

Recent Research Findings

A Matter of Life and Death

Gladiators in Popular Imagination and Historical Reality

By Gerburg Ludwig



Fig. 1: Jean-Léon Gérôme, *Pollice verso*, oil on canvas, 1872, Phoenix Art Museum, Phoenix, Arizona.

“Panem et circenses”: This satirical phrase that was coined by Juvenal in his *Saturae* (10, 81) almost inevitably calls to mind the world of gladiator combats. Iconic works like Jean-Léon Gérôme’s history painting *Pollice verso* (fig. 1), Edward Bulwer-Lytton’s novel *The Last Days of Pompeii* or Stanley Kubrick’s film *Spartacus* have shaped our concept of gladiators. Nowadays, Ridley Scott’s epic drama *Gladiator* has almost become a fixture on prime time television. Scott laid claim to the authenticity of the costumes and weapons used in the film, but as an archaeologist one raises a critical eyebrow at such statements. Marcus Junkelmann, a historian and experimental archaeologist with practical experience in the exercises performed by legionaries and gladiators, had hardly a good word to say about Scott’s film. In his opinion the historical and geographical range of the arms and armour used was far too great and the fighting technique resembled “mass slaughter” (Junkelmann – 2000, 8). Only the recreation of the suggestive atmosphere in the arena was a success in his eyes.

Gérôme’s painting impressively captures the sizzling moment of decision. The loser is ly-

ing on the ground and the victor is awaiting the decisive shout: “*missum!*” for mercy or “*iugula!*” (“Slit the throat!”). The spectators have already turned their thumbs down, but the emperor, as ultimate arbiter, is hesitating. In general, the thumb position is subject to controversy, and *Pollice verso* simply means “turned thumb”, leaving the direction open. According to Junkelmann, Gérôme’s painting exerted a great influence, and although the armour was not properly assembled, the painting reflected the current state of knowledge in the 19th century.

Some historical facts: Originating in Campanian and Lucanian funerary rites, the gladiatorial games, which were termed *munera*, meaning a duty or gift to the deceased, became immensely popular in Rome. They were instrumentalised by members of the Roman upper classes to gain popularity and to acquire political influence. In the 1st century B.C. the frequency and scale of the games became so excessive that, following the murder of Caesar in 44 B.C., the senate intervened on behalf of the state. Augustus reformed the gladiatorial entertainments and decreed that the *munera* were an imperial privilege, thereby connecting them to the

cult of the emperor. They lasted into the 4th century A.D. when the increasing pressure on the Empire from the outside, financial problems and the rise of Christianity gradually led to their decline.

How did one become a gladiator? The *lanista*, a professional entrepreneur who owned and directed a gladiator school (*ludus*), bought slaves and prisoners of war. Furthermore, prisoners and criminals could be condemned to life as a gladiator (“*damnatio ad ludum gladiatorium*”). As food and medical care were good, some individuals even chose this profession of their own free will. The training closely resembled military practices. Wooden weapons were used by beginners at first to fight an “opponent” personified by a pillar (*palus*) and then, as they grew more proficient, in single combat with fellow gladiators. The *lanista* rented out gladiators to the organisers of entertainments. Although the average life expectancy of a gladiator was only 18-25 years, some achieved fame and fortune and could even, on occasion, gain their freedom.

Junkelmann conducted research on the equipment used by gladiators, studying ancient images and weapons unearthed in the Casa dei Gladiatori in Pompeii and testing his findings in practice. A carefully chosen combination of protective elements worn on the body and evenly balanced weapons of attack and defence prevented the all too rapid death of one of the combatants, thus guaranteeing a suspenseful and thrilling fight. At the same time, depending on the experience and fitness of the opponents, a fatal outcome was not ruled out. The basic outfit of a gladiator included shield and sword, a wool or linen loincloth (*subligaculum*), a broad leather belt (*balteus*), leather or linen padded armbands (*manica*) and bronze greaves to protect the legs (*ocreae*). Mosaics with gladiators found in Zliten (Libya) and Kaiseraugst (Switzerland) represent the typical matched pairs recruited from eight different gladiator types: *retiarius* versus *secutor* and *thraex* or *hoplomachus* versus *murmillo*, as well as pairs of *provocatores*, *essedarii* and *equites*.

Recent research conducted on cranial bones and teeth from male skeletons buried in the



Fig. 2: A RETIARIUS. H. 9.2 cm. Bronze, solid cast. Roman, 2nd cent. A.D. CHF 7,600

gladiator cemetery in Ephesos (Turkey) revealed that the helmets of varying shapes worn by gladiators did indeed afford a certain degree of protection against blows inflicted by their opponents. Using techniques developed in forensic pathology, including microradiography, computer tomography and microscopic tissue analysis, scientists were able to determine that the deceased persons reached a maximum age of 20-30 years. Furthermore, they were able to identify different types of cranial injuries. These included well-healed antemortal cranial blunt force traumata, sharp force traumata inflicted by swords and daggers as well as puncture wounds caused by swords, daggers and tridents. In a second group of injuries, termed perimortal traumata, the cranial bones were destroyed or the weapons pierced the *dura mater*, a thick membrane surrounding the brain – both with lethal outcome.

