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The WWII Ringeltaube

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Abstract

In literature, many articles, books and original documents deal separately with the WW II German project *Ringeltaube* giant components: *Walnuß I*, *Weingut I*, *Weingut II*. In doing so, they highlight the financial effort and the forced workers' sufferings involved in the construction of each of them. This article dealing with *Ringeltaube* as a whole, estimates at 1,722,453,684\$ of today its total bill and between 18,100 and 20,500 the forced workers died because of *Ringeltaube*. In addition, the architectural details, the constructional advancement and the preservation state of each component today at more than seventy years from the end of the WW II are presented.

Keywords

Third Reich, WW II, *Ringeltaube*, Bedburg, Mühldorf, Landsberg, Kaufering, *Biber*, *Weingut*, *Diana*, *Walnuß*

1. Introduction

During the Casablanca Conference on January 1943, it was set the bases of the strategic Combined Bomber Offensive against the German Third Reich. Primary objective of the Offensive, culminated in the Operation Argument or Big Week on February 1944, was the German aircraft industries which represented the bigger portion of the industries involved in the war through the effort of about 400,000 workers, of which about 130,000 - 160,000 concentration camp (*Konzentrationslager—KZ*) inmates, and of about 10 *Reichsmarks* billions. 10,000 tons of bombs destroyed up to 75% of the aircraft plants and about 30% of the equipment. In March 1944 only one third of the expected German aircrafts was produced.

This and the necessity of increasing the number of aircrafts for controlling the air space caused the formation of the Fighter Staff (*Jägerstab*) in charge of speed up the fighter aircraft production and motivated the German Ministry of Ar-

maments and War Production (*Reichministerium für Rüstungs und Kriegsproduktion*) and the Aviation Ministry (*Reichsluftfahrtministerium*) to order the moving to central and southern Germany, where more concentrated protection could be offered, of industries involved in the production of the *Messerschmitt Me 262*, *Dornier Do 335* and *Focke-Wulf TA 152* aircrafts (*Jägersprogramm*). Twenty-seven major aircraft industries were planned to be moved in 729 smaller production shops hidden in mines, quarries, highway and railway tunnels.

However, confinement, humidity, raw materials and final products delivery problems led to the concept of locating all production within sheltered sites. This motivated Chancellor Hitler on 5th March 1944 to decide the centralization of the fighter aircraft production into six giant half-buried bunkers. In the period 19th-22nd April 1944 several high level meetings took place for defining the organization, priorities and security of the project which received the code name *Ringeltaube* (Wood Pigeon) and was put in charge to the Organization Todt (*OT*).

Each bunker site to be selected had to be rich in gravel and water supply for the bunker construction, heavily forested for their camouflage and near a railway station for material supply and delivery (Deiler, 2016; Müller, 2007; Odinius, 2004; Posset, 2016; Raim, 1992).

2. Locations and Architecture

The selected sites were Bedburg in Rhineland: *Walnuß I* or *Biber* bunker, Mühldorf am Inn in Bavaria: *Weingut I* bunker, Landsberg am Lech in Bavaria: *Weingut II*, *Diana II*, *Walnuß II* bunkers and the Protectorate of Bohemia and Moravia or Sudetenland: *Diana I* bunker. The three bunkers near Landsberg were planned for the aircraft final assembly based on assembly lines. From there, the aircrafts had to use a makeshift runway for take-off to their destinations. The Allied invasion of Normandy in June 1944 caused the restriction of *Ringeltaube* to *Walnuß I*, *Weingut I* and *Weingut II*.

The *Jägersprogramm* envisioned the production of over 900 of the more promising *Me 262* per month. The production of various *Me 262* parts had to be subdivided amongst *Walnuß I*, *Weingut I* and various, different local and foreign workshops while the final assembly concentrated to *Weingut II*.

