- The third example is a 100 mm height painted figuring limestone ostracon for Senenmut, architect and government official of Pharaoh Hatshepsut of the 18th Dynasty (1479-1458 BC) in display in the Metropolitan Museum of Art and shown in Fig.10.^[27] The image showed a double view of the great architecture engineer as if he is looking to the future of Egypt.
- The fourth example is a 225 mm height figuring limestone ostracon for Senenmut of the 18th Dynasty (1479-1458 BC) in display in the Metropolitan Museum of Art and shown in Fig.11.^[28] The artist had drawn a grid of red lines on the limestone to be able to adjust the image of Senenmut.



Fig. 10: Limestone ostracon from 18th Dynasty.^[27]



Fig. 11: Limestone ostracon from 18th Dynasty.^[28]

- The fifth example is an 80 mm height figuring limestone ostracon from the 18th Dynasty (1470-1458 BC) in display in the Metropolitan Museum at NY and shown in Fig.12.^[29] The artist used brown grid to adjust the dimensions of the drawn donkey.
- The sixth example is 344 mm height figuring limestone ostracon from the reign of Pharaoh Amenhotep III of the 18th Dynasty (1388-1350 BC) in display in the Cleveland Museum of Art and shown in Fig.13.^[30] The ostracon was inscribed from both sides. The shown side depicts an inscribed image for four human heads one of them with moustache and beard.



Fig. 12: Limestone ostrakon from the 18th Dynasty.^[29]



Fig. 13: Limestone ostrakon from the 18th Dynasty.^[30]

- The seventh example is a 350 mm height figuring limestone ostrakon for Pharaoh Akhnaten head from the 18th Dynasty (1353-1336 BC) in display in the Metropolitan Museum of Art and shown in Fig.14.^[31] The artist engraved the head of the Pharaoh in a professional way making it as it was produced in a 3D-mode.
- The eighth example is a 110 mm figuring limestone ostrakon from the 19th or 20th Dynasties (1307-1070 BC) in display in the Egyptian Museum of Cairo and shown in Fig.15.^[32] This is a wonderful fictional scene of a cat driving a flock of duck holding a staff in its left hand and a feeding basket in its right hand. The background was given a yellow color while the scene was in black ink.



Fig. 14: Limestone ostrakon from the 18th Dynasty.^[31]



Fig.15: Limestone ostrakon from the 18th 19th 20th Dynasty.^[32]

- The ninth example is a colored-figured ostrakon of a woman breastfeeding a child from the 18th-19th Dynasties (1300-1200 BC) in display in the Louvre Museum of Paris and shown in Fig.16.^[33] Most probably this limestone one depicting a women breastfeeding a baby and supervising kitchen or chemical works.

- The tenth example is a figured colored limestone ostracon of a woman acrobat dancer from the 19th Dynasty (1295-1186 BC) in display in the Egyptian Museum of Turin and shown in Fig.17.^[34] The figured scene depicted the high profession of the artist and his ability to use different colors in simulating the acrobat dancer.



Fig. 16: Limestone ostracon from the 18th-19th Dynasties.^[33]

Fig. 17: Limestone ostracon from the 19th Dynasty.^[34]

- The eleventh example is a 128 mm height figuring limestone ostracon of a running lion from the 19th-20th Dynasties (1295-1070 BC) in display in the Metropolitan Museum of Art at NY and shown in Fig.18.^[35] The scene was drawn using a single color ink (black) on the natural background of the limestone.
- The twelfth example is a 167 mm height figuring limestone ostracon for a breastfeeding woman from the 19th or 20th Dynasties (1295-1069 BC) in display in the British Museum at London and shown in Fig.19.^[36] The artist showed the lady setting on a stool and wearing a headdress.



Fig. 18: Limestone ostracon from 19th-20th Dynasties.^[35] Fig. 19: Limestone ostracon from 19th or 20th Dynasty.^[36]

- The thirteenth example is a 310 mm height limestone ostracon of Pharaoh Seti I from the 19th Dynasty (1290-1279 BC) in display in the Turin Museum at Italy and shown in Fig.20.^[37] The scene of the Pharaoh head was professionally engraved showing him

wearing a decorated Blue Crown with the Uraeus symbol on it with a thin long beard. This ostracon is really a master piece in this art one is wondering how such pieces leak out from Egypt to another countries !!.

