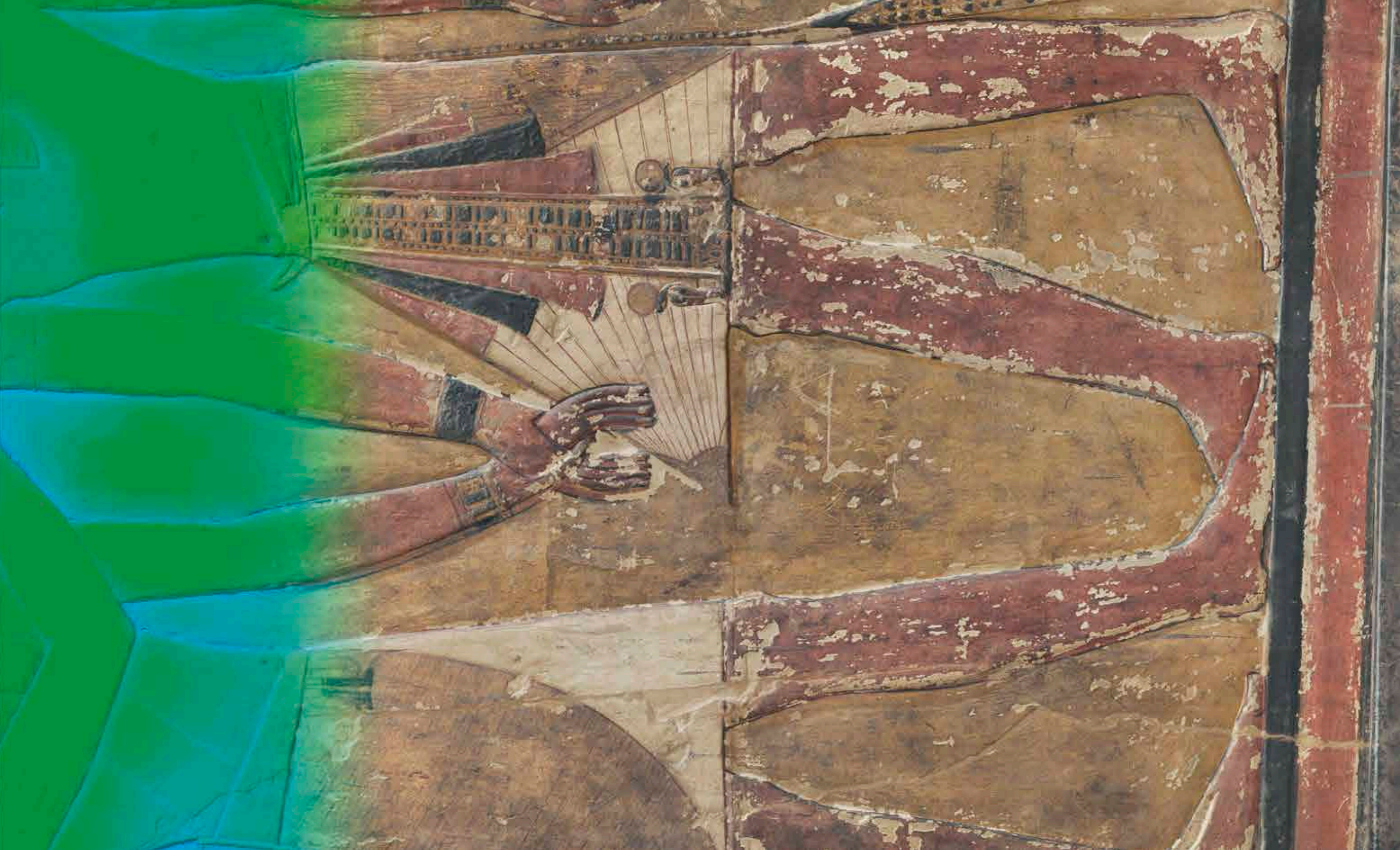


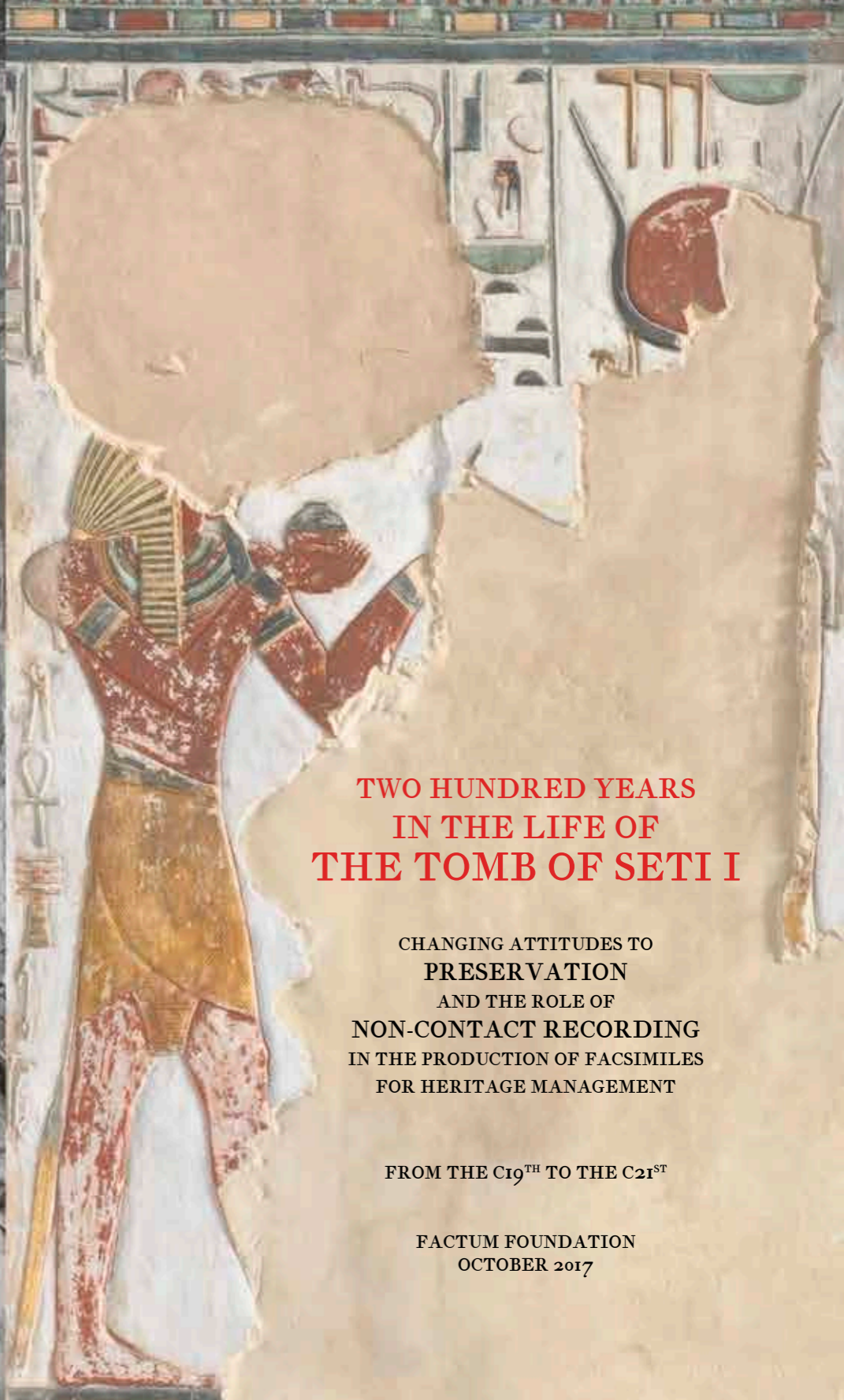
**TWO HUNDRED YEARS
IN THE LIFE OF
THE TOMB OF SETI I**

CHANGING ATTITUDES TO
PRESERVATION
AND THE ROLE OF
NON-CONTACT RECORDING
IN THE PRODUCTION OF FACSIMILES
FOR HERITAGE MANAGEMENT

FROM THE C19TH TO THE C21ST

FACTUM FOUNDATION
OCTOBER 2017





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Mrs. Cassop

1879



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IN CONSERVATION

CONTENTS

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the University of Basel, The Antikenmuseum (Basel), Sir John Soane's Museum (London)
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the 3D Scanning, Archiving and Training Centre a reality.

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And most of all, thanks to the extraordinary teams at Factum Arte and Factum Foundation for Digital Technology in Conservation who work with passion, care and inspiration to link technology to craft skills and freely share their knowledge with others who realise the importance of the work that is being done to preserve the articulate evidence of the past and to give it a voice.

Watching the work to rematerialize parts of the tomb of Seti I only confirms the scale of the undertaking carried out by Belzoni in 1821. It is sad he caused so much damage in the name of preservation.

For Abdu El Reheem Ghaba's son Mohammed and Mousa Sayd Mohamed's new son, Adam.

Introduction	7
<i>Two hundred years in the life of the tomb of Seti I</i>	
<i>The painting of 'Belshazzar's Feast'. A popular exhibition in London in 1821</i>	
<i>The first facsimile 1821 and the second facsimile 2017</i>	
<i>The tomb of Seti I between 1817 and 2017</i>	
Reprinting of <i>Don Juan in London</i> , by Alfred Thornton, 1822	17
Published in two volumes by Thomas Kelly, London	
Mummy Brown: Eating and Painting with Mummies	27
The Use of Facsimiles in the C21 st	29
Theban Necropolis Preservation Initiative	35
<i>Description of the work</i>	
<i>Stoppelaere House: regenerating the building and the establishment of a 3D Scanning, Archiving and Training Centre</i>	
Recording the Tomb of Seti I	39
Recording and Rematerialising the Sarcophagus of Seti I	47
<i>Recording in Sir John Soane's Museum, previous C19th copies, the production of the facsimile (using the latest elevated printing technology by Océ) and scanning fragments of the sarcophagus lid in their mountings designed by Joseph Bonomi</i>	
Recording Fragments from the Tomb of Seti I	53
<i>Summary of the recording of fragments removed from the tomb, the work of the University of Basel and a list of the fragments recorded</i>	
Conclusion	57



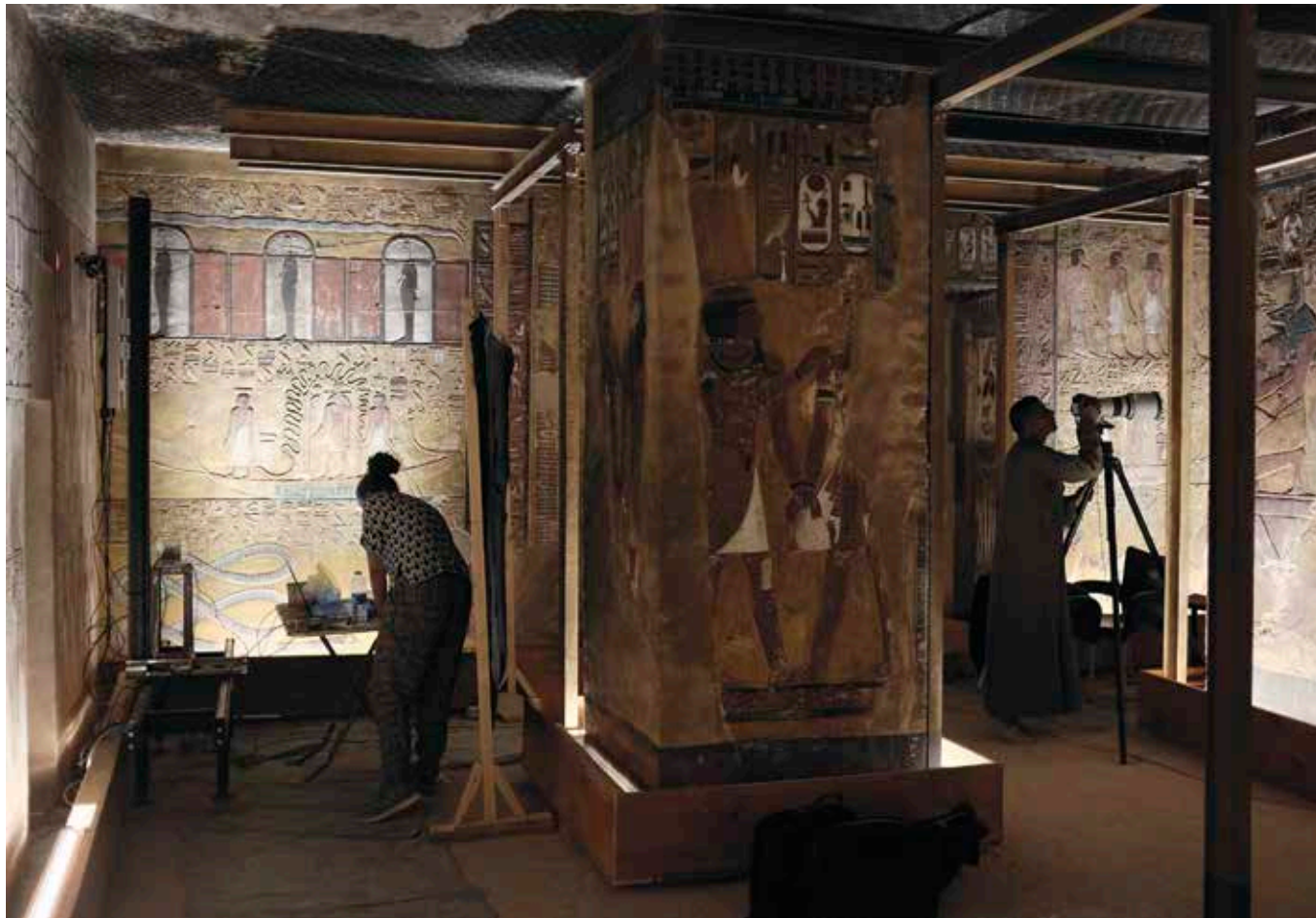
TWO HUNDRED YEARS IN THE LIFE OF THE TOMB OF SETI I

“On the 16th October, 1817,” says he (Belzoni), “I set a number of labouring Arabs to work, and caused the earth to be opened at the foot of a steep hill, and under the bed of a torrent which, when it rains, pours a great quantity of water over the spot in which they were digging..”

