

CHAPTER 35

TOMB RECORDING: EPIGRAPHY, PHOTOGRAPHY,
DIGITAL IMAGING, 3-D SURVEYS

ADAM LOWE

CONSERVED AND PRESERVED NOT RESTORED AND RENOVATED

“The authorities face agonizing decisions. Do they admit visitors to royal graves and witness the near-certain deterioration and perhaps disappearance of unique wall paintings from sheer people pressure? Or do they close everything to save it for future generations? . . . The dilemma pits the preservation of the priceless and finite archive that is ancient Egypt against the pressing economic needs of a developing country – altruism for future generations against short-term advantages.”

(Fagan 2004, 252)

THE ROLE OF RECORDING AND RECONSTRUCTION AND THE DEVELOPMENT
OF SUSTAINABLE TOURISM. (Fig.35.1)

In the Eighteenth Century Joachim Winckelmann proposed that sites and artefacts should be conserved and preserved, not restored, renovated or reconstructed. At the time Winckelmann and others were excavating Rome and shaping our image of ruins and antiquity – an image that embraced Greek, Etruscan, Roman and Egyptian influence. The comment was aimed at the imaginative and active approach of many of his contemporaries, especially Piranesi, who was restoring, renovating and reconstructing; treating the remains he found as a source-book for ideas and information. Piranesi was an artist. Winckelmann an academic who represents

the philological approach that was tune with the C20th and his views reflect those of most heritage professionals today. It an approach that was enshrined in the 1964 Venice Charter and other charters issued by ICOMOS, UNESCO and heritage professionals . However, as new technologies become available to record and study objects with forensic accuracy it is clear that the decision making processes of heritage managers and the practical tasks of conserving and preserving the past are neither simple nor an exact science.

However discrete the attempts to conserve might be, they alter the appearance of the original and often have unforeseen consequences that can be irreversible. They impose changes to colour, tone, texture and sheen, they condition the look and character of the sites and how we perceive them. They raise both moral and aesthetic issues. In the Valley of the Kings the glass panels installed in some tombs introduce a museum language that has nothing to do with the function or character of the tomb. The lighting, text panels, smell of human sweat, guards, tour groups and the ban on photography all play their part in imposing an aesthetic dimension onto the act of preservation.

When Winckelmann was writing in the middle of the C18th tourism was limited to a few wealthy and acquisitive individuals. The problem facing the heritage managers of today is how to insure that our cultural heritage is preserved for the next generation in a meaningful way. Whatever practical and political arguments are put forward, an essential part of every approach is documentation – we have a duty to record what we have inherited. Twenty years ago it was not possible to digitize, store and then rematerialize an object that, side by side with the original and at a normal viewing distance, looked identical. Now it is possible. It requires time, understanding, technology and a different mindset. It demands new intellectual and professional framework. It requires the development of hardware and software designed in conjunction with the people who are working to preserve and conserve. It requires collaborations between different disciplines that struggle to share a common language.

Since the Tomb of Tutankhamun was discovered, tourism has been the biggest threat to its survival. Yet Egypt's economy is dependent on tourism. Andrea Byrnes has described the problems clearly in her essay *Replication of the tomb of Tutankhamun. Conservation and Sustainable tourism in the Valley of the Kings*. She observes that Flinders Petrie and others were aware of the problem and that Howard Carter commented on the impact on the fabric of the tomb caused by the humidity and dust brought in by the visitors. She cites Michael Jones' chapter in Wilkinson's *Egyptology Today* and she provides figures: 'In 2005, for example, Egypt earned 6.4 billion US dollars in tourist revenue, providing work for around 12 per cent of the nation's workforce.' According to Kent Weeks and Nigel Hetherington's *The Valley of the Kings Site Management Masterplan*, during the height of the 2004 season the Valley of the Kings received 7000 visitors per day and over 1.8 million visitors in total for that year. *The Site Management Plan* operates on the assumption that visitor numbers in the Valley of the Kings will reach 15,000-20,000 per day by 2014. The tombs were built to last but they were not built to receive visitors.