- The fourteenth example is a limestone ostracon of a cat from the 19th-20th Dynasties (1292-1070 BC) in display in the Turin Museum at Italy and shown in Fig.21.^[38] The artist showed the cat setting and looking forward.



Fig. 20: Limestone ostracon from 19th Dynasty.^[37] Fig. 21: Limestone ostracon from 19th-20th Dynasties.^[38]

- The fifteenth example is a 75 mm height colored figuring ostracon of a woman riding a horse from the 19th Dynasty (1292-1189 BC) in display in the Fitzwilliam Museum at Cambridge and shown in Fig.22.^[39] Most probably this is a limestone ostracon where it was easy to paint. It reflects the courage of the ancient Egyptian women showing her riding the horse without a saddle.
- The sixteenth example is a figured ostracon of a boat from the 19th Dynasty (1292-1187 BC) in display in the Neues Museum at Berlin and shown in Fig.23.^[40] Probably this scene represented a Royal boat where a Pharaoh was shown wearing the White Crown with Uraeus on his forehead and a Deity in the front of the boat.



Fig. 22: Limestone ostracon from 19th Dynasty^[39]. Fig. 23: Limestone ostracon from 19th Dynasty.^[40]

- The seventeenth example is a 168 mm length painted figuring limestone ostrakon for a monkey from the 19th-20th Dynasties (1292-1069 BC) in display in the British Museum at London and shown in Fig.24.^[41] The artist showed the monkey sitting and eating from a basket on a table.
- The eighteenth example is a 185 mm height painted figuring limestone ostrakon presenting a Royal head from the 19th Dynasty (1280 BC) in display in the Walters Art Museum at Baltimore and shown in Fig.25^[42]. The Pharaoh was shown wearing the Blue Crown (Khepresh) with Uraeus on his forehead with two hands one before his face and one behind his head.



Fig. 24: Limestone ostrakon from 19th Dynasty.^[41] Fig. 25: Limestone ostrakon from 19th Dynasty.^[42]

- The nineteenth example is a 312 mm height painted figured ostrakon for Pharaoh Ramses II sucked by a deity from the 19th Dynasty (1279-1213 BC) in display in the Cleveland Museum of Art and shown in Fig.26.^[43] The artist showed the Pharaoh as a crowned child sucking from a goddess while holding the Flail symbol by his left hand. It is a symbolic drawing indicating the respect of the ancient Egyptian Pharaohs to their Deities.
- The twentieth example is a 230 mm length limestone hieratic ostrakon from the 20th Dynasty (1186-1069 BC) in display in the Petrie Museum at London and shown in Fig.27.^[44] It comprised a hieratic text written in nine horizontal lines using a black ink.
- The twenty first example is a 200 mm height hieratic limestone ostrakon from the Ramesside Period, 19th-20th Dynasties (1295-1069 BC) shown in Fig.28.^[45] It registered a list of the gifts given by women to a feast. The text was written using black ink in three columns separated by red lines including 13, 15 and 11 lines respectively. The scribe set a rectangular red box around each name followed by the donated quantity. This was an amazing tabulated document produced more than 3000 years ago !!

- The twenty second example is a 110 mm height colored figuring terracotta ostracon from the 19th-20th Dynasties (1292-1069 BC) in display by a private collector and shown in Fig.29.^[46] It depicted a scene for the head and hair of an ancient Egyptian lady.