Whenever it rained the water drained away. This suggested that the spot might conceal a void. On the 17th Belzoni found some evidence that he was digging in a good place. On the 18th he found the opening and entered a tomb he initially called the Tomb of Apis. He didn't coin this name until he had been into all parts of the tomb and found a mummified bull close to the place where he found the sarcophagus. Soon after he called it the tomb of Psammis, son of Necho. Champollion, the decipherer of hieroglyphics called it the tomb of Osirei. Joseph Bonomi, the first director of Sir John Soane's Museum in London called it the tomb of Oimeneptah I. We now know it as the Tomb of Seti I.

In 1817 it was the best-decorated and most complete tomb in the Valley of the Kings. Now it is in poor condition but still retains a vast amount of information. More is being revealed all the time. Dr Zahi Hawass led a team between 2007 and 2011 to excavate the tunnel that runs beyond the sarcophagus room. Sheikh Ali had excavated this in 1960 in pursuit of treasure. He suspected it was there until the day he died. The excavations led by Dr Hawass initially suggested he may be right. They revealed a tunnel over 130 meters long that descended steeply from the lowest point of this already extensive tomb. The team found objects and stairs...but never definitive proof of the reason the tunnel was made. Digging a tunnel of this size is a significant engineering feat that in pharaonic times would have required hundreds of people to risk their lives and to expend a vast collective energy. Perhaps it conceals a secret or perhaps it was an attempt to reach the water table and give access to the 'Waters of Nun'. No definitive answer was found and the mystery remains. There have always been suggestions of a missing room in the tomb of Seti I that may still be awaiting discovery.

In 2016, as the team from Factum Foundation were about to start the high-resolution recording of the whole tomb, Mustafa Waseri, the former director of the Valley of the Kings and now the director of the Supreme Council of Antiquities in Luxor, dictated the following message: Excavating the tunnel took three years and what did they find? They found little things. Shabti, objects, beams. An indication that there are still things there. 137 meters down it stops. The stairs are perfect. I am sure that with technology we will solve this mystery and find more.



Aliaa Ismail and Moussa Sayd Mohamed recording in the pillared part of the Sarcophagus Room (Room J) in 2016.

Image overleaf: The facsimile that was presented at the Egyptian Halls in London in 1821 was made from plaster casts taken from wax moulds made in the tomb by Belzoni and others. It caused a sensation in London. The craze for pharaonic Egypt, Egyptomania resulted in the birth of tourism to Luxor.



London. Published by Tho' Kelly 17, Paternoster Row, Dec' 1, 1831.



John Martin, *Belshazzar's Feast*, Exhibited at the British Institution in January 1821. Courtesy of Michael Campbell.

ANOTHER EXHIBITION THAT EXCITED LONDONERS IN 1821

This etching was issued in a sixteen page pamphlet entitled *A description of the Picture Belshazzar's Feast, painted by Mr. Martin, lately exhibited at the British Institution, now at No. 343, Strand, the first door on the left of Catherine Street.*

The painting won the first prize of 200 guineas and was sold to William Collins for 800 guineas. While the painting was on show over 33,000 people visited the British Institution. The scale of excitement that accompanied this approach to history painting certainly inspired Mr Bullock, the owner of the Egyptian Hall, and Belzoni. The numbering on the etching drew attention to 'the writing on the wall', Daniel the Prophet, King Belshazzar, the tower of Babel and other details but it also marked more sensational elements like 'A priest exhorting the women to sacrifice their children to avert impending danger' and 'the scale of proportion – a figure six feet high, by which the length of the halls is found to be one mile.'

THE FIRST FACSIMILE 1821 AND THE SECOND FACSIMILE 2017

This pamphlet aims to reveal the differences between the work carried out in the Tomb of Seti I by Belzoni and his team to make the facsimile that was shown at the Egyptian Hall in Piccadilly in 1821, and the work that is being carried out by Factum Foundation, the University of Basel and the Ministry of Antiquities to make a new facsimile that will contain all the elements removed in the C19th. This new facsimile will be erected on a site between Stoppelaere's House and Carter's House at the entrance to the Valley of the Kings. The aim of both approaches is preservation and the dissemination of the importance of this tomb. Belzoni's method was full-contact and removed most of the paint and some of the fabric from the walls, while the current approach is 100% non-contact and is facilitating a deep study of the tomb as well as providing the data needed to monitor its condition over time.

Writing to Joseph Bonomi, the first director of Sir John Soane's Museum, the great Egyptologist Jean-François Champollion was proud of having removed a large section of the tomb and taken it to Paris where it now hangs in the Musée du Louvre:

'Rest assured, Sir, that one day you will have the pleasure of seeing some of the beautiful bas-reliefs of the tomb of Osirei in the French Museum. That will be the only way of saving them from imminent destruction and in carrying out this project I shall be acting as a real lover of antiquity, since I shall be taking them away only to preserve and not to sell.'

Belzoni's facsimile caused a sensation in London when it opened in 1821. It was soon described in detail in chapter XIII of the second volume of Alfred Thornton's *Don Juan in London* with a colour engraving by Atkinson showing the gas lighting in the tomb and well-dressed Londoners relaxing and discussing the arrival of pharaonic culture in central London. Egyptomania and the discoveries in the Holy Land gripped the city and seemed to question or support the accuracy of the biblical account of history in the years before Darwin wrote the *Origins of the Species*. At this time Seti I was thought to have adopted Moses and brought him up as a brother to Ramesses II. John Martin's painting *Belshazzar's Feast* was exhibited at the British Institution in February 1821 and proved so popular that barriers had to be erected to keep the crowds from the painting. Belzoni went even further, while Martin's painting was an imaginative suggestion of the scale of the buildings in Babylon, Belzoni's facsimile was produced through a physical connection to the original. In 1821, few people could travel to Egypt so the facsimile was produced from moulds made in the tomb. The relief surface was cast directly from the moulds and the colour was painted by hand in London based on the watercolours made on site by Ricci and Belzoni.

THE TOMB OF SETI I BETWEEN 1817 AND 2017

1817-1819



The Hall of Beauties, watercolour by Alessandro Ricci and Giovanni Battista Belzoni made soon after the discovery of the tomb in 1817.

Courtesy of Bristol Culture / Bristol Museum & Art Gallery.

Belzoni produced two sets of watercolours with different colouring. When making the recreation the colours were based on traces of paint that remained on the walls of the tomb.

2017



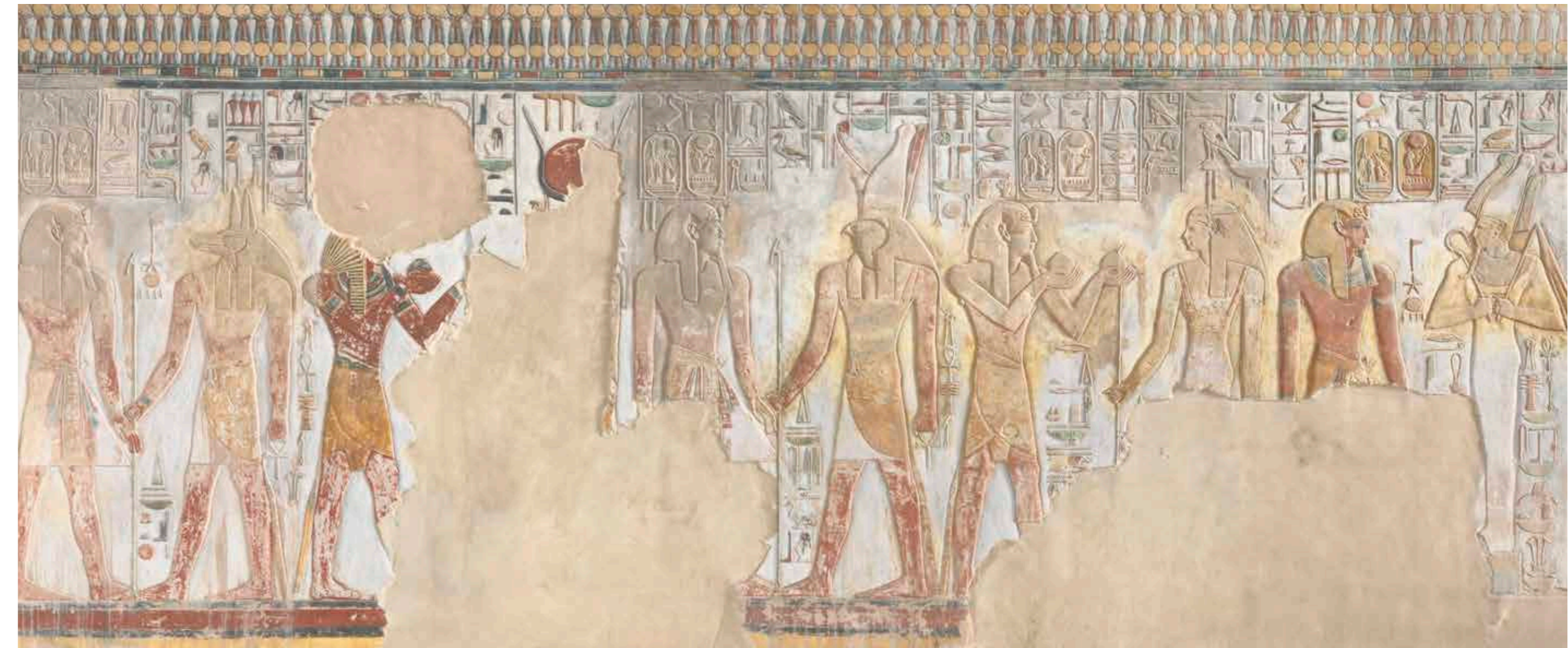
Factum Arte's reconstruction based on Belzoni and Ricci's watercolours and the 3D recording of the tomb carried out by the Theban Necropolis Preservation Initiative. The aim was to recreate the feeling described by Belzoni as he was transfixed by the pristine condition of the paintings he was looking at in 1817. Upon entering the tomb Belzoni 'perceived that the paintings became more perfect as we advanced further into the interior. They retained their gloss, or a kind of varnish over the colours which had a beautiful effect.'

1920's



The east wall of the Hall of Beauties photographed by Harry Burton during his documentation of the whole tomb. Courtesy of Metropolitan Museum of Art, New York.

2017



The east wall of the Hall of Beauties as it is now based on the high-resolution 3D scans and composite photographs made by Factum Foundation.

2017



A reconstruction of the east wall of the Hall of Beauties made for *Scanning Seti: the regeneration of a Pharaonic tomb* at the Antikenmuseum, Basel, demonstrating the production of wax, plaster and paper squeezes. Each method caused extensive damage that can be identified today.

BELZONI'S EXHIBITION OF THE EGYPTIAN TOMB – SKETCH OF THE ANTIQUITIES OF THEBES – EXPLANATION OF THE DECORATIONS OF THE SEPULCHRE – INTERESTING ADVENTURES IN THE MUMMY PITS – EGYPTIAN RELICS – A MUMMY THREE THOUSAND YEARS OLD – CURIOUS MODELS

Extracted from:

Alfred Thornton, *Don Juan in London*, 1822, Published in 2 volumes by Thomas Kelly

The effect of this wonderful Exhibition is, to render familiar to the eye and to the understanding, the manner in which the inhabitants of the ancient city of Thebes preserved the bodies, and, as they imagined, the souls also, of their deceased princes, by excavating immense tracts of rocks for their burial places and fitting up and decorating in all the splendour known to the arts in those days, the numerous and extensive chambers thus created by industry in the very bosom of the soil. These astonishing works were accomplished during the lifetime, and under the direction, of their respective occupiers; and the painted, carved, and sculptured hieroglyphics, with which every atom of the walls and roof are covered, are supposed to relate to the personal exploits of the deceased, as well as to the religion and history of the country*.