At the entrance to the tomb of Tutankhamun is a yellow sign that reads – EXTRA TICKET FOR TUTANKH AMON TOMB 100L.E. The celebrity of the tomb adds to its value and attracts visitors. While the political unrest has led to a temporary downturn, the growth of tourism and the continued public interest in Egyptology will undoubtedly lead to the return of the visitors once public confidence in political stability returns. In the 21st The Valley of the Kings has to play a dual role. On one hand it is a repository of paintings and written texts that reveal essential insights into who we are. On the other it is essential for the economy of Egypt in general and Luxor in particular.

Tutankhamun's tomb is a tourist magnet. Schools around the world fill receptive and imaginative minds with the great stories of the boy king, pharaonic culture, adventure and archaeology, Howard Carter and curses, gold and symbolism. Hollywood and computer

games turn this interest into entertainment. The treasures from the tomb were moved to the Cairo Museum following the discovery where they are seen by many more people than if they remained in Luxor. Touring exhibitions of selected objects attract wider audiences and remain popular. In London, the 1972 exhibition *Treasures of Tutankhamun* attracted 1,650,000 visitors. Now, in addition to exhibitions of original objects, several identical commercial touring exhibitions based on tourist-quality copies and dramatized documentaries are successfully touring the world. All of these generate interest and result in increased tourism.

Some of the measures carried out by the Supreme Council of Antiquities to protect the tombs have had a positive effect but all involve restricting access and keeping people moving through the tombs. Banning guided tours inside the tombs has made a significant difference and prevents large concentrations of people in one area. The restriction of each visitor to only three tombs per visit, the closure of the tomb of Seti I and the imposition of severe limitations on visits to the tomb of Nefertari and the use of a rotation system (similar to that used to protect the Etruscan tombs in Tarquinia) all help. But ultimately, as with the caves at Lascaux and Altamira, the only solution for long-term preservation is to radically reduce visitor numbers. The question is: can this be done in a way that keeps attracting the visitors and enhances our understanding of the importance of the site and the knowledge it contains? The use of new recording technologies is central to any answer. The role of facsimiles still needs to be defined and demonstrated. Since 1988 The Society for Friends of the Royal Tombs of Egypt under the direction of Erik Hornung and Theodor Abt have been championing this approach. The Supreme Council of Antiquities initiated a research project in the tomb of Seti I in 2001 and the recording work in the Tomb of Tutankhamun started in 2009. In 2012 the facsimiles of the burial chamber, the sarcophagus and the re-creation of the missing fragment from tomb of Tutankhamun were given to the people of Egypt by the Society of Friends of

the Royal Tombs of Egypt, the Factum Foundation and Factum Arte. The work has taken almost four years to complete and has involved a large group of individuals, each with different skills, working together as a team. Permission has been granted by the ministries of Tourism and Antiquities to install the facsimile on a site next to Howard Carter's house at the entrance to the Valley of the Kings. The aim is to encourage the conservation community and the general public to visit both the original tomb (while it remains open) and the facsimile and contribute to the debate about the problems of preserving and safeguarding fragile sites. The work that was carried out by Factum Arte over the past decade in the tombs of Tutankhamun and Seti I is a start – it reflects a coherent approach to the development and use of digital technology to record the surfaces and structure of the tombs in astonishing detail. This data is essential for objective study and to monitor the decay that is taking place. The fact that the data is of sufficient quality to reproduce it physically in three-dimensions is evidence of its correspondence to the original. This work has involved the development of new technologies to record, inspect, archive and reveal the complex histories of these two tombs. It has involved the development of a complete working practice to re-materialise the data that can be communicated and taught. It is an approach that is rapidly gaining acceptance and has led to the creation of the Factum Foundation for Digital Technology in Conservation. The Foundation funded most of the work in Egypt and has two main aims - to provide the technology and human skills to satisfactorily record the condition of the tombs and to turn the public interest into a force that understands the difficulties of preserving the past and makes a positive contribution to its preservation.