Forty male skeletons found in a necropolis in York (England) – presumably likewise a gladiator cemetery – provide remarkable corroborative evidence for the findings made in Ephesos, although the atypically large number of decapitations in the York burials pose a riddle that archaeologists still need to solve.

The *retiarius* on offer in the Cahn Gallery (fig. 2), the only type of gladiator without a helmet, protects himself with the prominently raised shoulder guard (*galerus*) and *manica* on his left arm. Keeping his distance, the lightly armed gladiator first attempts to throw a net (*rete*) over his opponent, the se-



Fig. 3: A PYXIS WITH HOPLOMACHUS. H. 7.7 cm. Bone. Roman, 1st-2nd cent. A.D. CHF 3,800

cutor with his smooth, closed helmet, sword and large, rectangular shield, in order to force him to the ground. The pair then engages in hand-to-hand combat with trident (*tridens*) and short sword. The defeated gladiator in Gérôme's *Pollice verso* is a *retiarius*.

On the pyxis also on offer at the Cahn Gallery (fig. 3), a heavily armed *hoplomachus* is represented twice in fine relief. He keeps his adversary, a *murmillio* who is not depicted, at bay. The arms and armour of the *murmillio* are similar to those of the *secutor* whereas the *hoplomachus* fights with a lance (*hasta*), a small round shield (*parmula*) and a short sword. His attire consists of a *manica* around his right arm (on our pyxis around both arms), long trousers and *ocreae*, which reach above his knees. On losing his lance, he uses his sword in close combat.

Gladiatorial combat was a strictly regulated, highly athletic and extremely risky form of swordsmanship that required a great deal of practice. For many spectators, gladiators embodied esteemed moral qualities such as fearlessness in the face of death, strength, courage, discipline and perseverance. This may have been one more reason why they were so enthralled by the action in the arena.

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Gallery

Welcome!

We would like to extend a warm welcome to Lillian Bartlett Stoner, who joined the gallery team in August 2018. Lillian is a classical archaeologist specialised in Greek and Roman art with a special interest in Attic vase painting. At the gallery she will be responsible for the cataloguing of objects, especially vases, provenance research and the organisation of fairs. Due to her strong ties to the USA she will also act as liaison for the American market.

Lillian received her Bachelor of Arts at Harvard University, where she was supervised by David G. Mitten. She continued her studies at the Institute of Fine Arts, New York University, attaining her PhD with the doctoral thesis "Hair in Greek Art: An Anthropological Approach". Lillian has worked as adjunct professor at Fordham University and as a research assistant at the Metropolitan Museum of Art in the Greek and Roman department. She has received numerous awards and was Panofsky Fellow at the Institute of Fine Arts, NYU.



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Publisher
Jean-David Cahn
Malzgasse 23
CH-4052 Basel
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Editors
Jean-David Cahn
Yvonne Yiu

Authors
Jean-David Cahn
Martin Flashar
Vincent Geerling
Ulrike Haase
Gerburg Ludwig
Yvonne Yiu

Translations
Bronwen Saunders
Yvonne Yiu

Photos
Niklaus Bürgin
Vincent Geerling
Ulrike Haase
Marina Milella
Yvonne Yiu

Design and Layout
Ariane Ballmer
Michael Joos
Yvonne Yiu

Printer
Druckerei Deiner
www.druckerei-deiner.de



A PAIR OF GALLOPING HORSES. L. max. 30 cm. Terra-cotta, polychromy. Western Greek, 3rd cent. B.C.
Price on request



BLACK-FIGURE SIANA CUP PROBABLY BY THE HEIDELBERG PAINTER. Dm. 25.6 cm. Clay. Attic, ca. 560-540 B.C.
Price on request



RARE CAMEO GLASS WITH VENUS AND AMOR. H. 12.7 cm. Roman, Early Imperial Period, late 1st cent. B.C.-1st cent. A.D.
Price on request

will also be choice of two Corinthian helmets: one an excellently well preserved, early example of a Stage II helmet after H. Pflug, the other a rare variant of a Stage III helmet with embossed palmette on the forehead, probably from Western Greece. A pair of galloping horses dating from the 3rd century B.C. is likely to attract attention on account of its almost Baroque-looking dynamism and lavishly detailed bridles and manes. There will also be some remarkable objects representing Celtic culture. Vying for pride of place alongside a grim-looking head made of red sandstone will be two masterfully crafted

bronze swords, one of which – a rarity indeed! – bears a Greek inscription. Also worthy of note is the selection of glassware that Jean-David Cahn will be bringing with him to this year's fair. In addition to Roman glassware in a range of colours and shapes – including a blue ribbed bowl and two beautiful, aubergine-coloured flacons, among other items – there will be three Islamic relief cups and an exquisite fragment of a cameo glass panel depicting Venus and Amor which probably adorned a piece of furniture. Its complex composition is reminiscent of masterpieces like the Portland vase. So there will be some-

thing there for everyone, also for those with a small budget. The fair is always worth a visit, and we look forward to welcoming you to our stand in Maastricht.