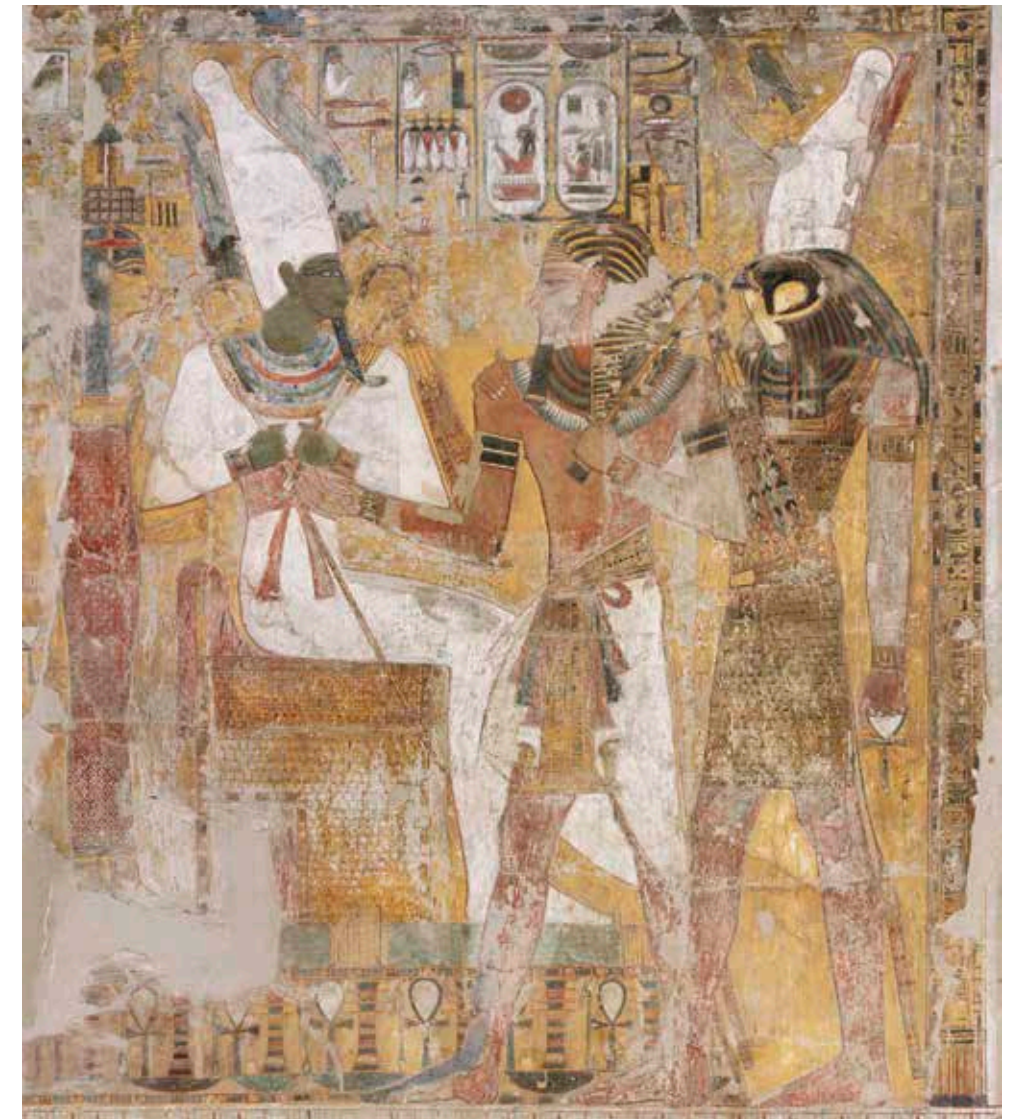
More than three thousand years have rolled away since the great and mighty people disappeared as a nation, whose genius, and acquirements in the arts and sciences, are so fully demonstrated in the works before us, as well as in the numerous and gigantic ruins of Temples, Tombs, and Colossal Statues which still mark the site of their magnificent city. The barbarism, avarice, and ferocity of the motley hordes who have for ages inhabited Egypt, long rendered a visit to the innumerable ruins with which all parts of the country were known to abound, a work of no ordinary labour and peril; and the immense accumulation of the sands peculiar to the soil had, in the course of some many centuries, actually buried even the most stupendous works. Within the last few years, however, an unconquerable zeal to explore those mysterious remains of antiquity has manifested itself, and every country of Europe has sent forth learned, scientific, and enterprising men, whose perseverance has conquered every difficulty, and achieved more than the most sanguine could have expected, in the discovery and delineation of numerous Catacombs; foremost in this host of talent and enterprise will ever stand the name of Belzoni, a man seemingly destined by nature for this species of research; for, in addition to the most ardent zeal and undaunted courage, he possesses prodigious personal powers, being of the amazing height of six feet seven inches, and of proportionate strength and muscular energy.

The Two Chambers constituting the exhibition are exact representations of two apartments in a vast Tomb discovered and opened by Belzoni himself*. “The sepulchre,” he says “of which they form but a small part, is a vast artificial excavation in a rock distant about three miles from the River Nile; but this is only one of an immense number of excavations to be found in the neighbourhood. All the various passages and halls of which it consists are covered with similarly painted figures in relief, and the whole length of the tomb equals 309 feet. These two apartments are not contiguous; but they have been selected for exhibition, the one for its great beauty, and the other for the instructive character of its emblematical representations; they will together give some idea of the splendour of the whole sepulchre. The figures are casts in plaster-of-Paris, from wax impressions taken on the spot, and painted with the greatest exactness and fidelity from drawings made at the same time: on the day the Tomb was opened, the colours were found as fresh and vivid as they are here represented. In examining, however, this curious monument, its high antiquity ought not for a moment to be lost sight of as it would scarcely be just or reasonable to compare the paintings, which have decorated its walls for nearly Three Thousand Years, with the specimens of modern art.”

The impression produced on the mind by an examination of this elaborate counterpart of the Sepulchre, in which at so remote a period of time the mortal remains of a prince who had reigned over a powerful and intelligent people, had been deposited in the superstitious hope of thereby rendering them immortal, is solemn in the extreme. Faithful to the actual appearance of the Tomb when first visited by Belzoni, the floors of the Exhibition Chambers are covered with black cloth, and the walls thickly decorated with numerous groups of figures, slightly raised, on a milk white ground, and painted in every respect like the originals, which are generally a sort of brown-red; but some are darker, and others nearly black. These figures consist of deities, men, animals, and symbols, representing processions, religious ceremonies, &c. The groundwork of the roof is nearly black, thickly studded with minute stars, resembling gold, and every gleam of day-light being carefully excluded, the whole is lighted up with lamps, part of which are placed on the heads of curious antique statues, brought from Egypt by Mr. Belzoni, having the bodies of women, and the heads of lions, rudely sculptured from blocks of dark granite. For a particular explanation of the figures on the walls, we shall quote the Programme of the exhibition:-

The farthest of the two chambers was the room in which Mr. B. found himself, after he had passed through the small aperture in the painted wall; and to this apartment he gave the name of the *Entrance Hall*. Its dimensions are 27 feet 6 inches, by 25 feet 10 inches; and the pillars are 4 feet square. Immediately in front of the door, as you enter, is the finest painted group of the whole Sepulchre, consisting of four figures, and representing the reception of some distinguished personage, by Osiris, the great divinity of the Egyptians. Osiris is seated on his

throne of state, supported by pillars, or feet; he holds a hook in each hand, and in the left the flail also; King Psammis, with his name on his belt, is presented to him by the Egyptian Apollo, Arueris, who has the head of a hawk. Behind Osiris is a female figure, probably the goddess Buto, with a cage and a bird over her head; according to the Egyptian mythology, she was the nurse of the children of Osiris and Isis. The dress of Osiris is almost entirely white, which, Plutarch says, was the usual colour of his attire.



Hathor (or Isis), Osiris, the Pharaoh Seti and Horus from Room F, The Tomb of Seti I

The whole tablet is surmounted by the winged globe, accompanied by the inscription which is scarcely ever wanting when this tutelary genius is introduced, whose name seems to be indicated by a bent bar, with a hand. The other characters appear to mean the *Sacred Father of the Protecting Powers, living unalterable, reigning, and ministering.*

But the most remarkable feature of the whole embellishments of the catacomb, consists of a procession of captives. Before a hawk-headed divinity, are four red men, with white kirtles; then four white men, with thick black beards, with a simple white fillet round their black hair, wearing striped fringed kirtles; before these are four negroes, with hair of different colours, wearing large circular ear-rings, having white petticoats, supported by a belt over the shoulder; and next in order, march four white men, with smaller beards and curled whiskers, bearing double spreading plumes on their heads, tattooed, and wearing robes, or mantles, spotted like the skins of wild beasts. Mr. B. is disposed to consider the red men as Egyptians, the black -bearded men as Jews, and the tattooed men as Persians; and these conjectures seem to accord remarkably well with the history of the times concerned; for Necho, the father of Psammis, *whose tomb this is supposed to be*, is known both from sacred history, and from Herodotus, to have had wars with the Jews, and with the Babylonians; and Herodotus mentions his expedition against the Ethiopians. So that this procession may very naturally be considered as consisting of captives made in his wars. The passages in scripture, which illustrate this portion of history will be found in the II. Chronicles, chap. xxxv., ver. 20, 21, 22, 23, 24; and chap. xxxvi., ver. 1, 2, 3, 4; and in Jeremiah, chap. xxxvi. See also the 2d Book of Herodotus. It is impossible to conceive anything more striking than this agreement of sacred and profane history, with this remarkable representation in the catacomb.

In the *Hall of Beauties*, there are two statues of granite, with lions heads, which Mr. B. brought from the temple situated behind the two colossi, in the plains of Gournou; the chief subjects of the representations on its walls, will be found to be, the reception of Psammis by the principal divinities of the Egyptian mythology; he appears to be generally attended by the hawk-headed diety, Arueris; and, in some places, is presenting offerings to Isis, or other female divinities; and is ultimately received by Osiris, clothed in white.

In the Passage are several tablets, which are thus explained:-

No. 1, Isis in the form of a cow, adorned by groups of figures

No. 2, King Psammis doing homage to a deity, considered to be a personification of Stability; a pair of weeping eyes are inserted between the two lower plates, or bust, and the hands hold the hook and flail. Over the King, the hieroglyphics are interpreted, *King Osiris, Dispenser of comforts to the Countries – Psammis the Powerful.*

Nos. 3 and 4. In these two tablets, the Goddess Buto is exhibited; she holds the King's right hand with her left, and with her right she presents to him a breastplate, denoting Truth, which hangs around her neck.

No. 5. Psammis is represented embracing a singular deity; over the King, is his name, followed by the epithet, *Vulcanian*, or "Devoted to Pthah."

No. 6. King Psammis, who is the principal figure of the Catacomb, is represented sitting on a throne, or chair of state; his belt, or apron, is marked with his name. The vulture soaring over the King seems to represent some tutelary genius; it holds a ring, which, in other cases serves for the support of plumes, or other honorary trophies. The altar before the figure is loaded with an offering of some substance, cut into slices, and standing in a compact mass.

In a Gallery above the chambers is a most excellent Model of the entire Tomb, so admirably constructed as to convey a perfect idea of the extent and magnificence of the whole excavation, and of the relative situations of the different chambers, halls, corridors, &c.; and in the same Galleries are several glass-cases, filled with various Egyptian relics, collected by Belzoni in various Tombs, Pyramids, and Cavern Temples explored by him. The contents of these cases are this enumerated in the "Description."

Nos. 1 and 2 contain female ornaments; the mummy of an ape; and the toe of a colossal figure, the head and arm of which have been brought to England, and deposited in the British Museum.

No. 3. Different idols; some made of porcelain, others of a hard calcareous stone; and also fragments of the tomb of Psammis.

No. 4. Various idols of white stone, or of beautiful blue porcelain, from the tomb of Psammis; different fragments of breccia, with hieroglyphics, found among the ruins of the temple of Berenice, on the Red Sea.

No. 5. Idols of calcareous stone; scarabæi of basalt, and of verdeantico; one of a square form, used by the kings of Egypt, and worn as an ornament on their breasts; some fragments of terracotta, and lacrymatories.

No. 6. Figures of alabaster; plates of the same substance – supposed to have been used for the religious ceremonies; vases and fragments of alabaster; tomb-stones, from the Mummy Pits of Gournou.

No. 7. Figures of wood, and of bronze; ancient coins; vases, containing the bowels of Mummies.

No. 8. Wooden idols; stone fragments; a most beautiful head of black basalt, from Sais; fragments of a sarcophagus of terracotta, from the Osiris of Ammon.

No. 9. Wooden boxes, which contained idols.

No. 10. Ancient shoes; and ropes, made of the leaves of the palm tree; Mummies of various animals, quadrupeds, and fish; tresses of hair, in a state of wonderful preservation.

No. 11. A Mummy, opened in England a short time ago; it is more perfect than any unfolded in Egypt by Mr. B. during six years' research; the box in which it was contained, is placed above.

No. 12. The Mummy of an Egyptian priest; remarkable for the singular position, and binding of the arm.

No. 13. A manuscript on papyrus, the largest known – it measures 23 feet.

No. 14. A portion of the original tomb of Psammis, which had fallen off the wall; the colours of the female figure are considerably faded.

In addition to these highly interesting relics, Mr. Belzoni has introduced, since the first opening of his exhibition, some admirable Models of other important places discovered by him, the particulars are as follow:-

No. 1. The porticoes of the temple in the island of Philoe. At the time when Christianity was persecuted in that country by the Caliphs, the Christians retired to perform their worship in the most distant and remote recesses to escape the fury of their persecutors. This place being far from the seat of their rulers, and situated in an island of the River Nile, among the rocks of granite which form the first cataract, was fitted up for a Christian church.

No. 2. The Ruins of the Temple of Erments, which once probably formed part of the great city of Thebes; it is re-

markable for the elegance of its construction and architecture, and the workmanship proves it to be of a very early date. No. 3. The Great Temple of Ybsambul. This extraordinary excavation was buried under the earth above two thirds, and was opened by Mr. Belzoni with great labour and difficulty, particularly owing to the indolence of the natives, who were a set of men not accustomed to labour or acquainted with the use of money. It is reckoned one of the most ancient excavations of the Ethiopians, Mr. Belzoni describes it as follows:

The outside of this Temple is magnificent. It is a hundred and seventeen feet wide, and eighty-six feet high; the height from the top of the cornice to the top of the door being sixty feet and the height of the door twenty-four feet. There are four enormous sitting Colossi, the largest in Egypt or Nubia, except the great Sphinx at the Pyramids, to which they approach in the proportion of near two-thirds. From the shoulder to the elbow they measure fifteen feet six inches; the ears three feet six inches; across the shoulders twenty-five feet four inches; their height is about fifty-one feet, not including the caps, which are about fourteen feet. On the top of the door is a colossal figure of Osiris twenty feet high, with two colossal hieroglyphic figures, one on each side, looking towards it. On the top of the Temple is a cornice with hieroglyphics, and above the cornice a row of sitting monkeys eight feet high, and six across the shoulders. This Temple was nearly two-thirds buried under the same, of which we removed thirty-one feet before we came to the upper part of the door. It is the last and largest temple excavated in the solid rock in Nubia or Egypt, except the New Tomb. It took twenty-two days to open it, and we sometimes had eighty men at work.

No. 4. Is the section of the passages, portcullis, and chambers of the Pyramid of Shephrenes, also re-opened by Mr. Belzoni. The first passage is of granite, and the rest are cut out of the solid rock, which rises much above the level of the basis of the Pyramid. The first passage descends in an angle of twenty-six degrees, and at the bottom is a portcullis; nearly all this passage was filled up by large stones, which took much labour to remove. The horizontal passage from the portcullis to the great chamber descends in a particular direction into the passages below; the chamber is all cut out of the solid rock, except the roof: it is forty-six feet long, sixteen feet wide, and twenty-three feet six inches high. At the end it has a sarcophagus of granite, eight feet long, three feet six inches wide, and two feet three inches deep in the inside. Returning out of this chamber other passages are seen, which lead into a number of chambers in different parts of the Pyramid.

No. 5. gives an exact view of the Pyramid in the reduced proportion of one foot to one hundred and twenty feet. At the basis of the Pyramid there is a great accumulation of stones and materials, which fell from the upper parts, and completely covered the entrance. In the centre of the accumulated materials, there is the excavation which discovers the two entrances into the interior.