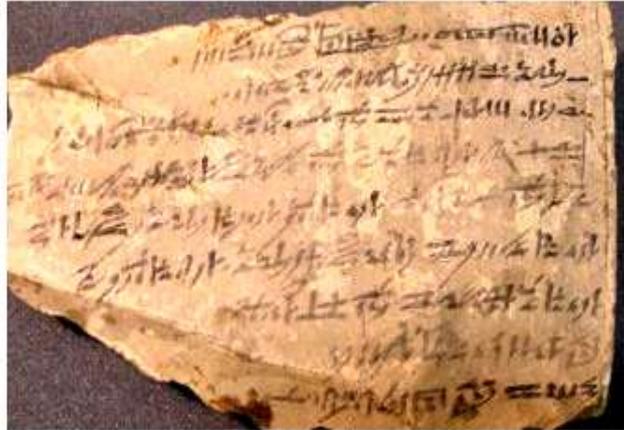


Fig. 26: Limestone ostracon from 19th Dynasty.^[43] Fig. 27: Limestone ostracon from 19th Dynasty.^[44]



Fig. 28: Limestone ostracon from 19th-20th Dynasties^[45]. Fig. 29: Limestone ostracon from 19th-20th Dynasties.^[46]

- The twenty third example is a 138 mm height figuring limestone ostracon of a sex scene from the 19th or 20th Dynasties (1292-1069 BC) in display in the British Museum and shown in Fig.30.^[47] The scene depicted a naked couple performing sex. One column hieratic text appears in the top-right side of the ostracon. It seems that they didn't feel shame from this operation by making it public!.
- The twenty fourth example is a painted limestone ostracon of Prince Sethherkhepeshef, son of Pharaoh Ramses III of the 20th Dynasty (1186-1155 BC) in display in the Egyptian Museum at Turin, Italy and shown in Fig.31.^[48] The Prince was shown striding, holding a

symbol by his left hand and raising his right hand. There was a column of hieroglyphic text behind him. He was fully dressed and wearing sandals.

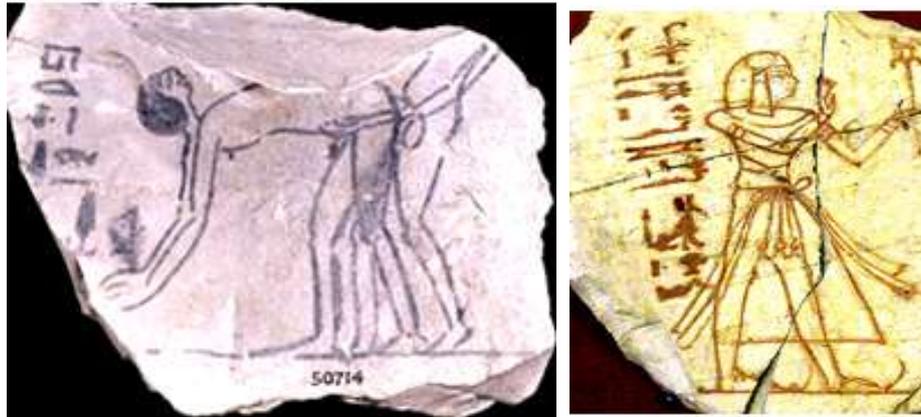


Fig. 30: Limestone ostracon from 19th or 20th Dynasties.^[47] Fig. 31: Limestone ostracon from 20th Dynasty.^[48]

- The twenty fifth example is a figuring ostracon showing Pharaoh Ramses IX offering a Maat statuette from the 20th Dynasty (1129-1111 BC) in display in the Metropolitan Museum and shown in Fig.32.^[49] This is probably a limestone ostracon depicting the Pharaoh wearing the Blue Crown with Uraeus on his forehead and his Cartouche drawn with horizontal and vertical orientation and a vertical hieroglyphic text in the left-bottom corner of the ostracon. It was a drawing with black ink.
- The twenty sixth example is a 0.834 m length limestone ostracon giving the plan of the tomb of Pharaoh Ramses IX of the 20th Dynasty (1129-1111 BC) in display in the Egyptian Museum at Cairo and shown in Fig.33.^[50] This is a wonderful scientific engineering drawing as a plan of the tomb of Pharaoh Ramses IX drawn more than 3100 years ago. It reflects the outstanding mechanical and architecture engineering founded by the ancient Egyptians. They have applied a technology still followed up to now in the architecture engineering.
- The twenty seventh example is a painted figuring limestone ostracon of a praying woman from the 20th Dynasty (1187-1069 BC) in display in the Louvre Museum at Paris and shown in Fig.34.^[51] The lady was shown seated and raising her hands in a worshipping manner used by the ancient Egyptians. Black ink was used in drawing this scene without any text.
- The twenty eighth example is a 180 mm height painted figuring limestone ostracon for Pharaoh Ramses IV (1153-1147 BC) of the 20th Dynasty in display in the Metropolitan Museum of Art at NY and shown in Fig.35.^[52] The ostracon was professionally drawn

