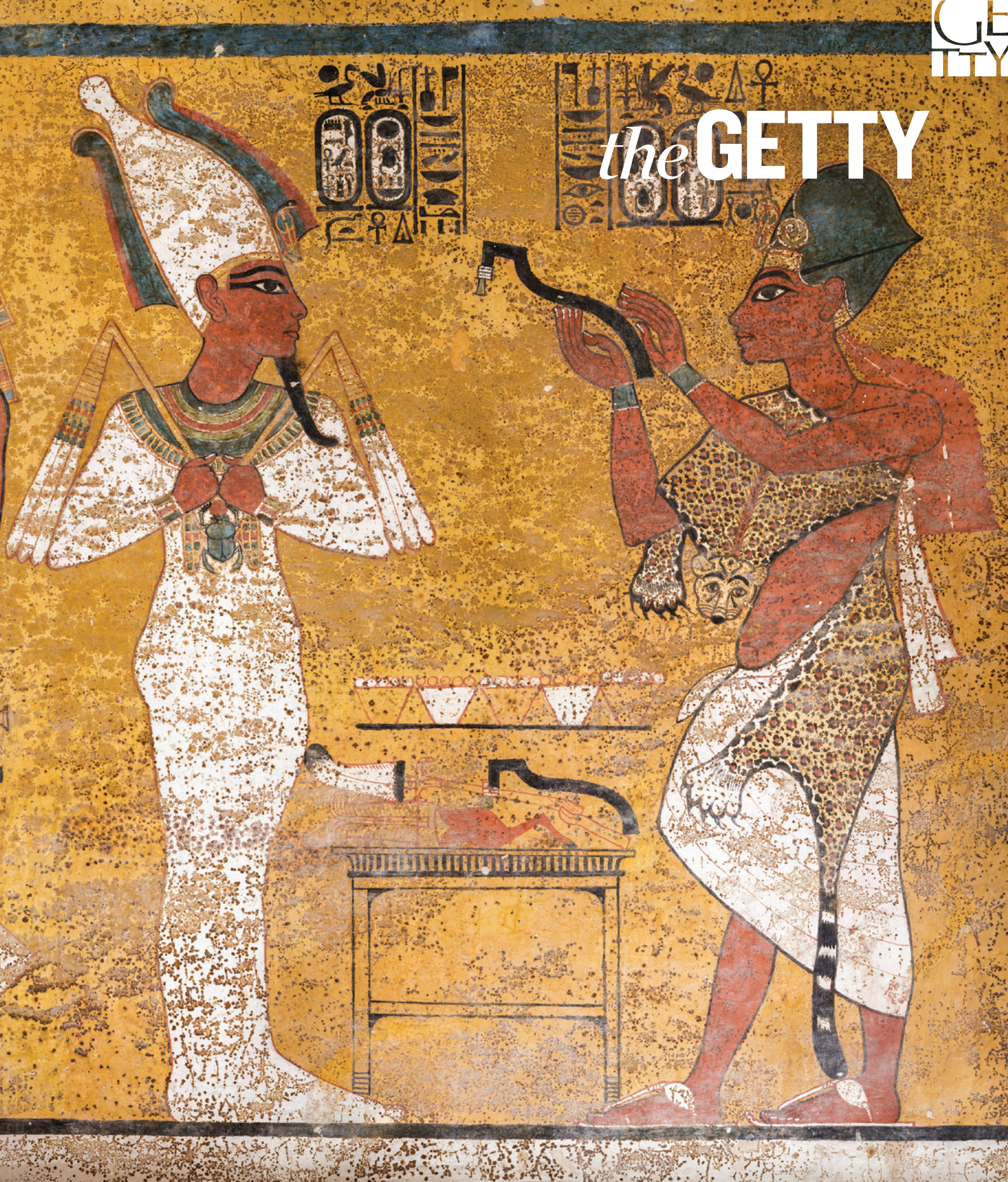

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CONSERVING AND MANAGING THE TOMB OF TUTANKHAMEN

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Since ancient Egyptians believed so profoundly in the afterlife, one might imagine that the boy king Tutankhamen (ruled 1332–1323 BCE) was luckier in death than during his time on earth, which was probably shorter than 20 years. Not only did his mummy survive the depredations of tomb robbers, the bane of royal graves throughout pharaonic history, but so did his grave goods, although archaeological evidence suggests that attempts were made to rob his tomb. Ironically, it appears that a flood, ordinarily the destroyer of a subterranean tomb, saved it from being plundered. Flood debris buried the entrance soon after it was sealed, and the tomb was lost to memory for more than 3,000 years.