No. 6. is intended to elucidate on the origin of arches. It will clearly appear that the brick wall has been erected on the border of the excavation, which forms the entrance into an Egyptian tomb.

Addenda

* Mr Belzoni's "Description of the Tomb," printed for the use of the visitors, contains, among a great mass of highly important information, including the following observations:-

"At the foot of the Lybian chain of mountains, is a tract of rocks called Gournou, lying to the west of the ruins of the ancient city of Thebes, and extending in length about two miles, which is hollowed out into chambers and galleries where the ancient inhabitants deposited their dead. No mines or catacombs in any

part of the world can be compared with these astonishing places, the number and enormous extent of which, attest the vast population of a city, whose antiquity reaches far beyond all historical notice. For though the ruins of Thebes afford the most complete evidences of the genius and amazing resources of the early Egyptians, no record enables us to form the slightest conjecture as to the date of its foundation; since its temples and obelisks had already begun to decay, when Menès, the first king of the country, commenced the building of Memphis. This latter, on the establishment of monarchy, became the capital city of Egypt, but of the comparative greatness of the two cities, we may judge by the simple fact that the exact position of Memphis is now a matter of dispute, while Thebes, though ruined, has resisted, in a wonderful manner the inroads of time, of ignorance, and barbarity.

"Its original inhabitants are supposed to have dwelt in caverns in the rocks; and Osiris, who taught them the use of husbandry, and whom they afterwards worshipped as a god, was imagined to have been the founder of the city. Garnac, where now stands the oldest and most expensive temple, on the eastern side of the river, was the first spot inhabited, but as the population increased, the western bank was also occupied and covered with houses, palaces and religious edifices. Though it has been surmised that Homer spoke rather as a poet than as a geographer when he described it as having a hundred gates; yet Thebes, in its glory, filled the whole valley, resting on each chain of mountains, and the Nile flowed through the centre of this vast and populous city, which is estimated to have been thirty miles in circumference, and even to this day, the remains of this wonderful place are so considerable that M. Denon, in his Travels of Egypt, asserts, that it took him more than twenty minutes to ride at full gallop round the exterior of the single temple of Carnac.

"The present natives of Gournou, the most independent of any of the Arabs in Egypt, and greatly superior to them all in cunning and deceit, now live in the entrances of caves, or ancient sepulchres. Here, having made some partitions with earthen walls, they form habitations for themselves, as well as for their cows, camels, buffaloes, sheep, goats, and dogs. They cultivate a small tract of land, extending from the rocks to the Nile; but even this is in part neglected, for they prefer to the labours of agriculture, the more profitable but disgusting employment of digging for Mummies. Aware of the eagerness with which these articles are purchased by strangers, they make and arrange collections of them, and Mr. Belzoni has frequently seen the dwellings of the Arabs, magazines, as it were, well stocked with Mummies, the empty wooden cases in which they had been contained, large pieces of asphaltum, much used and prized by painters, and other objects of antiquity procured from these caverns. The natives also break up the wooden cases for fuel, with which, together with the bones of Mummies, the asphaltum and rags which embalmed and enveloped them, they heat the ovens in which they bake their bread.

"Every part of these rocks is cut out by art, in the form of large and small chambers, each of which has its separate entrance, and notwithstanding they are very close to each other, it is seldom that there is any interior communication between them. Some of them, though now much defaced, shew that they were originally of great magnificence, richly ornamented, and of surprising extent; but, in general, the sepulchres at Gournou are the pits where the Arabs dig for Mummies.

"It is scarcely possible by description to convey an adequate idea of these subterranean abodes, or of the strange and horrible figures with which they are filled. Most travellers are satisfied with entering the large

hall, the gallery, and staircase; in fact, as far as they can conveniently proceed, but Belzoni frequently explored the inmost recesses of these extraordinary excavations. Of some of these tombs many persons could not withstand the suffocating air, which often occasions fainting. ‘On entering the narrow passage,’ say Mr. B. ‘which is roughly cut in the rock, and nearly filled up with sand and rubbish, a vast quantity of dust rises, so fine that it fills the throat and nostrils, and, together with the strong smell of the Mummies, threatens suffocation. In some places there is not more than the vacancy of a foot left, which you must contrive to pass through in a creeping posture, on pointed and keen stones, that cut like fragments of glass. After getting through these passages, some of them 200 or 300 yards long, you generally find a more commodious spot, perhaps high enough to allow a sitting posture. But what a place of rest! Surrounded by bodies, by heaps of Mummies on every side, which previous to my being accustomed to the sight, impressed me with horror. The blackness of the walls, the faint light given by the candles or torches for want of air, the different objects that surrounded me, looking at, and seeming to converse with each other, and the Arab guides, naked and covered with dust, themselves resembling living Mummies, absolutely formed a scene that cannot be described. In such a situation I found myself several times, and when exhausted, fainting, and nearly overcome, I sought a resting-place, and found one, my weight bore on the body of an Egyptian, and crushed it like a band-box. I naturally had recourse to my hands to sustain my weight, but they found no better support: so that I sunk altogether among broken Mummies with a crash of bones, rags, and wooden cases, which raised such a dust, as kept me motionless for a quarter of an hour, waiting till it subsided again.

“Thus I proceeded from one cave to another, all full of Mummies, piled up in various ways, some standing, some lying, and some on their heads. The purpose of my research was to rob the Egyptians of their *papyri*, of which I found a few hidden in their breasts, under their arms, in the space above the knees, or on the legs, and covered with numerous folds of cloth, that envelope the Mummy.”

** Belzoni thus relates the discovery of the situation of the tomb, and the means by which he succeeded in opening it to view, from the immense masses of sand by which it had been buried and concealed:-

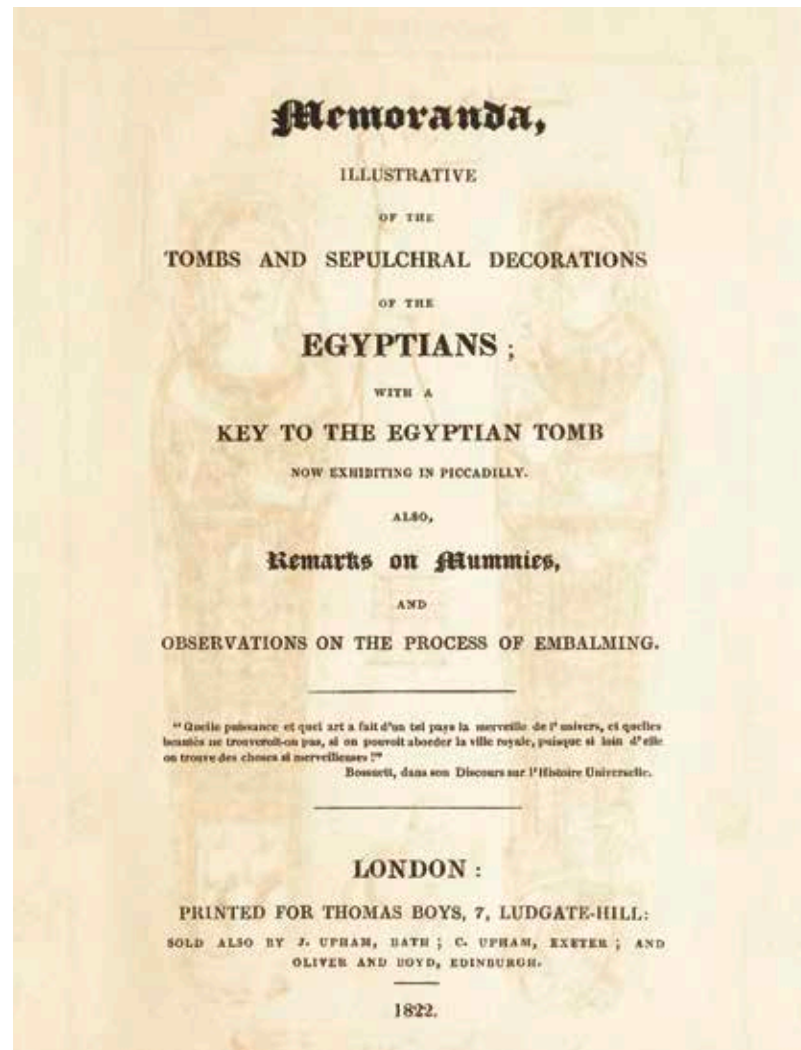
“On the 16th October, 1817,” says he, “I set a number of labouring Arabs to work, and caused the earth to be opened at the foot of a steep hill, and under the bed of a torrent which, when it rains, pours a great quantity of water over the spot in which they were digging. The Arabs, who were accustomed to dig, were all of the opinion, that there was nothing to be found there; but I persisted in carrying on the work, and on the evening of the following day, we perceived part of the rock that had been hewn and cut away. On the 18th, the workmen reached the opening, which was 18 feet below the surface of the ground. When there was room enough for me to creep through a passage, that the earth had left under the ceiling of the first corridor, I perceived immediately, by the painting on the roof, and by the hieroglyphics in basso-relievo, that I had at length reached the entrance of a large and magnificent Tomb. I hastily passed along this corridor, and came to a staircase 23 feet long; at the foot of which I entered another gallery, 37 feet 3 inches long, where my progress was suddenly arrested by a large pit, 30 feet deep, and 14 feet by 12 feet 3 inches wide. On the other side, and in front of me, I observed a small aperture, 2 feet wide, and 2 feet 6 inches high, and at the bottom of the pit, a quantity of rubbish. A rope fastened to a piece of wood that was laid across the passage against the projections which formed a kind of door-way, appeared to have been used formerly for descending into the pit; and from the small aperture on the opposite side, hung another, which reached the bottom, no doubt for the purpose of ascending, but both the wood and the rope crumbled to dust on being

touched. At the bottom of the pit were several pieces of wood, placed against the side of it, so as to assist the person who was to ascend, by means of the rope, into the aperture. It was not till the following day that we contrived to make a bridge of two beams, and crossed the pit, when we discovered the little aperture to be an opening forced through a wall, that had entirely closed, what we afterwards found to be the entrance into magnificent halls and corridors beyond. The ancient Egyptians had closely shut it up, plastered the wall over, and painted it like the rest of the sides of the pit; so that but for the aperture, it would have been impossible to suppose that there was any further proceeding [illegible]. Any one would have concluded, that the Tomb ended with the pit; besides, the pit served the purpose of receiving rain-water, which might occasionally fall in the mountain, and thus kept out the damp from the inner part of the tomb. We passed through the small aperture, and then made the full discovery of the whole Sepulchre.

“An inspection of the model, which forms part of the exhibition, exhibits numerous galleries and halls through which we wandered; and the vivid colours and extraordinary figures on the walls and ceilings, which every where met our view, will convey an idea of the astonishment we must have felt at every step. In one apartment we found the carcass [sic] of bull embalmed; and also scattered in various places, wooden figures of Mummies, covered with asphaltum, to preserve them. In some of the rooms were lying about, statues of fine earth, baked, coloured blue, and strongly varnished; in another part were four wooden figures, standing erect, four feet high, with a circular hollow inside as if intended to contain a roll of papyrus. The Sarcophagus of oriental alabaster, was found in the centre of the hall, to which I gave the name of the Saloon, without a cover, which had been removed and broken, and the body that had once occupied this superb coffin, had been carried away. We were not, therefore, the first who had profanely entered this mysterious mansion of the dead; though there is no doubt it had remained undisturbed since the time of the invasions of the Persians.”



The Model of the tomb of Seti I made from 3D data recorded with the Faro Lidar Scanner and printed on an assortment of 3D printers.



Edward Upham, Title page for the *Memoranda, Illustrative of the Tombs and Sepulchral Decorations of the Egyptians...* published by Thomas Boys, 1822, London.

DESCRIPTION OF THE MUMMY INCLUDED IN BELZONTI'S EXHIBITION AS DESCRIBED IN THORNTON'S *DON JUAN IN LONDON*

“This Mummy is certainly a most extraordinary relic; it is the body of a youth apparently about 17 or 18 years of age; and although it has probably been embalmed for nearly three thousand years, it is still entire, the flesh being rather shrunk than decayed; the teeth and nails are as perfect as during life, and much of the hair still remains; the abdomen bears evident marks of the opening made for the extraction of the bowels, and the flap is sewed down; the brains have been extracted through the nostrils. The appearance of this Mummy is by no means so offensive as might be supposed.”

MUMMY BROWN. EATING AND PAINTING WITH MUMMIES

Mummy Brown, Egyptian Brown or *Caput Mortuum* - were the names given to an artists' pigment made from the ground flesh of Egyptian mummies. It was in use as early as the C16th, a warm rich brown between Raw Umber and Burnt Sienna. It became very popular in the C19th with the growth of interest in Egypt.

The European trade in mummies that was happening in the C16th with the veritable looting of Egyptian burial grounds, as described by an English merchant and agent for the Turkey Company in 1586:

“We were let down by ropes, as into a well, with waxe-candles burning in our hands, and so walked upon the bodies of all sorts and sizes . . . they gave no noisome smell at all. I broke of all the parts of the bodies to see how the flesh was turned to drugge, and brought home divers heads, hands, armes and feet, for a shew; [...] One little hand I brought into England, to shew; and presented it to my brother, who gave the same to a doctor in Oxford”.

Sanderson, J, *Personal Voyages*, in *Purchas His Pilgrims*, 1625.

The blackened hue of a mummy was mistakenly believed to result from a step in the embalming process that involved soaking the body in bitumen - in Persian *mum* or *mumiya* from which the modern word for mummy derives. The flesh was thus thought to contain bitumen, which was used as cure against a number of different ailments. When bitumen became scarce, apothecaries sold ground mummy and physicians prescribed it as a substitute for bitumen. Despite the ethical concerns raised against what was essentially a form of cannibalism, ground mummy was employed as a drug into the C19th.

By this time, Mummy Brown paint was in widespread use, its popularity perhaps urged on by the craze for Egyptian culture and objects of the early 19th century. It is known that artists such as Delacroix, Alma-Tadema and Edward-Burne Jones used it. It was used mainly in oil painting and had a number of desirable qualities, including lightness and transparency; as late as 1904 it was described by the critic and writer F.G. Stephens as flowing “from the brush with delightful freedom and evenness”.