showing the details of the Pharaoh's head wearing the Blue Crown with Uraeus on his forehead with a long then beard.

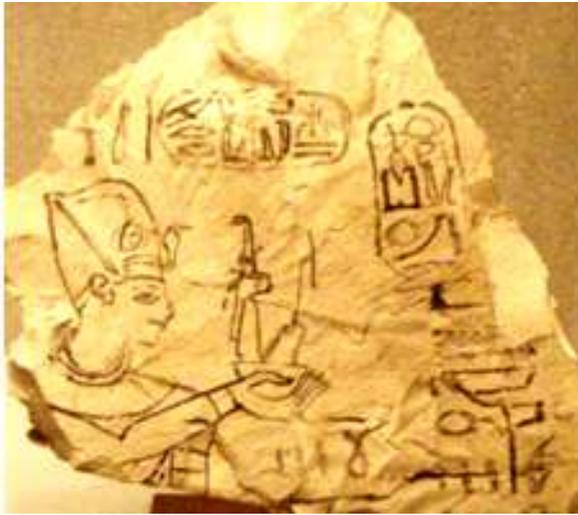


Fig. 32: Limestone ostracon from 20th Dynasty.^[49]



Fig. 33: Limestone ostracon from 20th Dynasty.^[50]

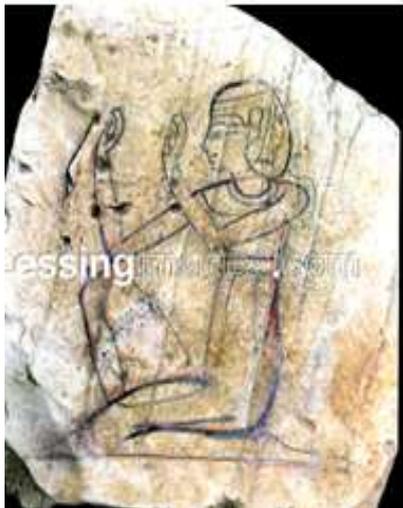


Fig. 34: Limestone ostracon from 20th Dynasty.^[51]



Fig. 35: Limestone ostracon from 20th Dynasty.^[52]

- The twenty ninth example is a painted figured limestone ostracon for a Royal rider on a horse, reign of Pharaoh Ramses VI of the 20th Dynasty (1145-1137 BC) in display in the Egyptian Museum at Cairo and shown in Fig.36.^[53] The artist showed the horse running and a leopard galloping beside it. The royalty of the rider was emphasized from the Uraeus on his forehead. His Crown is not clear in the presented image.
- The thirtieth example is a 280 mm height administrative text limestone ostracon from the 20th Dynasty, reign of Pharaoh Ramses VI (1145-1137 BC) in display in the British

Museum at London and shown in Fig.37.^[54] The eight horizontal lines hieratic text described the arrival of the Vizier of the Pharaoh.



Fig. 36: Limestone ostracon from 20th Dynasty.^[53]



Fig. 37: Limestone ostracon from 20th Dynasty.^[54]

Late Period Ostraca

The Late Period of ancient Egypt comprised the 26th to the 31st Dynasties over a time span from 664 to 332 BC.^[55] We have eight ostraca describing the development of ostraca use during the Late Period presented as follows:

- The first example is a 133 mm height hieratic text limestone ostracon from the 25th-26th Dynasties (712-525 BC) in display in the Metropolitan Museum of Art at NY and shown in Fig.38^[56]. The text was written using black ink in nine horizontal unequal lines.
- The second example is a figuring limestone ostracon of a cat, lion and ibex from the Late Period (664-332 BC) shown in Fig.39.^[57] I couldn't trace the present location of this ostracon. The artist used grids to transfer the limestone flake to a graph-paper-like to adjust the dimensions of his drawings. He didn't follow the natural dimensions of the three animals.