When the tomb was discovered by archaeologist Howard Carter and his patron Lord Carnarvon in 1922, the media frenzy that followed was unprecedented, and continues to this day. Carter and his team took 10 years to clear the tomb, so great was the density of objects—golden treasures that Carter himself described as "wonderful things." Carter must be credited for the pioneering documentation and stabilization of the tomb's contents. These incredible grave goods, now on display in Cairo, continue to draw dense crowds, and Tutankhamen exhibitions travel the world. If, as according to the ancient Egyptians, a man dies twice—first when his soul leaves his body and a second time after the death of the last person who speaks his name—the boy king Tutankhamen will outlive us all.

While the objects Carter's team so assiduously catalogued and stabilized were housed and secured, the tomb itself became a "must-see" attraction for visitors willing to pay an extra fee. Since its discovery, the tomb of Tutankhamen has been open to the public and has been heavily visited. The tomb still houses a handful of original objects, including the mummy of Tutankhamen himself, the quartzite sarcophagus with its granite lid on the floor beside it, the gilded wooden outermost coffin, and the wall paintings of the burial chamber.

The project team undertakes wall painting conservation in the tomb of Tutankhamen's burial chamber. Photo: Lori Wong

Concerns for Preservation

The great demand for entry to the small tomb gave rise to concerns among Egyptian authorities about the condition of the wall paintings. It was thought that the brown spots—microbiological growths on the burial chamber's painted walls—were growing, threatening to engulf the paintings. "Your last chance to see Tutankhamen's tomb," read a news blog from The Guardian. "Visitors are causing so much damage to the tomb of Tutankhamen that Egypt's Supreme Council of Antiquities wants to close it and open a replica instead."

The apprehension over the impact of visitors on the tomb is well founded, since visitors introduce humidity and carbon dioxide, as well as dust and lint. Humidity promotes microbiological growth, and may also physically stress the wall paintings when the amount of water vapor in the air fluctuates. Carbon dioxide creates an uncomfortable atmosphere for visitors themselves. But perhaps even more harmful has been the physical damage to the wall paintings. Close examination of the condition of the surfaces shows an accumulation of damage, including scratches and abrasion in areas close to where visitors have access, and from inadvertent damage likely caused by film crews with equipment operating in the burial chamber's tight spaces. Dust is also a serious problem in the tomb. The visitors constantly pouring through carry dust on their shoes and clothing that settles on the floor and horizontal surfaces. A more serious consequence is that the dust forms a gray veil on the uneven surfaces of the walls, obscuring the brightness of the paintings and necessitating cleaning, which increases the risk of paint loss.

The effects of high humidity (a concern for the paintings), excessive carbon dioxide, crowding, and poor presentation have also made for an unpleasant visitor experience as tides of humanity flow in and out of the tomb. Like the golden treasure that the tomb formerly held, ticket sales have been a golden egg—at least prior to the collapse of the tourism industry caused by the turmoil of recent years. Undoubtedly, visitor numbers will swell again when stability is reestablished, and when they do, the tomb's inherent fragility will remain a concern.

Conservation Planning

These concerns prompted a multiyear collaboration between the Getty Conservation Institute (GCI) and Egyptian authorities. In 2009 Egypt's Supreme Council of Antiquities (SCA) and the GCI initiated a collaborative project principally focused on the integrated conservation and management of the tomb and its wall paintings, to ensure a sustainable future. The GCI already had considerable experience working in Egypt on the Tomb of Queen Nefertari project in the Valley of the Queens (1986–1992) and on the plan for the conservation and management of the Valley of the Queens Project (beginning in 2006). As with all GCI site projects, intensive study and documentation of the condition were the first order of business, with the wall paintings a focus, given the claims of their perilous state. The GCI—mandated to investigate the tomb's actual condition—went on to carry out the most thorough study since Carter's time. The team of experts included an Egyptologist to conduct background research; environmental engineers to investigate the tomb's microclimatic conditions; microbiologists to study the brown spots; documentation specialists, architects, and designers to upgrade the tomb's infrastructure; scientists to study the original materials of the wall paintings; and conservators to carry out condition recording and treatment and to train local conservators.