Demand initially declined because bitumen was found to be an unstable paint that resulted in cracking. Due to the nature of production its qualities and composition were unreliable; it also took a long time to dry and interfered with the stability of other colours. In the early C20th the raw materials were becoming scarce due to trade restrictions but the pigment was stocked by the art supplier Roberson's until 1964 when they announced that they no longer had enough body parts to produce more paint.



THE USE OF FACSIMILES IN THE C21ST

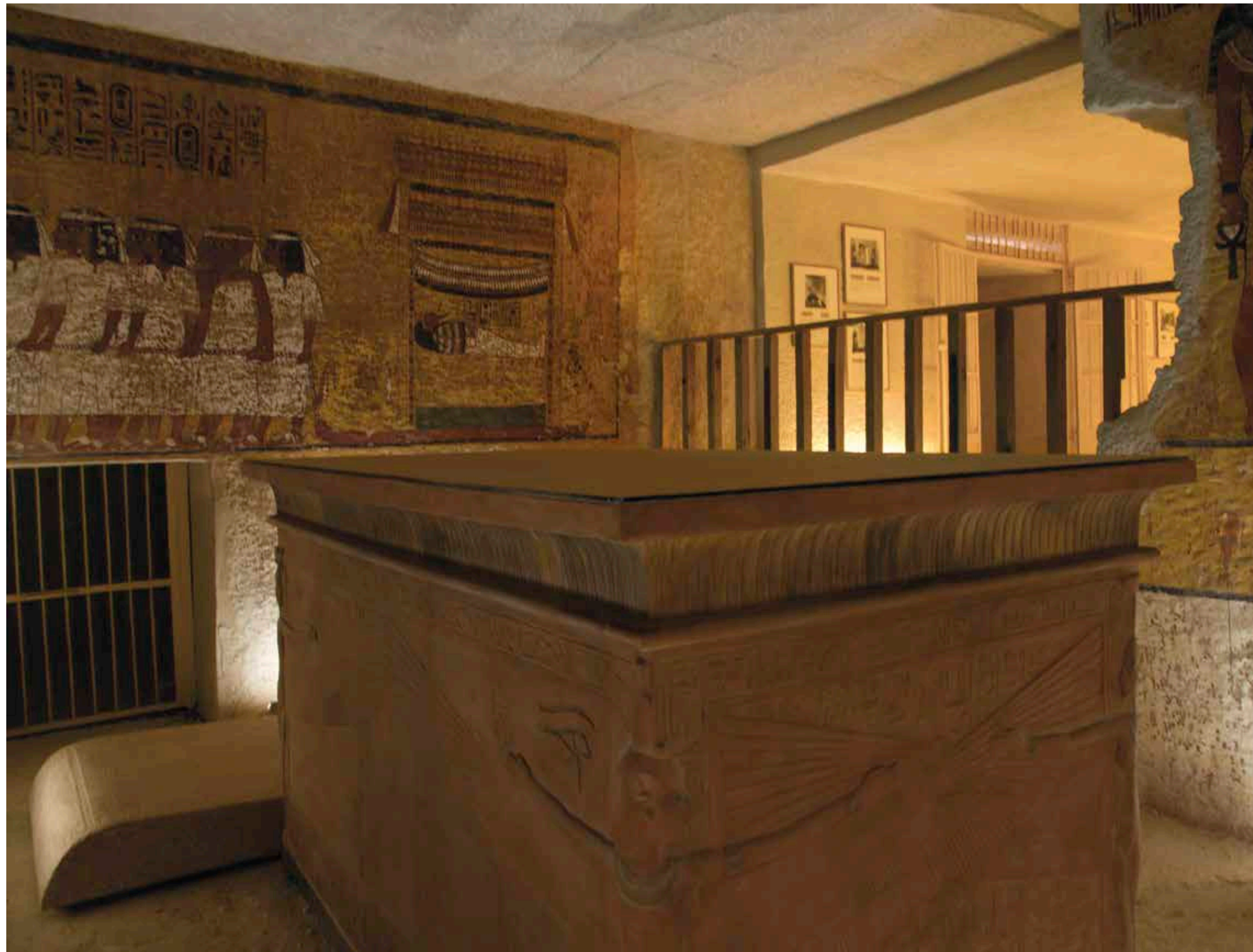
'I have often said I believe that the tombs of the pharaohs in the Valley of the Kings could be completely destroyed from modern activities in less than one hundred years. But there are tombs that we can replicate, which contain magical, beautiful scenes. These tombs are the tomb of Tutankhamun, the tomb of Seti I and the tomb of the great queen Nefertari.

Therefore, I am supporting this important project to create facsimiles of these great tombs in order to save the originals. People can visit the exact replicas and experience the beauty of these tombs and know that they are preserving the past.'

Zahi Hawass, *Reviving Egypt's Past for the Future*,
Published by Society of Friends
of the Royal Tombs of Egypt, 2009

The Friends of the Royal Tombs of Egypt, a society established by Erik Hornung and Theo Abt proposed building facsimiles of the Tombs of Tutankhamun, Seti I and Nefertari in the 1990's. The society worked with Factum Foundation from 2001 until 2014 when the exact facsimile of the Tomb of Tutankhamun was installed at the entrance to the Valley of the Kings, next to Howard Carter's house.

Facsimile of Thutmose III made by Factum Arte for the touring exhibition *Immortal Pharaoh*, a touring exhibition organised by United Exhibits Group, that opened at the National Gallery, Washington in 2002.



The facsimile of the burial chamber from the tomb of Tutankhamun is now part of Carter's House Visitor Centre. It is displayed in an underground space designed by Tarek Waly and built by craftsmen from the West Bank, Luxor. It contains a display of historical photographs by Harry Burton from the Griffith's Institute in Oxford explaining its discovery and why it looks as it does today. It also contains a section of images explaining the fragility of the surface and the problems of preserving the tombs for future generations to study and understand. The Theban Necropolis Preservation Initiative is now training selected individuals from the west bank to carry out the 3D scanning and recording and in 2016 began the recording of the tomb of Seti I. The two rooms from the tomb that are presented in *Scanning Seti: The regeneration of a Pharaonic Tomb* at the Antikenmuseum, Basel, were made from the data recorded at this time. After the exhibition the aim of the Theban Necropolis Preservation Initiative is to install a complete facsimile of the tomb of Seti I between Stoppelaere House and the facsimile of the burial chamber of Tutankhamun. It will contain all the fragments removed in the 19th whose whereabouts are currently known. This will be done as soon as all the permissions and security issues are resolved. The complete recording of the tomb will take at least five years but will provide jobs and income for people on the West Bank, Luxor.

'An exact replica of the tomb, a 'virtual experience' museum in close proximity to the actual tomb, could provide an alternative if tourist pressure becomes too great. Such a solution has met with great success at the site of the fragile, paleolithic cave paintings in Lascaux, France.'

Neville Agnew, Getty Conservation Institute.
Writing about the tomb of Nefertari
in *House of Eternity*, 1996.

The Facsimile of the Burial Chamber of Tutankhamun, part of the Carter House Visitor Centre, at the entrance to the Valley of the Kings. View from the north west corner looking back into the antechamber and the exhibition of photographs by Harry Burton.



Left: A resin cast.

Right: A mould printed from 3D data recorded in the tomb using Océ's new elevated printing system. This 3D printer builds the relief surface in 5 micron layers resulting in unprecedented levels of accuracy.



Top: Tarek Waly talking to the Director General of UNESCO, Irina Bokova, and the Minister of Antiquities, Khaled El Ennany, at the opening of the 3D scanning, Archiving and Training Centre in the newly restored Stoppelaere House.

Bottom: Abdu El Reheem Ghaba, one of the first local people to be trained in 3D laser scanning demonstrating to Khaled El Ennany the potential of high-resolution documentation for epigraphy and condition monitoring.

THEBAN NECROPOLIS PRESERVATION INITIATIVE

The Theban Necropolis Preservation Initiative (TNPI) is a collaboration between the Ministry of Antiquities, the University of Basel and Factum Foundation to ensure that the sites on the West Bank of the Nile in Luxor are recorded at the highest resolution by local people using the most advanced technologies.

The work began in 2009 and has already yielded practical results. A facsimile of the Burial Chamber of Tutankhamun was installed at the entrance to the Valley of the Kings and is now part of the Carter House Visitor Center. Stoppelaere's House, a domed mud-brick building by the great 20th century Egyptian architect Hassan Fathy was fully restored by Tarek Waly Centre for Architecture and Heritage. The building, opened in February 2017 by the director general of UNESCO Irina Bokova, the Minister of Antiquities of Egypt, Khaled El Ennany and the Swiss Ambassador Markus Leitner, will house the 3D Scanning, Archiving and Training Centre that is being established by the Theban Necropolis Preservation Initiative.

The complete recording and rematerialisation of the tomb of Seti I and all the fragments removed from the tomb since its discovery in 1817 is an important aspect of the Theban Necropolis Preservation Initiative. One of the main objectives is to reveal the changes to the tomb since it was discovered 200 years ago and to present a facsimile, on a site next to Stoppelaere House, that will contain facsimiles of all the fragments as well as the research being carried out by the University of Basel into the fragments found in and outside the tomb. This will make the facsimile more complete than the original in its current state.

The final and most ambitious phase of the TNPI involves building workshops that will employ and train local artisans to manufacture the high-resolution facsimile of the tomb. The workshops will be primarily practical, but they will also serve as a visitor centre in which the public can learn about non-contact approaches to conservation and about the exciting technical innovations that go into documenting cultural heritage, facsimile fabrication, condition monitoring, as well as assisting in the ongoing research into how to stabilise the condition of tombs that were built to last for eternity but not to be visited.



Stoppelaere House after restoration by Tarek Waly and the local team.

THE RESTORATION OF STOPPELAERE HOUSE

Stoppelaere House was built in 1951 by the Egyptian architect Hassan Fathy for Alexander Stoppelaere, Chief Restorer of the Department of Antiquities at that time. It was to function as Stoppelaere's apartment, as well as a guest house for the Department of Antiquities. It is prominently positioned on top of a hill at the entrance to the Valley of the Kings, near Carter's House, the facsimile of burial chamber of Tutankhamun and the Japanese Mission house. The house contains many of Fathy's characteristic architectural details and demonstrates his mastery of form through mudbrick vaulting techniques. Stoppelaere House, one of Fathy's few early surviving works, had fallen into complete dereliction over decades of abandonment.

As Stoppelaere House was conceived as an expedition house, the original design contained dedicated working and drafting spaces making it ideally suited for conversion into a centre for 3D scanning, archiving and training. The work to restore the building was carried out by Tarek Waly Centre for Architecture & Heritage using a local team of mudbrick builders.

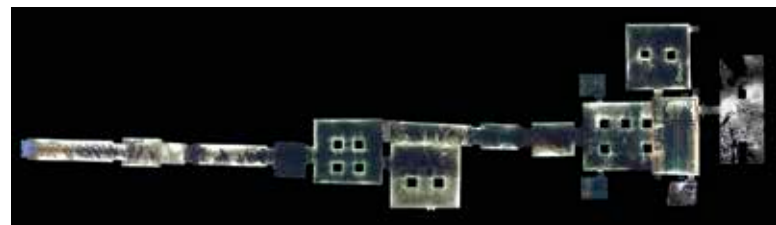
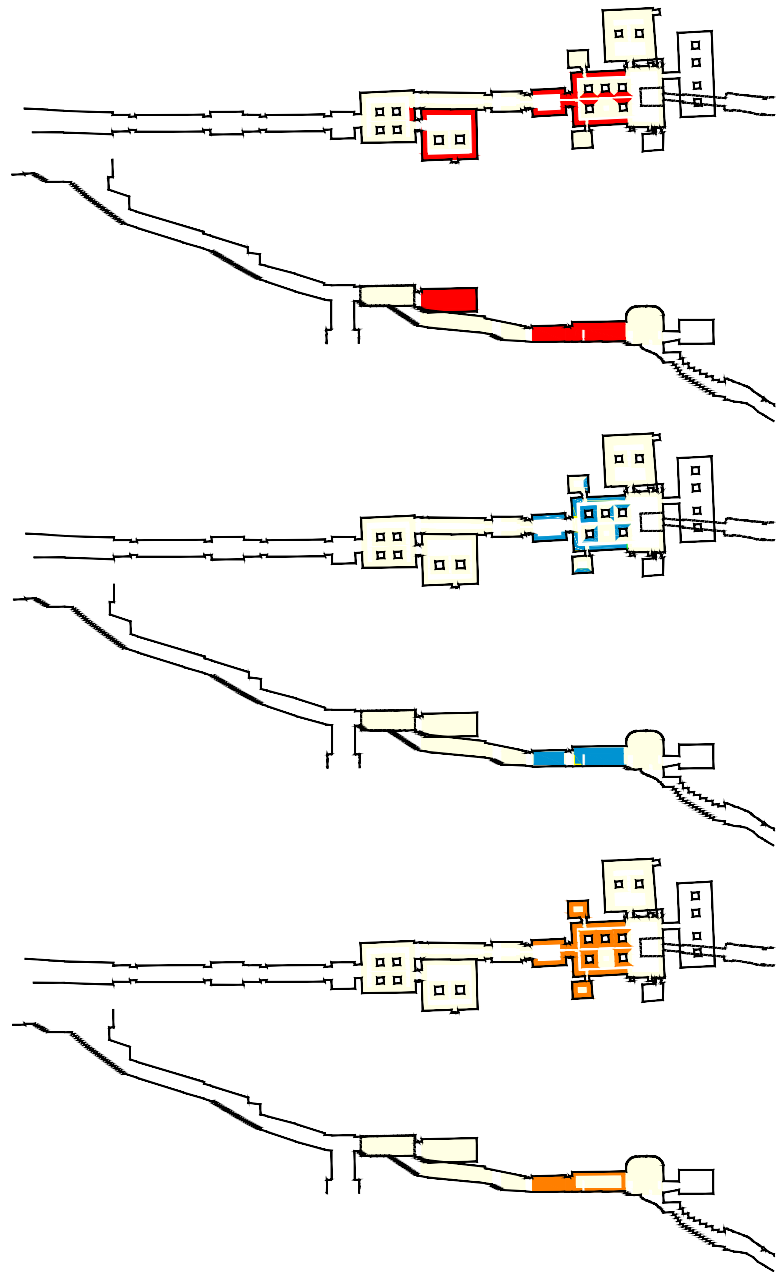
Mudbrick structures require constant maintenance, and Stoppelaere House is no different. The building had suffered severe deterioration due to local settlement of the site, weather and soil erosion. Poor plumbing and leaking water had caused further damage to the building's foundations. While many of the problems were immediately visible, others were revealed through detailed surveys.