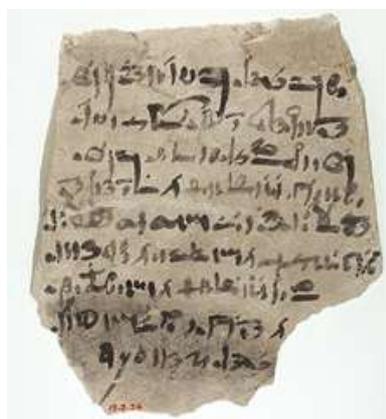


Fig. 38: Limestone ostracon from 25th-26th Dynasties.^[56]

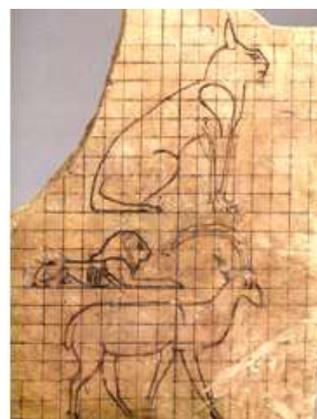


Fig. 39: Limestone ostracon from Late Period.^[57]

- The third example is a 120 mm height figuring limestone ostracon for a liliiform capital from the 26th Dynasty, reign of Pharaoh Psamtik I (664-610 BC) in display in the Metropolitan Museum of Art at NY and shown in Fig.40.^[58] The architect drew the capital on a graph limestone flake by drawing a grid to adjust the dimensions of the capital.
- The fourth example is a 110 mm painted figuring limestone ostracon for a harpist from the 26th Dynasty, reign of Psamtik I (664-610 BC) shown in Fig.41.^[59] The artist showed an old man harpist standing and playing on a vertical harp using both hands.

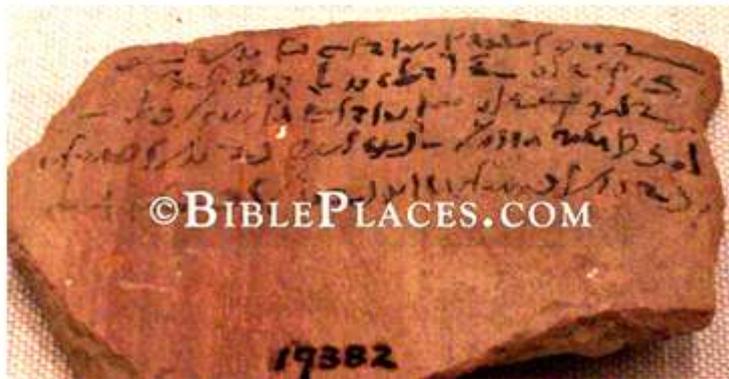


Fig. 40: Limestone ostracon from 26th Dynasty.^[58]



Fig. 41: Limestone ostracon from Late Period^[59]

- The fifth example is a 423 mm height document limestone ostraca from the Late Period (664-332 BC) in display in the British Museum and shown in Fig.42.^[60] It presented a document consisting of about 27 horizontal lines written using probably the demotic script and a black ink.
- The sixth example is a document ostracon from the 28th Dynasty of the Late Period (400 BC) in display by the Oriental Institute of the University of Chicago and shown in Fig.43.^[61] It comprised five horizontal lines of a demotic script written with black ink.

Fig. 42: Limestone ostracon from 26th Dynasty.^[60]Fig. 43: Limestone ostracon from 28th Dynasty.^[61]

- The seventh example is a 118 mm length ovoid granite document ostracon from the Late Period – Ptolemaic Period (400-100 BC) shown in Fig.44.^[62] The present location is not known and its text was written using a demotic script written in four unequal horizontal lines with a black ink.
- The eighth example is a 94 mm length document pottery ostracon from the Late Period – Ptolemaic Period (400 -30 BC) in display in the Metropolitan Museum of Art and shown in Fig.45.^[63] The document comprised four horizontal lines of a text written using (probably) the demotic script. The scribe used a black ink.