TECHNICAL CONSIDERATIONS BASED ON NON-CONTACT SURFACE OBSERVATIONS

The craftsmen that made these tombs had a highly developed understanding of materials. It is probable that they attached symbolic significance to the materials they used, the order in

which they were applied, the way they were mixed and their final appearance. They certainly understood the physical properties of the materials they worked with. They prepared the plaster layers and the application of the paint so the walls could breathe. They understood how to draw long black lines with even edges, they understood how to make and prepare both natural pigments and those that required human artifice in their production. It is equally probable that they knew that when the tomb was sealed the natural environmental stability would ensure their work lasted - guaranteeing immortality for the Pharaoh. The enemy of preservation is dynamic change – changes of temperature, changes of humidity, changes to the levels of dust, chemical changes and other diverse environmental fluctuations about which we are not yet aware.

The tomb was hacked out of the bedrock. Tool marks are visible underneath the plaster layers and brick holes. There is a visible raised line to the left of centre of the north wall as if the burial chamber was cut from both sides. The walls are coated with several layers of thinly applied plaster to smooth the irregularities in the bedrock before application of the priming coat and painted decoration. There is a skim of a greyish coarse plaster and then a coat of a creamy brown plaster wash. On the north wall there are many air bubbles that appear to be in this 'wash' layer. On the lower part of the west wall, there appear to be two layers of plaster while on the south wall there seem to be three, although it generally looks as if the plaster was applied quickly and re-applied where necessary. On the west and north walls there are tool marks in the plaster as if it was applied by trowel but there are also areas where it has been smoothed by hand and traces of fingers can be observed. Over the plaster there is a coat of white priming paint in many places but it is neither uniform nor consistent and on the south and east walls the golden ochre paint was applied onto the plaster without the priming layer.

There are many dark brown spots that are the subject of ongoing research by the Getty Conservation Institute. These micro-organisms cover most of the painted area of the tomb appearing in places on the ceiling but not on the Sarcophagus. Based on the evidence of Harry Burton's photographs they haven't changed since Carter opened the tomb and therefore suggest that the walls were not fully dry when the tomb was sealed. Damp walls and the decaying offerings in the tomb provided the conditions that the micro-bacteria needed to grow. They 'grew' in interesting ways on the painted areas and seem to prefer the light red under drawing and the areas in or around cracks. They also seem to be attracted to fibres within the paint or plaster. The photograph by Harry Burton of the 'missing fragment' shows that there was no micro-bacterial growth on this area of the decoration. This section of the south wall could breathe and would have dried faster than the painted areas in contact with the bedrock.

On the north, west and east wall some areas of missing plaster were re-painted at the time of the original painting and as a result are now covered with brown spots. Others areas of loss have been filled since the opening of the tomb and the restorer has covered their work with splashes of brown paint in imitation of the micro-bacteria. Based on observational information it seems likely that the binder of the paint is primarily gelatine while the binder in the black lines is more glossy and brittle suggesting a natural resin - Gum Arabic was (and still is) readily available in and around Luxor.

A close study reveals that the Baboons on the west wall were painted in the following order: 1.plaster 2.white priming coat 3.yellow paint 4.red under drawing 5.red face 6.blue 7.white hair 8.black lines. The Baboons are painted with a variety of tones of blue that appears to suggest a mixed colour varying in tone and hue. The Leopard on the north wall was painted in a slightly different way; 1.plaster 2.white priming coat 3.yellow paint 4.white paint 5.red

under drawing 6.pale yellow skin 7.red dots 8.black outlines. There are many drips and splashes of yellow and red paint suggesting haste, or a lack of care.

PROBLEMS INHERENT IN REMEDIAL AND AESTHETIC RESTORATIONS.

Even from a distance it is clear that the surface of the painted walls is heavily cracked and there is significant paint loss (fig.35.2). The surface reveals that the paint layer is in a friable and fragile state. The surface decay suggests that what is going on under the surface may be more serious. Observation of the dust deposits reveals that in places the plaster is detaching from the wall. From the high resolution photographs it is possible to see shadows behind some of the holes in the paint and plaster – it is clear that large sections of plaster are only held in place by the skim layer of plaster and the consolidant that has been applied. The scale and location of some of the refills and repainting (the largest is an area of about one square meter) confirm this and reveal the fragile condition of the paint surface.