As Jean-David Cahn reported at some length in CQ3/2016, TEFAF has now expanded to New York, where it is to have one event in the spring and another in the autumn, at the Armory on Park Avenue. The Cahn Gallery will be present both at TEFAF New York Spring (May 4-8) and at TEFAF New York Fall (October 27-31). So we look forward to seeing you in the Big Apple, too!

New Research Findings

Tracing Hannibal's Tracks Over the Alps

Scientists Piece Together a Palaeoecological Puzzle Composed of Carbons, Pollen and Horse Droppings

By Gerburg Ludwig

That was something the Romans certainly hadn't reckoned with! Just a little over 20 years after the end of the First Punic War, this outrageous Carthaginian had the cheek to sneak up on them from over the Alps!

Ancient chroniclers such as Polybios (*Historiai* 3, 47-56) and Livy (*Ab urbe condita* 21, 31-37) were fascinated by Hannibal's daring venture. As is often the case – and with such an unprecedented expedition all the more so – the reports on the route chosen, the size of the army and the losses sustained are at variance with each other and in part quite fantastical. This has not been without consequences for scholarly research: at least three different routes (fig. 1) as well as the number of soldiers and animals involved are still the subject of debate to this day. Prof. Jakob Seibert of the University of Munich provides a useful overview. According to Polybios, Hannibal began his expedition with 38,000 infantry, 8,000 cavalry, 37 elephants and an unspecified number of beasts of burden, and Seibert estimates that their journey took 15 days.

In search of facts, the geographer and geologist William C. Mahaney of York University, Toronto, made repeated jour-

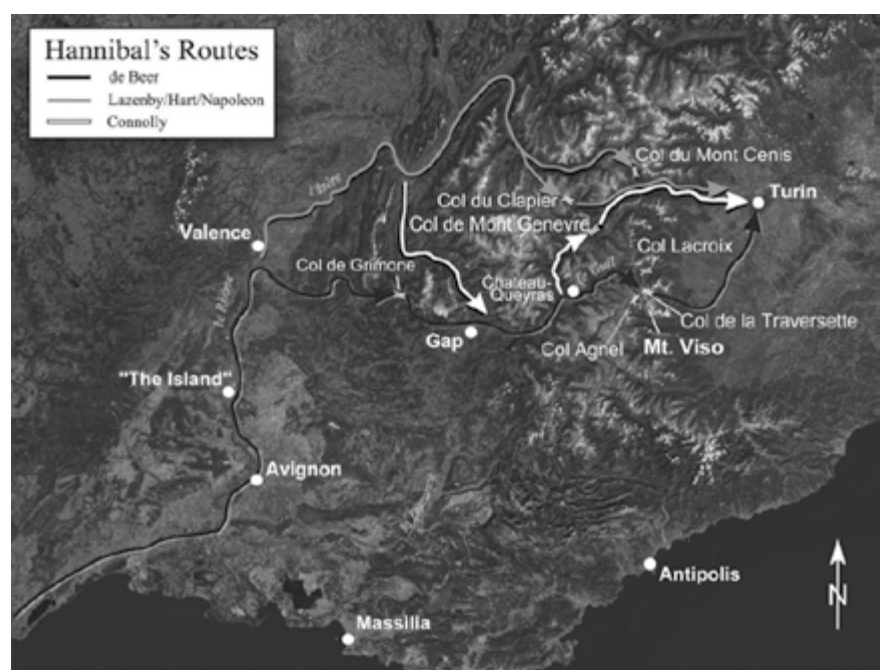


Fig. 1: A satellite image showing the Western Alps and the three invasion routes possibly taken by Hannibal. © 2016 The Authors. For them, courtesy of NASA and USGS.

neys to the rugged alpine ranges on the French-Italian border. Together with geoscientists and biologists he undertook field trips investigating the three main routes over the mountains proposed by historians. Amongst other things, they searched for the landmarks on Hannibal's route described by ancient authors such as the two-tier rockfall mentioned by Polybios, recorded geographic reliefs using a digital 3-D method and analysed stratigraphic data. It gradually became clear that the most direct, but also the highest route – from the River Rhône over the Col de la Traversette (2947 m asl) – which had

With the aid of biochemical methods, biomarkers such as lipid degradation products from animal faeces were extracted. By means of gas chromatography mass spectrometry, substances were separated into their components and the masses of atoms and molecules were determined, revealing traces of digestive juices. Furthermore, genetic analyses identified a strikingly high incidence of various faecal bacteria, mainly *Clostridia*, which are especially typical of the intestinal flora of horses. In the form of extremely resilient endospores these bacteria can survive for millennia.

hope to detect the eggs of parasites such as tape worms. And who knows, maybe one day the researchers will finally – as the decisive piece in this very complex puzzle – find direct evidence for the passage of elephants.