Fig. 44: Granite ostracon from Late-Periods.^[62]Fig. 45: Pottery ostracon from Late Ptolemaic Ptolemaic Periods.^[63]

CONCLUSION

- The evolution of mechanical engineering in ancient Egypt through the study of the ostraca industry during the Predynastic to Late Periods was investigated.
- The ancient Egyptians produced ostraca as one of the writing and drawing media.
- They used some local materials for this purpose including: Nile silt sherd, pottery, terracotta, limestone and granite.
- They used ostraca for the purpose of: figuring, documentation, accounting, administration, sexuality, musician.
- They produced ostraca with height ranging from 75 to 423 mm and length up to 834 mm.
- They wrote on both sides of ostraca since the Predynastic Period (more than 5000 years ago).
- They produced ostraca for the goddess 'Bat' from more than 5000 years ago during the time of Naqada III.
- They produced painted figuring ostraca since the time of the 1st Dynasty (more than 4900 years ago) using pigments sustained the environmental effects for thousands of years.
- They registered some animals on ostraca such as: bull, baboon, cat, mouse, hippopotamus, donkey, lion, donkey and ibex.
- They used hieratic script in their documental ostraca since the time of the Old Kingdom (more than 3200 years ago).
- They sketched mummy graph on pottery ostraca during the end of the Middle Kingdom.
- They registered some their symbols on figuring ostraca during the 18th Dynasty.
- The artists of the 18th Dynasty transformed the limestone flake to a graph paper by drawing red grid to adjust the dimensions of the drawn objects.
- They drew human heads on ostraca since the 18th Dynasty.
- They produced fictional ostraca during the 4th-6th and the 19th-20th Dynasties.
- Some of the engraved figuring ostraca were so professional to appear as if they were 3D-images during the 18th Dynasty.
- They registered women breastfeeding of their children on limestone ostraca during the 18th and 19th or 20th Dynasties.
- They registered the work of an acrobat-dancer on a colored figuring ostrakon during the 19th Dynasties.
- Wonderful and professionally produced figuring limestone ostraca were produced during the 19th and 20th Dynasties displaying Royal heads.

- They authorized a woman riding a horse even without a saddle on a colored figuring limestone ostrakon during the 19th Dynasty.
- They registered Royal ships on limestone ostrakon during the 19th Dynasty.
- Hieratic text ostraca continued to be produced during the 19th and 20th Dynasties.
- They knew writing in tables with fields separated by red lines during the 19th-20th Dynasties.
- The hieroglyphic and hieratic scripts continued to be used during the Late Period.
- They produced an architectural plan of the tomb of Pharaoh Ramses IX on a limestone ostrakon during the 20th Dynasty.
- The technique of gridding the limestone ostrakon continued down to the Late Period.
- Musical ostraca were produced during the Late Period.
- Document ostraca with demotic script appeared during the Late Period with documents written in up to 27 horizontal lines.

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BIOGRAPHY**Galal Ali Hassaan**

- Emeritus Professor of System Dynamics and Automatic Control.
- Has got his B.Sc. and M.Sc. from Cairo University in 1970 and 1974.
- Has got his Ph.D. in 1979 from Bradford University, UK under the supervision of Late Prof. John Parnaby.
- Now with the Faculty of Engineering, Cairo University, EGYPT.
- Research on Automatic Control, Mechanical Vibrations, Mechanism Synthesis and History of Mechanical Engineering.
- Published more than 230 research papers in international journals and conferences.
- Author of books on Experimental Systems Control, Experimental Vibrations and Evolution of Mechanical Engineering.
- Chief Advisor of the International Journal of Computer Techniques.
- Member of the Editorial Board of a number of International Journals including WJERT.
- Reviewer in some international journals.
- Scholars interested in the author's publications can visit:
<http://scholar.cu.edu.eg/galal>.