On the west wall near the hand-rail there is clear evidence that human touch has smoothed and eroded the surface and that all areas within reach are significantly more degraded than the rest of the tomb. On the area around the figure of Tutankhamun, lying on his funeral sledge, you can see the cracked and flaking nature of the paint with the slightly glossier black lines lifting from the background golden ochre. Even from the position by the handrail you can make out an irregular surface sheen as if the large areas of the wall have at some point been given a wash of consolidant. The high-resolution makes it possible to study the surface in great detail and then test these observations against the actual wall. From close up the fragile state of the paint surface is instantly clear. Hundreds of injection marks reveal that significant work has been done in an attempt to bind the paint layer and plaster to the bedrock, white residues and drip marks from local surface applications of Paraloid can be found in many places. To fully understand what is happening the conservators from the Getty Conservation Institute will need to see if the application of Paraloid is the problem or the

solution. If it has limited the ability of the paint surface to breathe it will cause a build-up of moisture and this will encourage the growth of salt crystals that are capable of pushing the paint off the wall. This mix of a fragile surface and dynamic change caused by fluctuations in temperature and humidity will eventually result in collapse. There has been significant paint loss since the tomb was opened. If the means of consolidation are now a cause for concern the treatment will need to be reversed.

REVERSIBILITY – A TERM IN NEED OF CLARIFICATION

Reversibility is a central principle of conservation practice. The term refers to the ability to remove any addition or change that is made. Since the 1970's Paraloid, a product originally designed to make printing ink more flexible, has been used extensively in the tombs. Now many conservators now have serious reservations about its use and reversibility over time. When used to consolidate the painted surfaces in the tomb of Tutankhamun or Seti I Paraloid cannot be removed without significant paint loss. The application of this acrylic resin also changes the colour and tone of the paint, this is a non-reversible change. Paraloid injected under the surface of the paint to stick the paint and plaster layer to the bedrock is also irreversible and changes the way the surface moves and breathes.

In the 1999 ARCE condition report on the Tomb of Seti I, Dr Bojana Mojsov comments:

‘...during recent ‘restoration’ efforts plaster and several pigments have been added on top of uncleaned surfaces with varying results. This is particularly disturbing since it was done just recently and now only adds to the relatively numerous problems of the reliefs. All of this layer of *pentimento* ought to be removed and the surfaces cleaned before we can see what is left of the original decorations underneath or make any decisions about future restoration.’

At the time that the ARCE report was being prepared a new ‘test’ restoration was being carried out in Seti’s tomb (Room F). This test has resulted in a significant change in tone and colour to a section of about 50x50cm. 15 years after it was done this test clearly demonstrates

the problems inherent in using Paraloid but it also reveals the way restorations change the appearance of the image. The white area on the left of the restoration has been over-painted with a white that is both a different 'colour' and a different character to the original white. The un-restored area to the left of the restoration reveals a matt white (almost certainly huntite) painted over a greyish under-painting that could be either the plaster base or intentional under-coat. The restored area appears to be a recently applied acrylic or gouache under a layer of Paraloid – the surface consolidation has slightly yellowed and the paint it covers is now flaking off the wall. All of this demonstrates the inherent difficulties of keeping things stable if the environment is dynamic and confirm the importance of high-resolution documentation.

REASONS FOR OPTIMISM

Despite all the reasons for concern the C21st is providing us with new high-resolution recording technologies that can digitise the tombs with sufficient accuracy to monitor the speed of decay. With the correct political support and infrastructure the documentation could be carried out by Egyptian teams providing employment in Luxor and the surrounding area – in theory it could also be self-financing. The fact that it is possible to record the tombs in colour and three dimensions with forensic accuracy should become a central part any preservation policy. New technologies and software applications are resulting in innovative ways to study, analyse and elaborate information. The developments in technology are moving fast but a divide between technicians who understand the equipment and managers who understand the technical possibilities interferes with their application. The practical solution at present is to take advantage of the successful mechanisms that are in place and already applying technology - the Theban Mapping Project is one example.