A daredevil feat, Hannibal's alpine expedition was nonetheless a success. His losses were marginal and he defeated the Romans in their home territory. Later, Hasdrubal also crossed the Alps to join his brother in Italy. It would take another fifteen years before Rome finally prevailed and Carthage lost its freedom for good.

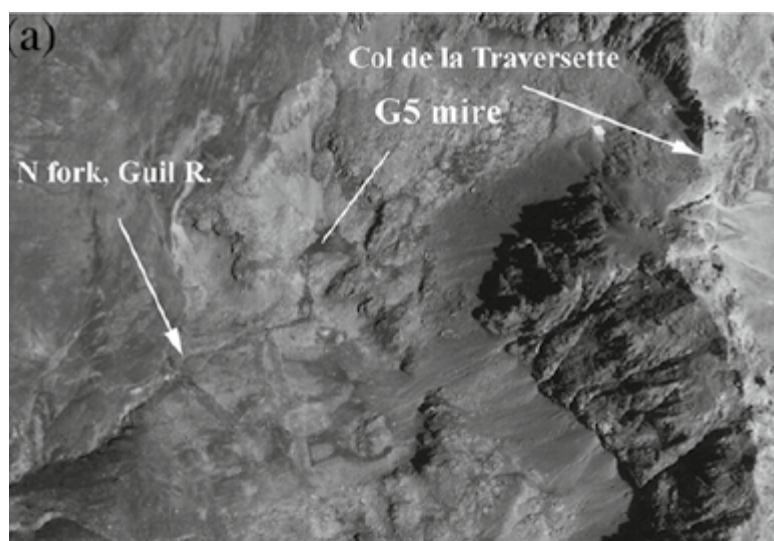


Fig. 2: Aerial photograph with the Col de la Traversette and the site examined to the south-west of the River Guil. © 2016 The Authors.

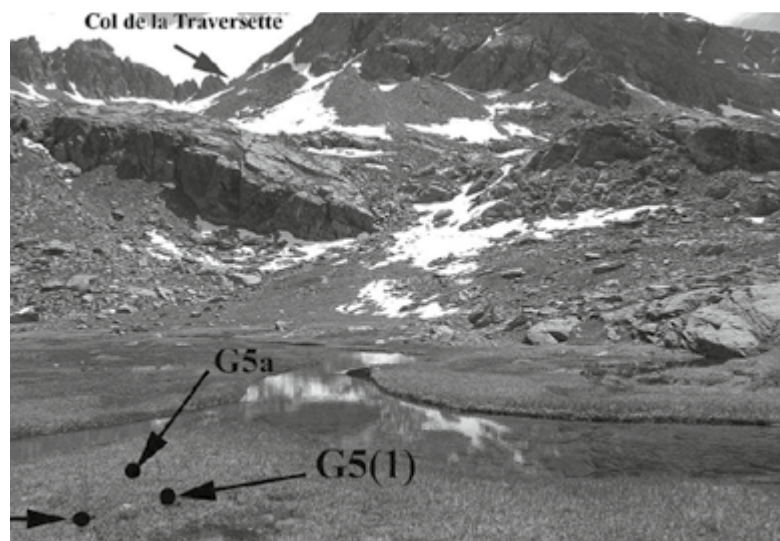


Fig. 3: The core recovery sites with the Col de la Traversette in the background. © 2016 The Authors.

already been favoured by Sir Gavin de Beer in the 1950s-1960s was in all likelihood the one taken by Hannibal.

Since 2016, the choice of this route has been substantiated by convincing stratigraphic, geochemical and microbiological evidence published in two essays in the scientific journal *Archaeometry* (online edition in 2016; printed edition in February 2017).

How exactly did Mahaney and his team proceed? The scientists recovered several 70-cm-long cores of organic-rich, alluvial mire from a near-level watering hole located 2580 m asl on the southern route to the Col de la Traversette (figs. 2-3). Subsamples were removed and subjected to various analytic procedures in the laboratory. The results were then pieced together, forming a kind of palaeoecological puzzle.

The properties of the soil were recorded; its organic carbon content was determined using elemental analysis; its mineralogical composition was investigated by means of SEM imagery and X-ray deviation; and pollen was analysed with the aid of light microscopy. The radiocarbon dating method which is based on the rate of radioactive decay of the ^{14}C isotope provided the relevant dates.

The results led the scientists to focus on a layer located at a depth of 40-50 cm which was extraordinarily rich in organic substances. ^{14}C dating indicated that it belonged to the time of ca. 200 B.C. Significant characteristics are disrupted bedding, an above-average amount of sedge (*Cyperaceae*) pollen, a residual organic carbon increase and the presence of atypical levels of faecal biomarkers – much more than would have resulted from transhumance – all of which suggest the encampment and passage of a large army. The large number of horses, beasts of burden and, in Hannibal's case, elephants, would probably have used the near level area along the Guil catchment as a watering hole and feeding ground (fig. 3). Although the scientists could not determine conclusively that the evidence pertained to the Punic Army, they believe that an archaeological excavation of the site might yield artefacts and evidence that would definitely link it to Hannibal's invasion of Italy.