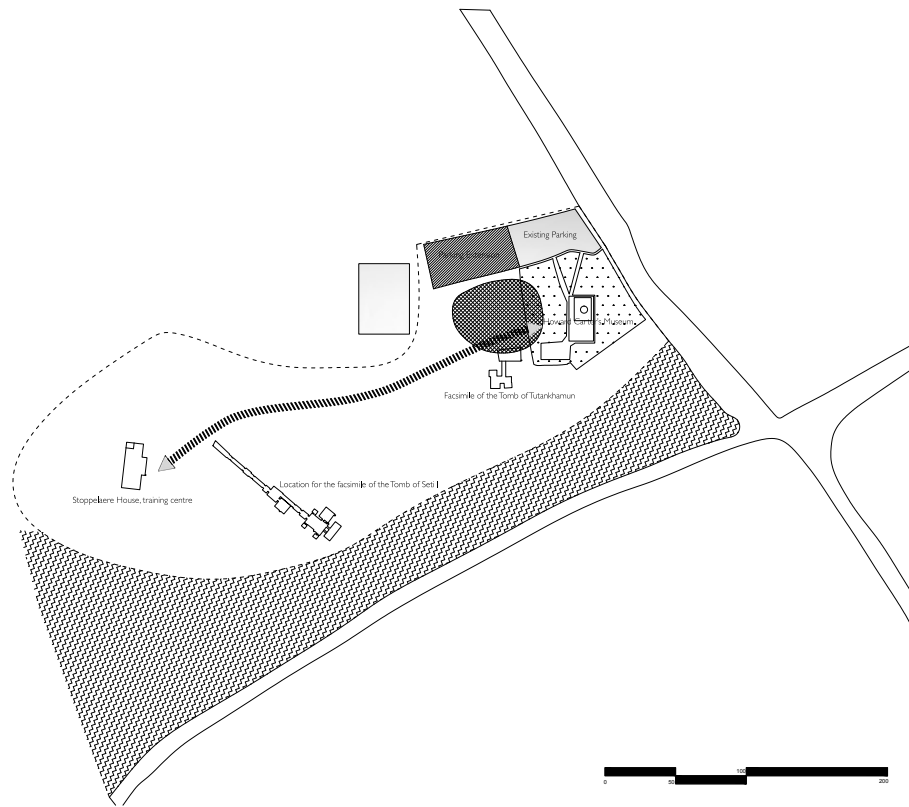
Aliaa Ismail running a class on data processing for Mahmoud Salem, Abdu El Reheem Ghaba and Moussa Sayd Mohamed in Maria Golia's building near Medinet Habu that was used as the temporary training centre while Stoppelaere house was being restored in 2016.

A number of measures were needed to convert the building into a centre for 3D scanning, archiving and training. Structural interventions were essential; the existing structure had to be stabilised using a reinforced concrete 'ring-beam' to tie the building together. The entire structure, including external walls and domes, were then restored or rebuilt, taking steps to guard against future deterioration. The restoration recycled elements of the existing building using original construction techniques. Doors and lattice work were remade by local carpenters. There were limited modifications to the services to enhance the quality and functioning of the building. New dust-proof and sealed windows were installed. The entire interior was renovated, with new electrics, plumbing and air conditioning added in the adaptation of the house to its new use. The exterior was restored and landscaped. While all necessary interventions to enable the advanced digital recording technologies to function on site were made, great importance was given to catering for contemporary needs while respecting and preserving the architectural values of the house.

Following the opening of Stoppelaere House in February 2017, negotiations are ongoing to finalise the lease that will allow the building to operate as a 3D Scanning, Archiving and Training Centre. The Centre will provide the latest technologies needed to document the tombs using non-contact high-resolution 3D and photographic recording, local training and employment. It will contribute to the long-term survival of the tombs and assist heritage managers in the complex task of preserving the Theban Necropolis in the 21st century. Its existence will ensure that any future documentation can be carried out locally and for the benefit of the community.



Left: Plans of the tomb of Seti I, top to bottom: composite photography -marked in red already recorded areas; Lucida 3D Scanner – marked in blue already scanned areas; photogrammetry – marked in orange already scanned areas; top view of the FARO Scanner 3D data covering the whole tomb.
Right: A map of the area at the entrance to the Valley of the Kings showing the elements being developed by the Theban Necropolis Preservation Initiative.



RECORDING THE TOMB OF SETI I

A mixture of different technologies and skills are required to record, mediate, transform and replicate the tomb of Seti I. Both the *Hall of Beauties* and the pillared part of the Sarcophagus Room have been replicated for *Scanning Seti – the regeneration of a Pharaonic Tomb* with all known fragments from these spaces that we have been able to record. For study purposes, this has been a valuable way to focus the knowledge of different specialists on the task of understanding how the tomb looked in 1817 and why it looks as it does today.

All systems used by Factum Foundation are 100% non-contact and meet the highest conservation standards. At no time during the recording is there any physical contact with the wall. No markers or colour charts are attached to any part of the wall at any time.

RECORDING TECHNOLOGIES USED IN THE TOMB OF SETI I (Taken from the report on work in the tomb of Seti I 2016)

FARO FOCUS 3D X 130 HDR

The Terrestrial Laser Scanner (TLS) FARO Focus 3D x 130 HDR is a mid-range device that uses phase shift technology, offering accurate scanning from 0.6 m up to 130 m. It can capture millions of 3D measurements at up to 976,000 points/second, with a ranging error of ± 2 mm. The integrated colour camera records a HDR photo overlay of up to 165 megapixel colour.

In 2016, a complete survey of the tomb of Seti I was carried out from over 70 different scan positions, significantly improving on the previous recordings of the Theban Mapping Project. The point cloud of the entire tomb comprised about 2.132 million points, with an average distance between measured points of 1.5 mm to 3 mm.

THE LUCIDA 3D LASER SCANNER

The Lucida Laser Scanner was developed by Manuel Franquelo at Factum Arte for the recording the 3D relief in the tomb of Seti I. The concept was developed in 2001 following the first season's work in the tomb. Since then, the system has been perfected and is entirely built by Factum Arte. The software has been designed for simplicity and ease of use without compromising the quality of the working applications.



The Lucida records tonal video using two precision cameras placed either side of a low level laser. This black and white information is then converted into 3D data. At present 100 million independently measured points per sq meter are extracted from the depth map. The video data is also stored as raw video, which in the future can be processed at even higher resolutions. The Lucida is a close-range system which scans at a distance of 8 cm from the surface of the wall. The scanning head is mounted onto a lightweight mast and horizontal and vertical movement (X and Y axes) is regulated by a CNC controller. The depth (Z axis) is manually set. The scanner has a depth of field of 2.5 cm and records an area of 48 x 48 cm in one hour. The main areas of each wall were recorded with the Lucida Scanner. Throughout 2016, two to three Lucida scanners could be found working in the tomb at any one time.

COMPOSITE PHOTOGRAPHY

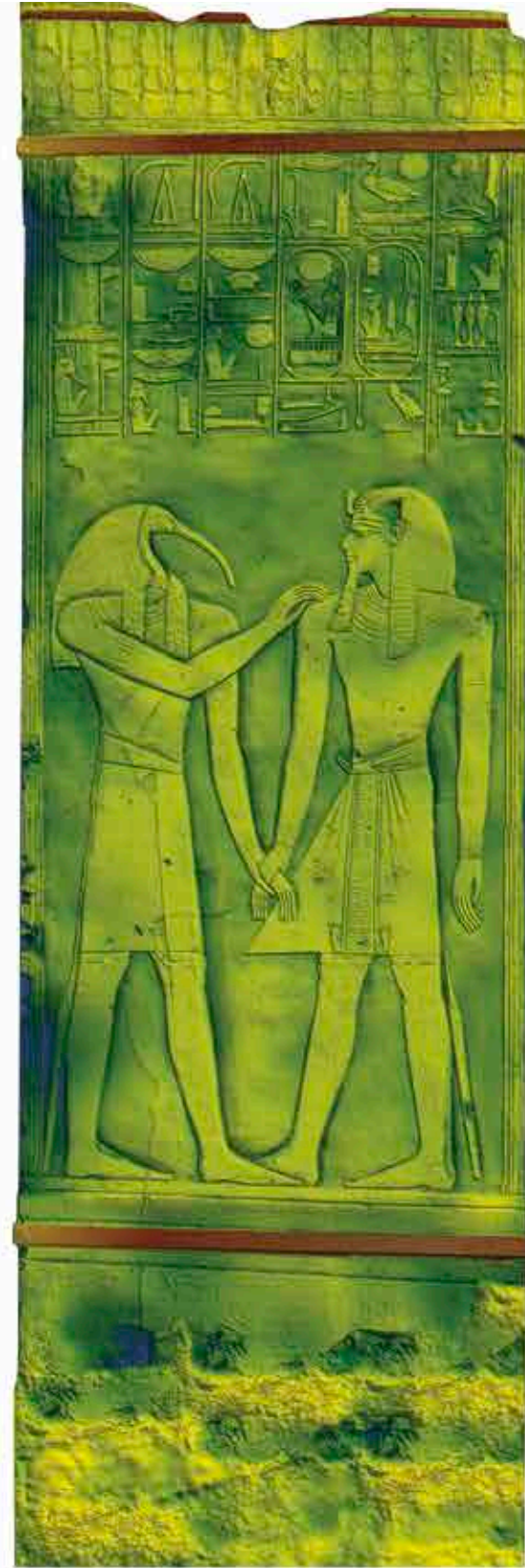
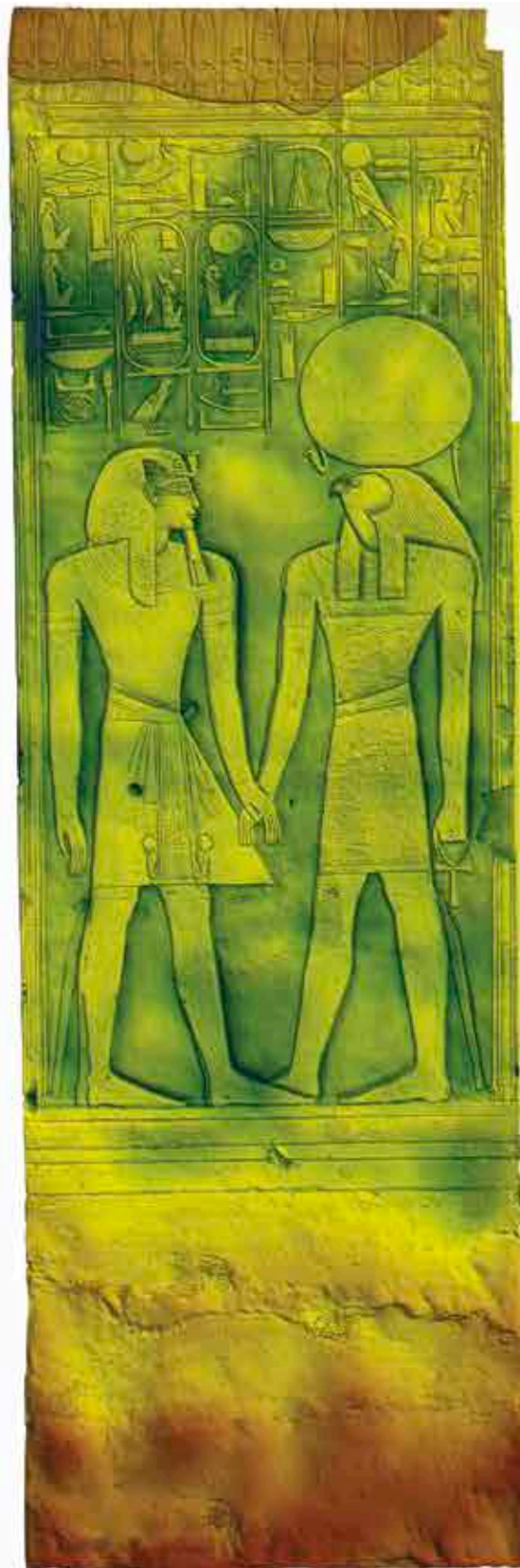
Composite photography involves the production of a high-resolution image or form from the stitching of a mosaic of individual images. The photographs are taken on a Canon 5DSR 35 mm camera using a variety of lenses and lights. All the lights used in the tomb meet accepted museum conservation standards. The camera can either be tripod mounted, hand-held or fixed to a pan and tilt head. The approach to taking the photographs varies depending on their use. Photogrammetry requires one approach and colour recording another.

Photogrammetry capable of extracting sub-milimetric data is an emerging technology. Factum Foundation currently employs two software packages and is working closely with Autodesk and Capturing Reality to increase both the quality of the data, the processing times and the ease of use.

Colour Composite panoramic photography is often referred to as Gigapixel photography due to the vast amount of data that is recorded. The aim is to record the entire tomb at a scale of 1:1 with image files of about 500 PPI. In areas where the space allows (for example the East and West walls of the sarcophagus room) the resolution can reach 600 PPI after the perspectival distortions are removed. In other areas with limited space, such as between the pillars in Room J, the resolution will not exceed 300 PPI. The Hall of Beauties has been recorded at resolutions between 400 and 500 PPI. The composite photographs are stitched using PTGui software at sub-pixel accuracy and the resulting files are aligned to the 3D data. They are prepared as layers in viewers that can be securely accessed via the internet. They can be viewed together or separately, facilitating study. These high-resolution files can be enlarged to about five times the actual size without loss of image quality. The floors, walls, columns and ceilings of the entire tomb are recorded using a variety of different lenses.