In 2001 the Theban Mapping Project began work with Quantapoint to use their laser measuring system to produce accurate 3D plans and models. The Theban Mapping Project

website was launched in August 2002 and its impact was immediate – by the end of its first month it had 150,000 unique visitors, clearly demonstrating a need and a receptive audience. While the Quantapoint system can produce an accurate survey of the shape of a tomb it cannot map the details of the surface texture or colour. This requires different equipment and a different set of skills. The work that Factum Arte carried out in the tombs of Seti I and Tutankhamun recorded the surface of the walls with 100 million measured points per square meter. Colour was recorded at a resolution of 800 dpi at a scale of 1:1. This data could be aligned and added to the Theban Mapping Project website. This would allow the virtual visitor to study the structure and layout of the tomb, zoom into any area and see the decoration in colour, select any section and magnify it in order to inspect details, shift between colour and 3D data, connect to archives of historical photographs and other source material. The availability of this quantity of information in a virtual form does not reduce the desire to visit Egypt. On the contrary, it encourages it. It nurtures an intimacy with the site and facilitates new ways of study. But equally importantly it allows us to know what damage we are doing - to monitor the speed of decay and to make informed decisions about how to safeguard the Theban Necropolis and assist in the long-term preservation of the site.

THE PRACTICAL APPLICATION OF DIGITAL TECHNOLOGY IN NON-CONTACT CONSERVATION

Outlined below are the stages involved in the recording (de-materialisation) and the construction of a facsimile (re-materialisation).

The digitalization of the surface of a work of art is a relatively new field: if carried out at sufficient resolution it can be used both to study and monitor the surface of any object. It can also be used to re-materialise the object in diverse forms, ranging from multi-media presentations to the construction of exact facsimiles. The validity of this type of recording is dependent on the quality of the data gathered. Since its invention in the 1920's

photographically based 3D recording systems have focused on capturing the shape of an object. It is only recently that the technology has been able to record surface data. Recording the relief and texture of a surface is now possible and is leading to new insights about why the surface looks the way it does.

DE-MATERIALISING 1: THE LUCIDA LASER SCANNER – DESIGNED TO RECORD THE TOMBS.

Lucida is a 3D laser scanner designed by artist and engineer Manuel Franquelo, custom built by Factum Arte and funded by Factum Foundation. This system, the result of more than ten years of investigation into the high-resolution recording of the surface of paintings and relief objects, uses two cameras and one laser. A thin strip of red light is projected onto the surface of the object. As the line moves over the surface it is recorded by the two cameras positioned either side of the laser. The distortions of the line produced by the relief of the surface are recorded as a tonal depth map which is then converted into 3D information. The scanner moves parallel to the surface plane of the object, controlled by linear guides. *Lucida* uses a system of double exposure to extract the optimum data from both dark and glossy surfaces. The relationship between noise and information is critical: for any recording technology to be meaningful for cultural applications, it is essential that there is a close correspondence between the surface and the recording of the surface.

Lucida stores the data as raw black and white video. This is a radical innovation that significantly distances *Lucida* from other scanning systems, which use software algorithms to convert the photographic data into a three-dimensional mesh - this transformation is an irreversible abstraction of the data that results in a loss of information. *Lucida* condenses the raw (unprocessed) information, thus removing many of the obstacles that could limit future generations from accessing and re-processing it.

Lucida uses the raw files to generate 3D and rendered simulations of the surface relief. These can be exported into triangulated meshes (.stl), point clouds or a variety of different renderings. It is by virtue of the latter that the recorded data can be accessed without specialised (and usually expensive) 3D software: it can easily be opened with standard image viewers. Moreover, it can be incorporated into accurately aligned, multi-layered files that can also include additional types of recording such as infra-red, X-ray and colour information. Multi-layered files are proving very helpful for researchers and conservators alike and facilitate an accurate, objective and meaningful method for analysing the artwork.