Recently, Chris Allen, a member of Mahaney's team and microbiologist at Queen's University Belfast, announced on the website *The Conversation* that further results could soon be expected. The soil samples are the subject of ongoing microbiological and genetic analyses. Amongst other things, the scientists

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 Jean-David Cahn
 Malzgasse 23
 CH-4052 Basel
 +41 61 271 67 55
 mail@cahn.ch
 www.cahn.ch

Editors
 Jean-David Cahn
 Yvonne Yiu

Authors
 Jean-David Cahn
 Martin Flashar
 Cornelia Holzach
 Ulrike Haase
 Gerburg Ludwig
 Yvonne Yiu

Photos
 Niklaus Bürgin
 Ulrike Haase
 Petra Jaschke
 Eugen Leu
 Günther Meyer
 Yvonne Yiu

Translations
 Bronwen Saunders
 Yvonne Yiu

Design and Layout
 Michael Joos
 Yvonne Yiu

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related to a theatre play and refers to a historical event. Side A depicts a nude Greek man with a pointed beard and a cloak knotted in front of his chest. He strides forwards hastily, his left arm outstretched, his right hand holding his phallos. On side B an Oriental archer wearing a body-suit and a soft hat bends forwards with a gorytos dangling from his arm. He turns his head to face the beholder and raises his hands level with his head.

Whilst on side A the vase painter plays with a motif well known from representations of amorous chases and running warriors, the conduct of the Oriental figure comes as a surprise. The inscription beginning close to the Greek man's mouth reads: "I am Eurymedon. I stand bent forward."

In the year 465 B.C. the Greek fleet and army under the command of the Athenian strategist Cimon defeated the Persians by the Eurymedon River in Asia Minor – a final victory in a protracted conflict. This victory is represented in a brutal and humiliating manner: The Greek man is seeking to abuse the Persian sexually. But is this how a victory should be depicted? Hardly! Cimon's mother's family was Thracian, so he was not a pure Greek. The Other serves to justify his deed and at the same time reveals him to be ruthless. When does a caricature turn into a prejudice? Cimon was later ostracised from Athens and forced to leave the city.



Dr. Frank Hildebrandt studied Classical Archaeology, Ancient History, Pre- and Protohistory and Medieval Archaeology at the Universities of Tübingen and Freiburg im Breisgau. He received his PhD, which was supervised by Professor Dr. Volker Michael Strocka, in 2005. He participated in excavations in South Germany and Spain, and his research interests took him to Pompeii and Athens, amongst other places. Since 2006 he has been Curator of the Ancient Art and Antiquities Department of the Museum für Kunst und Gewerbe Hamburg, and since 2013 he has also been responsible for Exhibition Project Management.

Recent Research Findings

Reading the Invisible

X-Ray Phase-Contrast Imaging Reveals Letters in Carbonized Papyri

By Gerburg Ludwig



D. Delattre, C. Ferrero, V. Mocella (from left) preparing the X-ray phase-contrast tomography. © J. Delattre

Black letters on a black background – how can that be legible? Physicists, chemists, computer analysts and papyrologists from Italy, France and Belgium have made the seemingly impossible a reality. In recent years they have examined completely carbonized, still rolled-up papyrus scrolls by means of high-energy X-rays with the aim of deciphering the collection of texts – a unique cultural treasure – unearthed in 1752-1754 in the Villa dei Papiri in Herculaneum.

How had these papyri been reduced to such a state? The cause was the eruption of Vesuvius around noon on 24 August in the year 79 A.D. Pliny the Younger, who witnessed the cataclysm from the safety of Misenum, in the north-west of the Gulf of Naples later described it in two letters addressed to Tacitus (Pliny the Younger, *Epistulae*, VI.16; VI.20). Even today such explosive eruptions are termed Plinian eruptions. Some hours after the volcano had ejected ash, lapilli and pumice, the first pyroclastic flow – a fast-moving current of hot gas and rock – streamed down

the mountain's slopes, devastating the town of Herculaneum. With temperatures of ca. 320 °C, this searing wave cost the lives of countless people. The enormous heat completely carbonized the approximately 1800 papyrus scrolls resting on the bookshelves of a small side room adjacent to the villa's courtyard. Like other organic substances, they were subsequently conserved by a several metre-thick layer of rubble, ash and solidified pyroclastic rock, which is also called tuff because of the numerous gas cavities it contains.