The bunker project (Figure 1), based on the ground formwork (*Erdschalung*) concept, was developed by the *OT* chief executive Xaver Dorsch, on the basis of the projects of the V-weapons bunkers in France, for reducing formwork wood, facilitating the concrete casting and save construction costs.

Each bunker had to be about 400 m long, 85 m wide and 32.20 m high of which 13 m above ground and 19.20 m underground. The arcuate coverage was formed by 12 arches, each 33 m long, separated by a 30 cm gap to be filled at the coverage completion.

Soil and trees had to be removed for clearing out the bunker area. A removal tunnel (*Entnahmetunnel*), provided with silo valves at regular distances on its

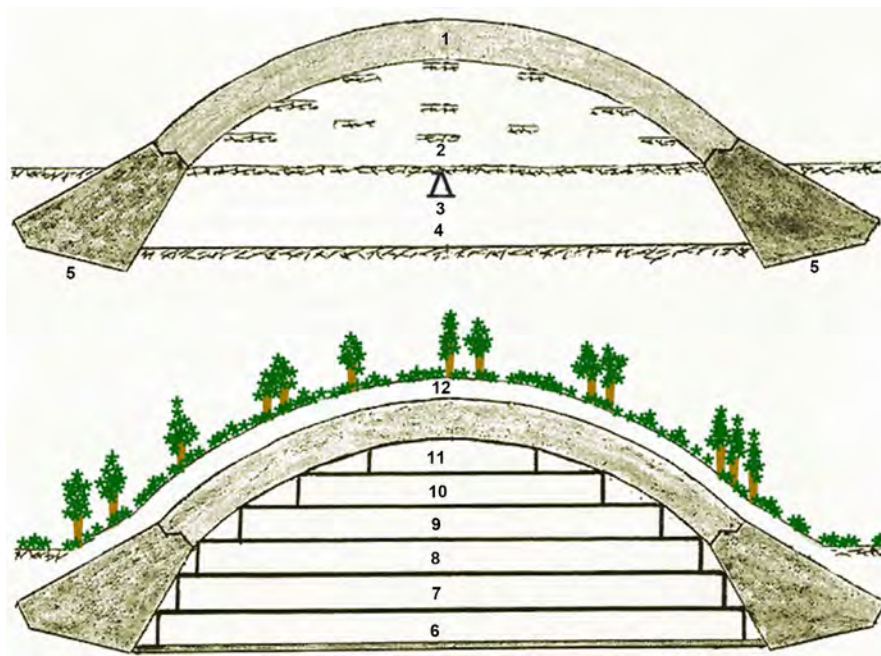


Figure 1. Bunker project: (1) arcuate coverage; (2) semi-cylindrical ground formwork; (3) removal tunnel; (4) final soil level; (5) concrete arch foundations; (6) 1st floor; (7) 2nd floor; (8) 3rd floor; (9) 4th floor; (10) 5th floor; (11) 6th floor; (12) forested layer (Start image Ehmke, 2005).

top, had to be dug into the original terrain along the central axis of the foreseen arches. Two trenches parallel to the tunnel had to be dug and concrete poured inside for creating the arch foundations. Once dried, gravel and earth had to be collected between the arch foundations and over the tunnel to form a semi-cylindrical ground formwork. It had to be smoothed and flattened for receiving a 30 cm thick concrete layer of the first arch. Metal rods had to be fixed on it for supporting a second 5 m thick concrete layer accumulated by means of cranes and pumps. Twenty days later when the concrete was dried, the ground formwork had to be removed from below the arch by means of a convoy entering the removal tunnel and parking the wagons under the silo valves. The silo valves opening caused the ground formwork gravel and earth to fill up the wagons. The original terrain had to be excavated up to the underground soil level. These operations had to be replicated up to the last arch. Over the bunker arcuate coverage obtained, a final 3 m forested layer had to be formed to provide camouflage. A 5 m thick wall provided with entrances had to close each bunker extremity. A construction provided with six to eight floors had to be built in the bunker interior (Ehmke, 2005; Müller, 2007; Odinius, 2004; Cocconcelli, 2002; Zaloga, 2012).