Lucida is easy to use and transport. Due to its size, lightness and physical configuration, it allows the user to work in conditions that are normally incompatible with computer-based technologies. It can be powered by mains electricity or battery. The battery can be recharged with solar energy by using a simple solar panel. In all the work that has been developed for use in Egypt the aim has been to reduce cost, reduce complexity and produce robust systems that can be used in the dusty, harsh conditions that exist in the tombs of the Theban necropolis.

DE-MATERIALISING 2: WHITE LIGHT RECORDING

There are several white light scanning systems that could be used in the tombs of the Theban necropolis. Each has advantages and disadvantages. The system chosen and used by Factum Arte IN 2009 was the NUB3D SIDIO (fig.35.3). While it is heavier than many comparable systems and only has one camera the data it records has a close correspondence to the surface being recorded. The SIDIO system employs a conjunction of optical technology, 3D topometry and digital image processing to extract 3D coordinates from the surface of the object, a technique known as triangulation. Three-dimensional information is acquired by analyzing the deformation caused when parallel lines are projected onto the surface of an object and recorded by the camera. With these images, SIDIO integrated software calculates

a coordinated XYZ point cloud relating to the surface and shape of the object. The Sidio records the surface from many individually positioned shots that are then aligned. It requires a skilled and experienced operator to achieve good results.

DE-MATERIALISING 3: A PANORAMIC PHOTOGRAPHIC SYSTEM

After working with a parallel photographic recording system for many years, Factum Arte switched to panoramic recording when the technology became available to produce high-resolution images quickly and accurately. At the end of 2010 we started working with German company CLAUSS. They have been developing panoramic photographic equipment since 1993 and launched their pan-and-tilt head in 2003.

The automated equipment consists of a motorised panoramic head and a computer (to control the head) as well as the recording device (camera) and the archiving software to download and name the resulting photographs. The lighting, distance, speed of recording and resolution all depend on factors specific to each recording task. When recording the image many photographs are automatically taken in sequence and then stitched together at sub-pixel accuracy. The aim is to record a high-resolution image that is in focus and has a resolution of at least 600 DPI at a scale of 1:1. The camera used to record the tomb of Tutankhamun was a Canon EOS7DII DSLR with various lenses depending on distance. The use of a UV filtered high-speed flash is recommended but in conservation recording there is resistance to the use of flash. In the tomb a low-level cold lightsource was used. Depth of focus can be a problem but this can be overcome by combining a mix of focus stacking and panoramic recording. The different planes of photographs are stitched together using focus-stacking software technology. The merging process consists of multiplying control points between photographs on the same plane and photographs on different planes, until a stitching result of sub-pixel accuracy is achieved. The result is a gigapixel image with uniform sharpness.

When carrying out photographic recording for conservation purposes all the normal colour and greyscale references are used. However Factum Arte have found it essential to develop their own colour reference system for use when printing the data. The main difficulty of recording the colour is to understand the extreme complexity of the painted surface. The paintings were executed as broad areas of paint with a limited palette but a combination of centuries of ageing and modern interference has resulted in an inconsistent and intricate surface.

RE-MATERIALISING:

At a time when many people are just starting to understand the role virtual models can play in studying and presenting cultural heritage the technology is making it possible to go one stage further and return the data into a physical form. What has been carried out in the tomb of Tutankhamun is a two way process – from the real world to the digital archive and then from the digital files back into the physical world without significant change or loss of detail. This has been possible for some time but the costs have been prohibitive. Now, due to a highly focused and motivated team at Factum Arte the protocol has been put in place to vastly reduce the costs and break down all stages of the work into tasks that can be taught to a local workforce in Luxor. The details of this work are not the subject of this text but it is important to outline the many stages that are involved.

The most time consuming and expensive part of the ‘re-materialisation process is routing the 3D data at high resolution. To rout a 1 x 1 sq meter panel in 3D at a resolution of 250 microns takes approximately 400 hours. Once routed the sections need to be cast and joined together. A skeleton needs to be made to hold the panels in place and allow the entire surface of the tomb to be assembled with a floor and a ceiling.