In addition to the high-resolution composite photographs, an archive of reference images is also being made. These record the condition of the tomb before and after scanning, the work that is taking place, the individuals involved and any detail that is relevant for research or for facsimile production.

Factum Foundation's aim is to record data that will be of sufficient quality that the whole tomb can be replicated in its present condition. To do this, we must have accurate references about the colour of the tomb under the current lighting conditions. Both standard photographic colour charts and physical colour reference sticks are used. These are held close to the surface of the wall but not in contact with it. The colour reference sticks are made specially for each area of the tomb and then taken to the place where the facsimile is being made.



Depth maps of the pillars in Room J produced with 'Global Mapper' software.



Recording the sarcophagus in Sir John Soane's Museum, London.



Making the replica of the sarcophagus of Seti I in Factum's workshop in Madrid.



3D renders of the sarcophagus of Seti I.

RECORDING AND REMATERIALISING THE SARCOPHAGUS OF SETI I

The suggestion of decay and change is inherent in the idea of a sarcophagus: the name conjures a flesh-eating stone container that protects the body and soul during its most vulnerable transformation.

The sarcophagus of Seti I, one of the most famous objects in Sir John Soane's collection, contains the protective figure of the goddess Nut on the base and a copy of the text of the Book of Gates on the outside and inside. The Book of Gates is one of a group of texts, along with the Amduat and the Book of Caverns that focus on the Sun-God's complex journey through the 'dark hours of the sun' and his rejuvenation each morning. Metaphorically, the sarcophagus is the container that 'consumes' its contents, protecting the original as it decays while ensuring it can live again.

PREVIOUS ATTEMPTS TO RECORD THE SARCOPHAGUS

On 17 June 1840 a letter from John Williams was read to the Trustees of Sir John Soane's Museum in which he requested permission to take a copy of the Egyptian Sarcophagus using a mechanical process he had invented and which he claimed to have used with success in the British Museum. The Trustees granted him permission to copy the hieroglyphs on condition that his method 'will not be in any way injurious to the Sarcophagus'. Some time between June and October that year Mr Williams carried out the recording using his specially designed mechanical process. We are not sure of the exact details of the process but it was probably a variation on a pantograph or a system using an array of metal pins that could be pressed against the surface to fix an impression of the relief. In 1853 the Crystal Palace Company also requested permission to make a cast. This request was denied and fortunately a direct plaster cast was never made. A plaster cast of a fragile alabaster object with Egyptian blue inlay would have had a negative impact on its condition.

The mid-19th century was the era of casting and copying and 2017, the year of the 200th anniversary of the discovery of the tomb of Seti I by Giovanni Battista Belzoni, is also the 150th anniversary of the signing of the Convention for the Reproduction of Universal Artworks. In 1867 the Victoria and Albert Museum's first Director, Henry Cole established this convention as an agreement between the museums of Europe that allowed the reproduction and circulation of casts of important sculptures and architectural elements. Cole's illustrious career began in the Public Record Office and reflected the Victorian age's ambition to catalogue and make accessible the arts of the world. The Cast Courts in the V&A stand as a testament to the scale and success of Cole's vision. But they also reveal a more complex story, one that brings into focus the question of how we care for,

value and preserve our cultural heritage. The mould-making process posed a significant threat to the integrity of the original but as a result of communicating their importance it bestowed value on sculptures and architectural façades which helped to ensure their preservation. This was in the age before mass tourism. To the colonial manager, if the people could not be brought to the works of art then the works of art had to be brought to the people. The damage this caused was one reason the obsession with three-dimensional copying started to fade. Another was the arrival of photography. It was easier and cheaper to record an object in two dimensions and the results presented fewer problems in terms of archiving and dissemination. The physicality of the cast was replaced with the tonality of the black and white photograph.

Recently photography itself has been undergoing a revolution. With the current conditions of exponentially increasing digital potential, high-resolution composite photography is opening the door on to a new world of triangulated polygons and point clouds. Photogrammetry is the name given to the science of taking measurements from photographs. In this environment it is not only the relationship between two and three dimensions that is being addressed but the relationship between originality and authenticity is rapidly being questioned and renegotiated.

Historically accepted methods of preservation are undergoing reinvention and re-evaluation; digital recording technologies are experiencing rapid growth. The first attempt to scan the alabaster sarcophagus in 2002 using a hand-held laser scanner was not successful due to the translucent nature of the stone. However, in March 2016 the sarcophagus of Seti I was the subject of a high-resolution photographic recording in colour and three dimensions. The recording was non-contact but provided data of the delicate carvings that can be studied with forensic accuracy. This will lead to a deeper and more intimate understanding of this enigmatic object.

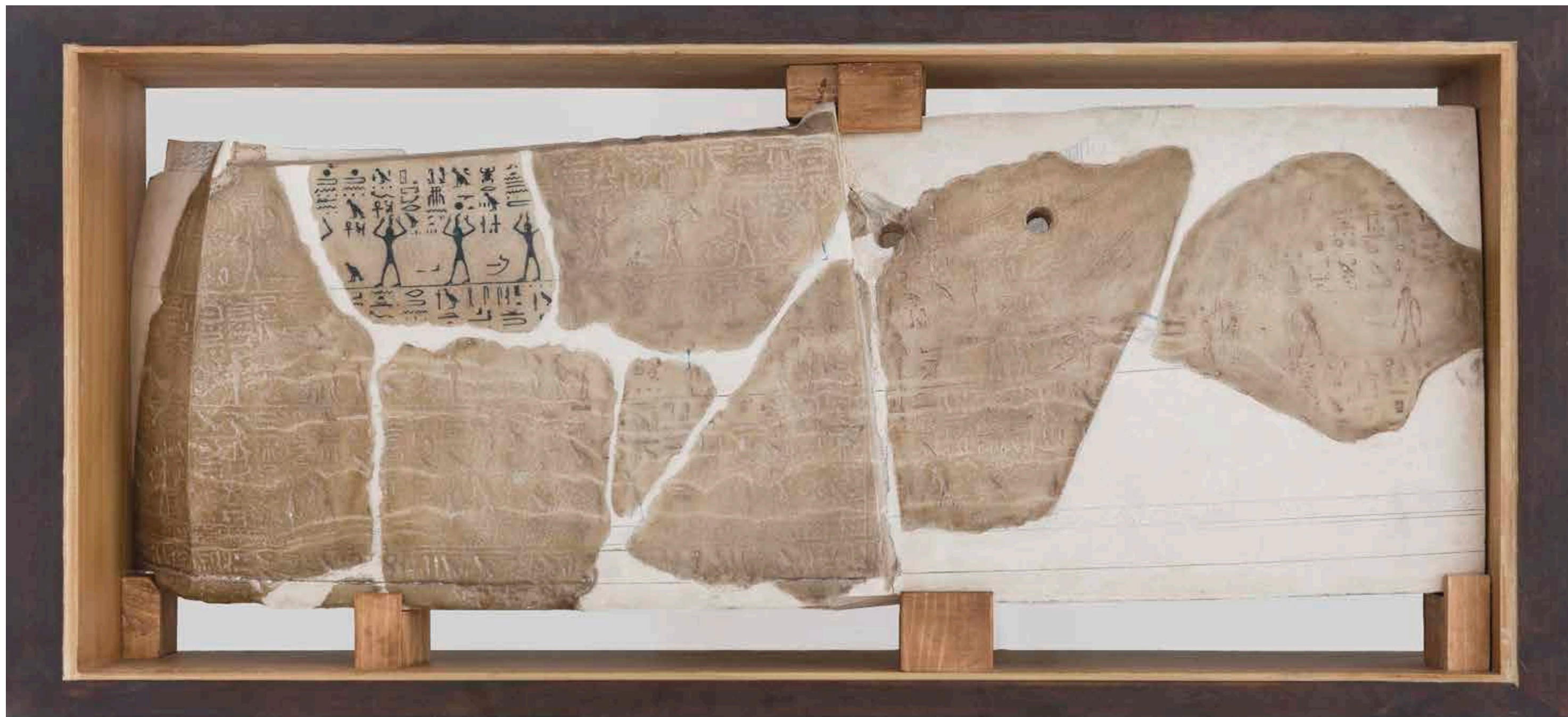
Continuing the trajectory of the artefact and its preservation, the new photogrammetric recording of the Sarcophagus of Seti I was carried out by a team from Factum Arte supported by the Factum Foundation for Digital Technology in Conservation thanks to a generous donation from Jeffrey and Veronica Berman. Documentation, considered for too long to be a boring, repetitive, time-consuming job, is becoming a technically innovative challenge requiring curiosity, ingenuity and action. Capturing the colour, shape and surface of an artefact that can, if desired, be re-materialised as a physical object using a range of ingenious techniques, presents technical challenges.



MAKING THE FACSIMILE OF THE SARCOPHAGUS

The physical recreation of the Sarcophagus presented a series of challenges due to its size, the complexity of the form, the translucent nature of the material, its complex featuring and the very subtle carving on the surface of the entire interior and exterior faces of the sarcophagus. The final solution that was adopted is the result of some remarkable advances in 3D printing technology being developed by Océ, part of the Canon group of companies. Their elevated printing system can build up a surface in full colour in 5 micron layers. However the challenge of digitally separating a very thin skin from the surface, flattening it onto a flat plane but keeping the surface relief, and then fixing it back onto a CNC milled rendition of the Sarcophagus without its surface was both conceptually, intellectually and technologically challenging. This work was carried out in Factum Arte by a team led by Enrique Esteban using 'Global Mapper' software.





Fragments of the sarcophagus lid presented in a case designed by Joseph Bonomi.



Detail of the recreation of the pillar Aa from Room Jb (Hornung's Room M) based on the research and scholarship of Florence Baberio. With time it should be possible to piece together this vast jigsaw helping to generate a deeper understanding of the original nature and appearance of the tomb.



THE WORK OF THE UNIVERSITY OF BASEL. FRAGMENTS FOUND ON SITE AND OUTSIDE THE TOMB OF SETI I

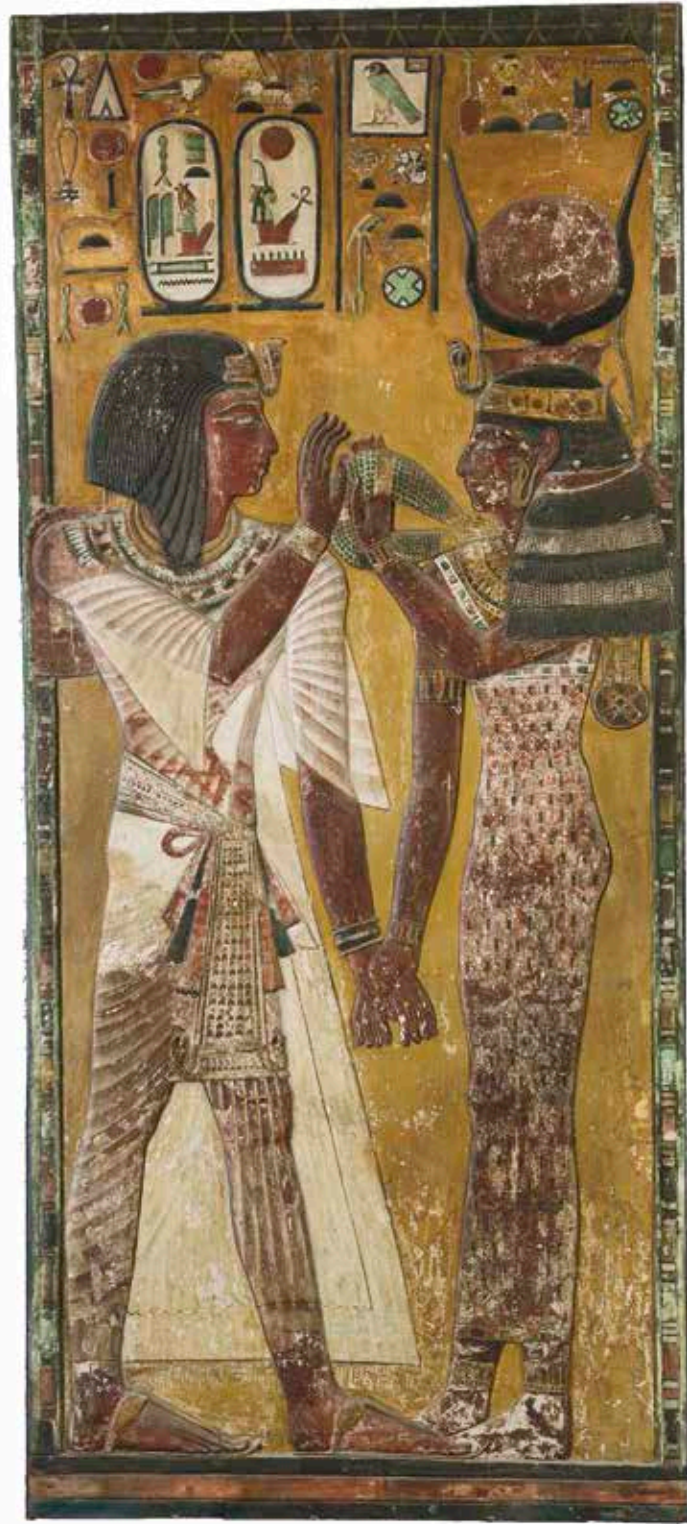
In the years following the discovery of the tomb, sections of the decoration were removed and there are now hundreds of fragments in museums and collections around the world. The largest are in the Musée du Louvre in Paris and the Archaeological Museum in Florence. There are also a large number of smaller fragments that were found in, or near, the tomb by a team from the University of Basel led by Susanne Bickel and Florence Baberio.

A fundamentally important part of the work that is being carried out by Factum Foundation and Basel University is the complete recording of all the fragments that were removed since its discovery in 1817. In 2016 a group of fragments were recorded at the Museum of Fine Arts, Boston. In 2017 fragments were recorded at the Louvre (Paris), at the British Museum, the Sir John Soane's Museum (London), the Archaeological Museum (Florence) and in a private collection.