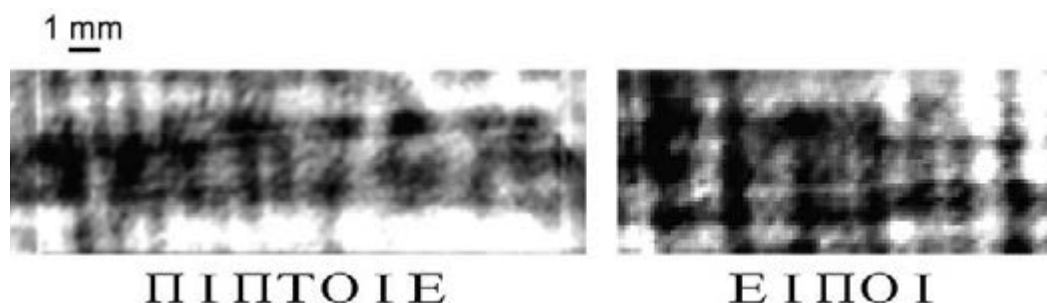
These extremely fragile objects (most of them are today preserved in the National Library of Naples) have time and again fascinated specialists. On unrolling them, however, they disintegrated into thin layers. The Oslo Method which was developed in the 1980s intentionally used this characteristic of the scrolls in order to examine individual specimens. With the aid of microscopes and digital photography using multispectral filters, the open scrolls could be deciphered. But those which

were not opened did not reveal their secrets; they remained compact, black clumps.

How was this writing material actually made? The stalks of the papyrus plant were cut into thin strips, placed on top of each other crosswise and then pressed so that they stuck together. The resulting sheets were then smoothed and bleached. The sheets were pasted together forming rolls that were over 15 metres long. The ink was made of carbon residues and also contained a considerable portion of lead, as was recently discovered. The ink was not absorbed by the papyrus sheets which is why the letters stand out in slight relief, a phenomenon frequently observed using the microscope. The enormous heat of the pyroclastic waves and the pressure of the volcanic deposits distorted the rolls and their internal spiral structure. The papyrus and the ink merged into a single mass with carbons of a similar density. Thus, conventional low-energy X-rays could not be used to examine the rolls as this technique only works with materials of different density.

The scientists had a brilliant idea: why not intensify the radiation? For this reason, they carefully transported two carbonized papyrus scrolls – formerly presented as a gift to Napoléon Bonaparte by King Ferdinand IV of Naples – from the collection of the Institut de France in Paris to the European Synchrotron (ESRF) in Grenoble, one of the largest particle accelerators in Europe. The high-energy X-rays generated there were used by the scientists for the three-dimensional data capture of the papyrus layers by means of phase-contrast tomography.

The team was particularly interested in the scroll PHerc.Paris 4. The scroll was positioned



Letters from a hidden layer of the fragment PHerc.Paris 1 fr. 101. On the left, the sequence of letters ΠΙΠΤΟΙΕ can be read as ΠΙΠΤΟΙΕ[ν] or as ΠΙΠΤΟΙ followed by a word beginning with Ε[ν] or Ε[ι]. Translation: "would fall". On the right the sequence reads ΕΙΠΟΙ, meaning "would say". © Vito Mocella



Letters from a hidden layer of the scroll PHerc.Paris 4. The sequences ΑΡΝ and ΚΙ can belong to many different words. ΗΕΥ can be divided into Η, the feminine definitive article "the", followed by ΕΥ, the prefix for "good". © Vito Mocella

at one of the 49 beamlines of the electron storage ring, allowing it to rotate. An optical instrument (monochromator) was placed in front of it in order to isolate the required electromagnetic radiation. As the radiation passes through the layers of papyrus, the waves undergo a phase shift – they are, so to speak, thrown out of sync. When they pass through a layer of ink the wave pattern undergoes further change. A sensitive digital camera records these varying shifts and a computer translates the data into an image on the screen: the ink relief appears in two dimensions in the shape of letters.

The papyrologist Daniel Delattre, a proven authority on the papyri from Herculaneum

Both the style of writing and the letter shapes are documented for a whole group of papyri from Herculaneum which can be dated to the 2nd quarter of the 1st century B.C.

An extremely tedious procedure, one may think. Nonetheless, this new method of examining the papyri greatly accelerates the process of deciphering the letters! At regular intervals the team publishes its results in the renowned scientific journals PNAS and Nature. Work on the papyrus scrolls continues and the researchers are sure that with the optimisation and refinement of phase-contrast tomography it will in future require only a few hours of Synchrotron-Beamtime to read



Carbonised papyrus scroll from Herculaneum. © E. Brun



The Villa of the Papyri, Herculaneum.

checked and compared the shapes of the letters and individual embellishments. He was also able to recognize letters that were deformed by heat or the adhesion of the layers. By means of comparison, he consulted passages of a dated and deciphered scroll from the National Library in Naples containing a work by the Epicurean philosopher Philodemos. Delattre discerned significant parallels between the two manuscripts, for not only the handwriting but also the letter shapes were very similar.



an entire scroll. To date this is the only material-friendly, non-destructive method available for the analysis of these extremely fragile papyrus scrolls which come from the only surviving library dating from Antiquity.