Printing onto a relief surface presents its own difficulties and after experimenting with various transfer systems Factum Arte developed its own elastic membrane that can be printed

as a flat sheet. The membrane is a layered mixture of three different materials - a thin flexible ink-jet ground, an acrylic gesso and an elastic acrylic support. It is built in seven layers rolled onto a slightly textured silicon mould. The printing of the facsimile was done using a purpose-built flatbed ink-jet printer. For many years this printer has been at the centre of Factum Arte's approach to the production of facsimiles as it allows the image to be built up in layers, each printed in perfect registration. This approach means that both the colour and the tone can be controlled and locally altered to ensure a perfect match.

The printed flexible skins are positioned using a slow-cure contact adhesive. Sight and touch are both essential to ensure the exact relationship between the surface and the colour.

Working with a raking light the skin is positioned and re-positioned until all details in the printing correspond to the underlying surface. Once positioned correctly the skin and the relief are put into a vacuum chamber and pressure is applied evenly until the adhesive has cured. Due to the gossamer-like character of the skin when it is fixed to the surface it takes on the character of the wall of the tomb.

The burial chamber is assembled from interlocking panels that are bolted together from the outside. It has been designed for ease of transport and assembly. Once the tomb is assembled the final joins are filled and re-touched.

The proposed lighting for the facsimile in its eventual location should match the lights used in the Valley of the Kings. The acoustics, smell and temperature can also be controlled to increase the similarities between the original and the facsimile. Special effects can be used to control of humidity and temperature and projections onto the surface can inform the visitor of the problems in the tomb and the impact of these dynamic conditions.

THE BIOGRAPHY OF OBJECTS – THE OBJECT AS SUBJECT

The biography of any cultural artefact reveals various levels of human intervention at different times in its life. Many of these interventions have been made to preserve the object

but others reflect changing attitudes towards our relationship with the past. Some actions that have disastrous consequences are well intentioned while others are not. The Tombs in the Valley of the Kings contain examples of mindless vandalism as well as acts of love, care and possession that have had equally ruinous and unpredictable consequences. The tomb of Seti I contains numerous examples of both; Graffiti from the C19th and C20th cover the walls, sections have been removed and are now in museums and collections around the world (the largest two sections are in the Musée du Louvre and the Museo Archeologico in Florence - interestingly these two fragments now look very different from the original tomb and from each other). Belzoni cast large sections of the tomb in wax and vegetable fibre in order to make the 'first' facsimile that introduced the wonders of pharaonic culture to London in 1820's. The travel agents used to sell plaster-casting kits to their tourists so they could take their own 'handmade' souvenirs home; both had grave consequences for the tomb. Evidence of erosion of the surfaces and accidental damage can be found everywhere.

Values and opinions change from generation to generation. Winckelmann's statement that we must conserve and preserve is obviously correct but we now have tools that he never had. Perhaps we can engage once again with the act of reconstructing and re-thinking our relationship to the past in a way that makes it more accessible. Culture has wrongly been connected to leisure. This has led to many of today's problems. The tombs are not being preserved to give future generations something to do when they are on holiday, they are being protected to safeguard the important knowledge they contain. It is essential that this is done without impositions on the original. The aim is not to turn an original into a reproduction of itself by altering its appearance, but to allow the next generation to inherit the past in full knowledge of the complexity this involves.

If the facsimile, in its site next to Carter's house can capture the public imagination in a similar way to the discovery of the tomb, then Tutankhamun can secure his immortality – at

least for a while longer. With the right approach new technologies are making it possible to have both an altruistic approach that preserves the site for future generations and the commercial benefits of tourism that the people of Egypt need right now.

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KEY TO ILLUSTRATION

Fig.35.1. The final installation of the facsimile of the burial chamber of Tutankhamun, during its temporary installation at the Conrad Hotel as part of the EU Task Force, November 2012.

Photo by I. della Valle, courtesy of Factum Arte.

Fig.35.2. The surface of the East Wall in the burial chamber of Tutankhamun showing flaking paint and a sheen from surface painted Paraloid. Photo by G. Dupond, courtesy of Factum Arte.

Fig.35.3. The Sidio White Light scanning system recording the surface of the sarcophagus of Tutankhamun. Photo by G. Dupond, courtesy of Factum Arte.

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