Research conducted by the University of Basel in the Valley of the Kings has expanded our knowledge on the tomb of Seti I (KV 17). The excavations carried out near the adjacent tomb of Ramesses X (KV 18) between 1998 and 2005 brought to light roughly 5,000 decorated fragments from the tomb of Seti I. Larger fragments were found inside Seti's tomb where they had been stored for more than a hundred years. In 2015 the Supreme Council of Antiquities authorised analysis of this material; since then 868 new fragments have been listed, a figure which is expected to rise in the course of future projects.

Factum Foundation is committed to recording these fragments and assisting with the computer visualisations that will help with their study and re-integration. Digital restoration is a fast growing area of digital humanities. Both recording hardware and analytic software are changing the way academia functions. In recent years Florence Baberio and the team from Basel University have pieced together many fragments. As objectively accurate technologies are applied to the understanding of the past, new discoveries are constantly being made. Technology is playing an increasingly important role in human medicine, now it is starting to have a real impact on the preservation of the past.

Factum Foundation is also seeking to record any existing squeezes; wax squeezes are thought to exist at MFA and in the British Museum. These objects contain vital evidence about the surface of the tomb and also help to understand the damage that can be found in the tomb. Understanding why the tomb looks like it does is an important part of understanding its meaning and relevance.



A fragment showing Hathor offering her neck decoration to Seti, Archaeological Museum, Florence (left) and a matching panel from the opposite door post now in the Musée du Louvre, Paris, demonstrating two very different approaches to restoration made in separate places and times. These panels look neither like each other, nor the original tomb, and demonstrate changing fashions in the treatment of cultural heritage.



A pillar from Room J showing Seti I and Osiris now in the Egyptian Museum in Berlin.

FRAGMENTS RECORDED BY FACTUM FOUNDATION

(2016-2017)

- Museum of Fine Arts, Boston
 Reference 72.645ab; 300 x 200mm
 Reference 72.646; 70 x 80mm
 Reference 72.647; 160 x 140mm
 Reference 72.649; 220 x 150mm
 Reference 72.650; 100 x 40mm
 Reference 72.651; 130 x 100mm
 Reference 72.653; 180 x 180mm
 Reference 72.661; 90 x 120mm

- Musée du Louvre, Paris
 Reference B7; 2260 x 11050mm (see image to left)

- Ägyptisches Museum und Papyrussammlung, Berlin
 Reference AM2058; 2610 x 880mm
 Reference AM 2079; 1050 x 530mm
 Reference AM 2079; 1060 x 540

- Museo Archeologico Nazionale, Florence
 Seti and Hathor; 2350 x 1030mm
 Maat; 740 x 470mm

- British Museum, London
 Reference EA855 (Side A); 1660 x 630mm
 Reference EA855 (Side B); 1660 x 200mm
 Reference EA884 (Side A); 490 x 400mm
 Reference EA884 (Side B); 490 x 210mm
 Reference EA5602; 240 x 180
 Reference EA5603; 250 x 240mm
 Reference EA5604; 110 x 70mm
 Reference EA5605; 130 x 100mm
 Reference EA5606; 100 x 180mm
 Reference EA5608; 280 x 200mm
 Reference EA5610; 250 x 380mm
 Reference EA35499; 80 x 110mm
 Reference EA35500; 50 x 80mm

- Sarcophagus lid fragments at the British museum
 Reference EA37928; 100 x 160mm
 Reference EA29948; 350 x 240mm
 Reference EA37927; 120 x 140mm

- Sir John Soane's Museum, London
 18 fragments of the sarcophagus lid of different sizes. Two are presented in a glass case while the others are set into plaster and housed in four wooden cases with glass protection. One revolving case but in each both sides are visible. The display was the work on Joseph Bonomi.



CONCLUSION

Digital recording technologies are leading to a deeper understanding of works of art. Artworks can now be studied with forensic accuracy as repositories of evidence revealing the many subtle decisions that were taken as they were being made. Conservation is the management of change. The evidence revealed by new recording technologies helps identify changes that have happened over time, revealing how things have aged. This evidence facilitates a detailed analysis of the interventions that have been made for different reasons at different times and in different places.

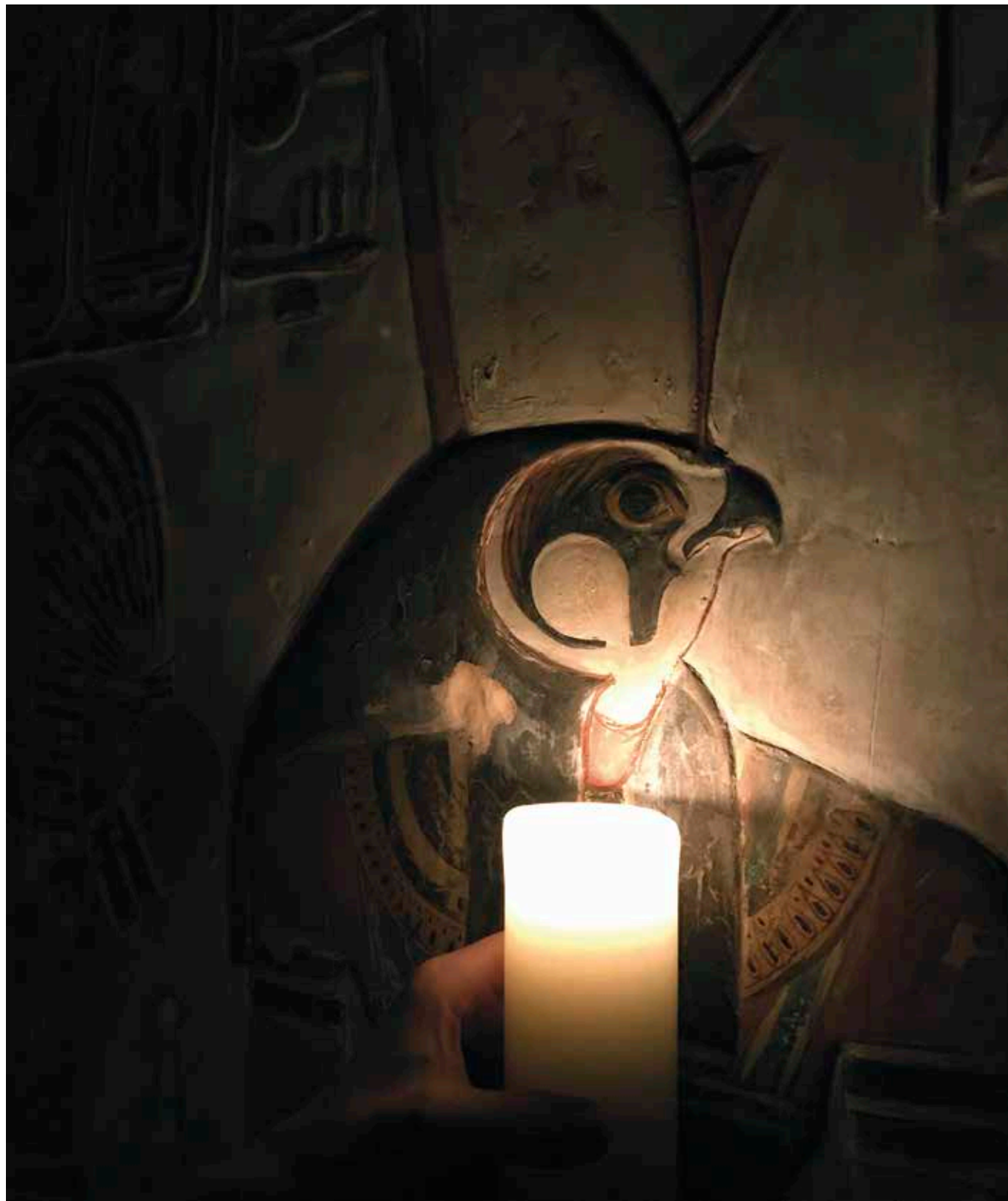
By using these methods, we become able to read both original intention and the values of those who have ‘looked after’ the cultural object. The use of technology relies on fact, not opinion, and is resulting in a deeper understanding of the reasons things look as they do.

This approach is creating a new type of connoisseurship that helps to reveal the complex history of an object, allowing it to be read and engaged with in new ways. The recording work that was carried out by Factum Arte’s team in 2009 in the tomb of Tutankhamun has proved to be a turning point in documenting and preserving the past through the application of new technologies.

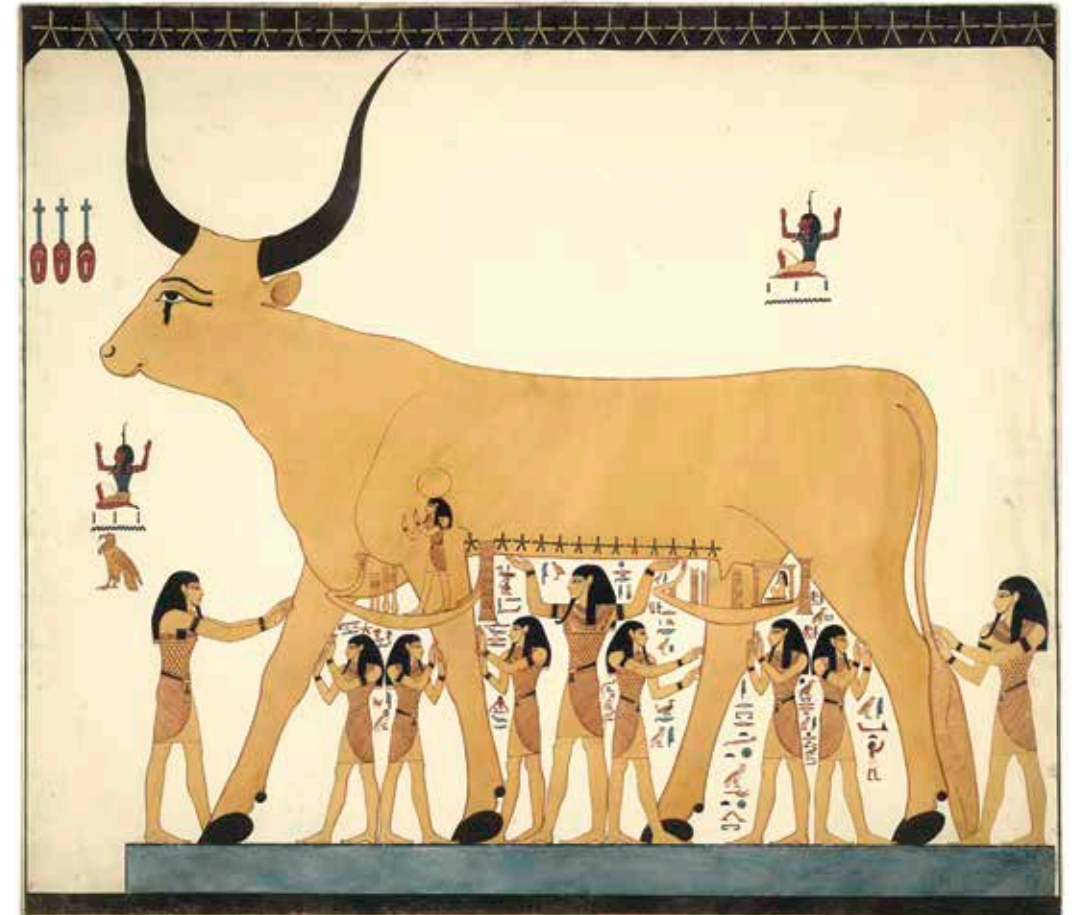
The work that is being done in the tomb of Seti I will set new standards and transfer all the skills and technologies to a local team. Factum Foundation is currently developing a similar approach in other places that are affected by conflict, economic hardship, natural disasters and neglect. The Middle East and North African (MENA) region is an obvious focus of attention. Its historical importance and current conflicts make it exceptionally vulnerable. With the current political climate of localism and extremism spreading from Washington to Pyongyang, everywhere becomes a possible conflict zone. The documentation of cultural heritage is now more important than ever. It is vital that recordings contain sufficient information to act as an accurate record in the case of damage or destruction, rather than as souvenir or memory of something we have lost.

The key to the successful recording of cultural heritage lies in: the transfer of skills and technologies to local communities; the provision of training and support; the development of a distributed archiving system and finally; ensuring the data is shared, disseminated and used.

Ownership of data is key to this. Factum Foundation’s core policy is to transfer the ownership of the data to the organisations responsible for looking after the object or site. They will own the commercial rights for all current and future applications. In return they will make the data freely available for study, condition monitoring, conservation applications, digital restorations and general interest.



The reconstructed Hall of Beauties as it may have looked in 1817 illuminated with candle light. When seen with this light the white paint is matt and absorbs the light while the colours have varying degrees of reflectivity.



The Heavenly Cow, watercolour by Alessandro Ricci and Giovanni Battista Belzoni made soon after the discovery of the tomb in 1817. Courtesy of Bristol Culture / Bristol Museum & Art Gallery.

Once the exhibition at the Antikenmuseum in Basel has finished, the rematerialised rooms, along with the sarcophagus and all the fragments, will be sent to Egypt where they can take their place alongside the facsimile of Tutankhamun's burial chamber. It is hoped that with political will and support from UNESCO, the World Monuments Fund, the Getty Conservation Institute, the Peri Foundation and other foundations committed to the preservation of cultural Heritage, this could be the model for future long term preservation. Sites of this importance and fragility urgently need our protection. In the spirit of the original purpose of the tomb and its contents, Seti's memory will be preserved, while his reputation and memory will continue to spread.

text

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The section from *Don Juan in London* by Alfred Thornton in 1822, reprinted from the original version published by Thomas Kelly, transcribed by Otto Lowe.

Research into *Mummy Brown* by Eva Rosenthal.

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Ibarra Font is the result of a collaboration initiated by the printer San Francisco Artes Gráficas and the Technological Institute of Aragón (ITA). The aim was to recover an ancient Spanish font commissioned by the renowned eighteenth-century Aragonese printer Joaquín Ibarra y Marín from the engraver Antonio Espinosa de los Monteros. The work was carried out by Nacho Pulido and Sandra Baldassarri, both involved with the Advanced Graphic Computing Group at CPSUZ; managed by Francisco José Serón Arbeloa.