Source: Brun, E. et al., *Revealing metallic ink in Herculaneum papyri*. PNAS 2016 vol. 113, no. 14, 3751-3754 doi: 10.1073/pnas.1519958113; Mocella, V. et al. *Revealing letters in rolled Herculaneum papyri by X-ray phase-contrast imaging*. Nat. Commun. 6:5895 doi: 10.1038/ncomms6895(2015).

ing tenor that was present even in the works of the ancients.

YY: What did you especially like about the *Independent*?

JDC: The fair is easy-going and the atmosphere upbeat, and exhibiting there is so incredibly uncomplicated and youthful. You instantly feel at ease. And the venue, too, the Bauhaus-style Vandenborcht department store dating from the 1930s, is very beautiful. It was my first experience of the *Independent* and it certainly won't be the last.

VOTIVE BUST OF A YOUNG MAN in the exhibition curated by Guillaume Leblon at the *Independent* Brussels 2016. H. 31.5 Terracotta. Etruscan, 4th–3rd cent. B.C. CHF 18,000

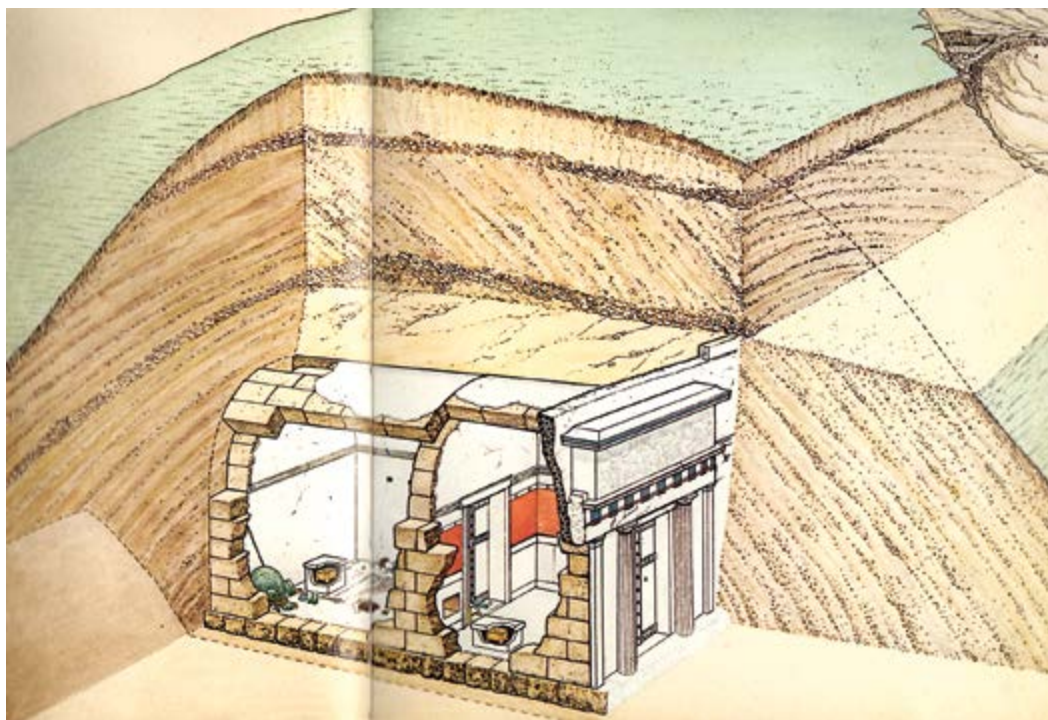


New Research Findings

Ancient Bones in the Laboratory

Modern Forensics Shed New Light on Macedonia's Royal Tombs

By Gerburg Ludwig



Reconstruction drawing of "Philip's Tomb", M. Andronikos, Vergina. *The Royal Tombs and the Ancient City* (Athen 1984) illus. 55.

Has the mystery enshrouding the occupants of the Royal Tombs of Vergina for the past four decades finally been solved? The team of Greek, Spanish and French anthropologists and palaeontologists headed by Antonis Bartsiakas of the University of Komotini is firmly convinced it has. Based on the detailed examination of the bones from Royal Tomb 1

in Vergina, the scientists succeeded in establishing that this was the final resting place of King Philip II of Macedonia, who was murdered in 335 B.C. by one of his followers. The key evidence was provided by modern forensic examinations. Published in the *Proceedings of the National Academy of Sciences (PNAS)* in 2015, the results brought new im-

petus into the decades-long debate about the identity of the Tombs' occupants.

Vergina is located on the north slope of the Pierian Mountains and was in all likelihood the site of the ancient Macedonian royal residence Aigai. The Great Tumulus (*Megalí Toumba*) – which was built as protection from pillagers who were already active in Antiquity – lies to the south of the ancient town and contains several tombs from the second half of the 4th century B.C. Due to their excellent state of preservation and historical importance the entire site has been awarded UNESCO World Heritage Site status.