The objectives of this collaborative project were to conserve the paintings; improve environmental conditions; upgrade the infrastructure (lighting, walkways, viewing platform, and ventilation) and presentation (signage and interpretive materials); undertake training of staff; and devise a program for sustainable maintenance and visitation of the tomb. Because the project allowed for unprecedented study of the tomb and its wall paintings, its findings have provided a deeper understanding of tomb construction and decoration practices from the New Kingdom. The findings have also shed light on the tomb's condition and the causes of its deterioration, and have helped the development of measures to counter ongoing risks.

Implementing the Plan

Tutankhamen's tomb is simple in comparison with other royal tombs in the valley. With only four chambers, it is one of the smallest. (In contrast, the tomb of the sons of Ramesses II, KV 5, the largest in the valley, has more than 130 chambers and is still being excavated.) Even for a tomb of a historically insignificant king, its diminutive size is unusual, as is its location in the main valley rather than in the neighboring Western Valley, where other 18th Dynasty rulers, including his successor, the pharaoh Ay, are buried.

These circumstances tend to confirm the widely accepted belief that after Tutankhamen's untimely death, the tomb was hastily adapted from one already under construction. This might also explain why only the burial chamber was decorated; the other chambers were left with the bare rock walls exposed. Also, technical inconsistencies in the paintings were observed from wall to wall, including differences in setting-out technique and the omission of a ground layer on one of the walls—again suggesting haste in the tomb's preparation.

The paintings were in relatively stable condition, apart from localized flaking and loss of paint. Flaking was especially prevalent with the black and red pigments on the east and west walls, but not on the north and south walls. Because of this irregularity, the flaking was likely due to inconsistencies in the materials used and their application. Other losses were attributed to mechanical damage caused by visitors. Newly designed barriers now restrict visitor access in these areas. Further losses can be connected to physical interventions on the paintings, such as dusting. The installation of a filtered air supply and exhaust ventilation system in 2015, and the implementation of recommendations to limit visitor numbers, will help control humidity and carbon dioxide levels and also mitigate dust intrusion. These measures will lessen the need for dusting, thus helping reduce risk of damage to the paintings.

On the east wall of the burial chamber, Tutankhamen's mummy is shown lying in a shrine mounted on a sledge, being drawn by 12 men in five groups. The men wear white mourning bands over their brows. The last pair, distinguished by their shaven heads and different dress, are the two viziers of Upper and Lower Egypt. Photo: Carleton Immersive Media Studio, Carleton University

Wall painting stabilization was undertaken, including paint flaking stabilization, plaster repairs, dust removal, and reduction of coatings from previous treatments. (Past treatments were not always based on thorough understanding of the paintings' conditions and the causes of their deterioration.) Condition monitoring protocols were also established to better evaluate future changes.

Another major concern has been the mystery of the brown spots that mar the painted surfaces. Other tombs do not show the same phenomenon, and the spots were already present when Carter first entered the tomb. Egyptian authorities wondered if the presence of visitors was causing spots to grow, so research was conducted to identify the microorganisms and determine if they posed a continued risk to the paintings. A comparison of the spots with historic photographs from the mid-1920s showed no new growth. To confirm this finding, DNA and chemical analyses were undertaken and physical samples of the spots were examined under magnification and then mounted in cross section. Analytical investigation confirmed that the spots were microbiological in origin, but concluded that they were dead, and thus no longer a threat. Because the spots have penetrated the paint layer, they were not removed, since this would harm the wall paintings.

The project was completed in the fall of 2018. A bilingual maintenance manual for the installations in the tomb was provided, together with training for SCA personnel. Also offered: recommendations for visitor numbers and management that include guidelines for filming inside the tomb.

Looking forward, a symposium is planned for early 2019, during which the project will be presented. A monograph will be published, as well as a book for the general public. Conservation work at other heavily visited sites, meanwhile, can be informed by what was learned in Tutankhamen's tomb.

"This project has greatly expanded our understanding of one of antiquity's best-known sites," says Tim Whalen, John E. and Louise Bryson Director of the Getty Conservation Institute. "It's also representative of the kind of collaborative effort the GCI undertakes with colleagues to create a model of practice that can be shared and used at other sites around the world. So much cultural heritage is at risk, and without the engagement of skilled professionals, it will disappear. That's why we partner with conservation colleagues internationally to expand the body of knowledge needed to care for our shared cultural legacy."