A look back: Ever since Manolis Andronikos, the head of excavations at the site in the 1970s, presented his spectacular finds to the public, the majority of archaeologists assumed that Royal Tomb 2 was the resting place of Philip, his second wife Cleopatra and their newborn infant. According to Andronikos, the tomb's remarkably luxurious decoration and grave goods, which included magnificent wall paintings, furniture, golden larnakes (funerary urns), jewellery, golden tableware and splendid weapons, provided conclusive evidence for this. The British anthropologist Jonathan H. Musgrave was of like opinion, identifying the royal skeleton on the basis of a wound to the right eye socket which, according to various Ancient authors Philip received in battle.



Interior of "Persephone's Tomb", M. Andronicos, Vergina. *The Royal Tombs and the Ancient City* (Athen 1984) illus. 46.

Such a spectacular find always provokes sceptics, and indeed there were some inconsistencies. Royal Tomb 2 did not contain any skeletal fragments of a new-born child and the date of some of the grave goods and the style of the architecture of the tomb's facade suggested a later date of creation and occupancy, namely by Philip III Arrhidaeus – the elder half-brother and direct successor of Alexander as King – and his wife Adea Eurydice. These contradictions provided the kindling for ongoing discussions. Only the identification of the third tomb as the resting place of Alexander IV, the son of Alexander the Great, was never called into doubt.

The new forensic examinations concentrated exclusively on the bones found in Royal Tomb 1, the oldest of the tombs, which was called the Tomb of Persephone because of the magnificent mythological wall paintings in the burial chamber but which had unfortunately been completely plundered. These yielded significant differences challenging the status quo of the 1970s. The team reordered the bones which belonged to an adult male, an adult female and a new-born infant, studying not only their surface and structure but also tooth attrition and the width of the epiphyseal lines (caused by growth). Furthermore, they took into consideration the post-mortem bone shrinkage when calculating the age-at-death of the infant. This enabled the team to adjust the age of the man upwards to 45 years; the woman was aged 18 when she died, and the infant lived for only a few weeks.

Literary and historical sources substantiated these finds. Philip is known to have reached an age of circa 46 years. Cleopatra was less than twenty years old when she was forced to commit suicide by Olympias, Alexander's mother, her baby having been murdered immediately before. Philip III Arrhidaeus, however, was executed at the age of 39 in 317

B.C. in the course of the Wars of the Diadochi. At the same time his wife, aged 25, was driven to commit suicide. Their marriage had remained childless, which corresponds to the finds in Royal Tomb 2.

Selected bones were studied with the aid of radiography, computed tomography and surface scanning, revealing pathological changes that had hitherto not been discovered. Most importantly, it could be observed that the male individual suffered from a flexional ankylosis of the left knee, resulting in the fusion of the tibia and the femur. In the centre of the deformed section of bone there is a large hole which reveals that a fast moving projectile such as a spear almost completely destroyed the joint and that part of the foreign body that had caused the injury, probably the shaft of the spear, was only removed at a later point in time. As a result, the man would have been lame, walking with a waddling, toeing-out gait. Attrition and bone outgrowths at the base of the skull and on one cervical vertebra show that the lameness led to a compensatory tilting of the head (chronic punctuated torticollis).

These results correspond to what ancient sources report about Philip. Demosthenes, Seneca, Plutarch, Athenaeus and Justin all describe how Philip was severely wounded in the leg by a lance in a battle against the Thracians in 339 B.C. It is remarkable that



Coin Portraits of Philip II, G.M.A. Richter, *The Portraits of the Greeks*, vol. 3 (London 1965) illus. 1705-06.

Philip, in an era without antibiotics, recovered from this terrible wound, and this testifies to the skill of his doctors. His robust nature soon came to terms with his stiff leg and only a year later, he set out with Alexander on a campaign against the Athenians and Thebans, vanquishing them in the Battle of Chaeronea and thereby putting an end to the institution of the Greek polis.

Source: *PNAS* (2015) vol. 112, no. 32, 9844-9848.



Congratulations!

We would like to congratulate our archaeologist Gerburg Ludwig on her 15-year work anniversary at Gallery Cahn and on the start of her own business. As of May 2016, she will work in Hamburg as a freelance archaeologist with specialist qualifications in scientific journalism.

Gerburg studied Classical Archaeology and Ancient History at the Universities of Leipzig and Freiburg and participated in the Freiburg excavations in Nysa, Turkey. From 2001-2016 she worked for Gallery Cahn. Gerburg was the main author of the popular animal catalogues that appeared in the years 2004-2008 and from 2007-2015 she was the main author of our auction catalogues, which are highly esteemed by collectors and experts because of their scientific excellence. Furthermore, Gerburg advised our German-speaking clients both at fairs and in the gallery. Her professional competence and kind attention was very much appreciated.

We are delighted that Gerburg will continue to share her expertise with us on a free-lance basis, assisting us with the cataloguing of our stock and as an author for our publications. We wish her all the best for the future!