3. Biber

The *Biber* (Beaver) site (50°58'56.2"N, 6°35'8.7"E) was near Bedburg, on the right side of the river Erft, in the *Rheinbraun* Fortuna brown coal open-cast mine

(**Figure 2**). At its completion, *Biber* had to accommodate about 40 firm branches, which starting from March 1945, had to produce, on 110,000 m² surface, military equipments such as electrical devices, cables, crankshafts, aircrafts devices. The site was selected by the OT Chief Construction Department (*Chefkonstruktionsabteilung*) in Berlin because of its solid underground, a deep groundwater, a nearby gravel plant with large gravel and sand deposits, water supply through the Erft and a good connection with the German railway network (*Reichsbahn*) by the Bedburg railway station.

The bunker design was carried out by the OT department *Hansa* based in Essen. The overall management was assumed by the OT Operational Group *Rhur*, Supply Department (*Einsatzgruppe Ruhr, Abtl. Nachschub*) based in Essen-Heidhausen. Each arch foundation had a concrete volume of 7500 m³ and the total construction had a concrete volume of 300,000 m³. About 70 - 90 kg of steel were used per concrete cubic meter. Each arch was built by pouring the concrete in formwork boxes. Engineers of the OT constantly checked the concrete quality (B 225). *Biber* followed a project slightly different from that of the already started *Weingut I* in Mühldorfer Hart. *Biber* had to be 370 m long, 112.40 m wide with a concrete coverage 6 m thick. The coverage had to receive a 3-meter-thick ground layer. After each arch drying, a sand, gravel and ground thickness of 31 m had to be removed for the internal construction of 6 floors, each 4 m high. The 3rd floor corresponding to the original ground level had to be accessed by three rail lines for distribution of incoming raw material and shipping of finished pieces. The 6th floor had to host a kitchen, cantinas and a pantry for about 2060 workers.

Ground and concrete constructions had to be carried out by Butzer, Hoch-Tief AG and Rathjens firms, concrete and precast concrete sections by Weys & Freitag and Dyckerhoff & Widmann firms, transport and elevator systems



Figure 2. *Biber* area—A Federal highway 61; B: Bedburg; Bi: *Biber* site; Be: Bergheim; E: Erft; K: Kaster; L: Lipp; M: Millendorf; O: Oppendorf (Zoom Earth).

by Otis and Demag firms, ventilation systems by R.O. Meyer firm. The fans of Auer firm had to circulate 200,000 m³ air per hour. 36 air supply and exhaust systems, consisting of fans, air heaters and filters were planned. A gas protection of the entire system was not foreseen because several gas-proof rooms for the about 4000 workers had to be built inside the bunker. Ten transport lines for manufactured sections were foreseen. A further bunker 100 m long, site unknown, was planned for armament production.

In spring 1944, the entire right bank of the Erft between Bedburg and Bergheim was enclosed by barbed-wires controlled by guarded posts. Inside, *KZ* extended over 6 km for about 10,000 workers, although this number seems exaggerated, other workers were lodged in two *KZ* near Bedburg. An unprecedented number of construction machines (excavators, mixing machines, construction cranes) were collected. The site received a new rail line from the Bedburg railway station and the required amount of water through a pipeline from the Erft. Each day, two work shifts were on the site, each formed by 3000 - 4000 workers. These were mostly forced workers, among which Italian, Dutch, Polish and Russian POWs. The work conditions were miserable: up to 10 - 12 hours work time, insufficient food, no suitable work clothes, no wages, flogging also for minor transgressions. The nearby town inhabitants were unaware of *Biber*. Unauthorized accesses to the site, photographing and sabotage attempts caused life danger.

The construction material was delivered via the new rail line, while the gravel was transported by a camouflaged rail line from the gravel plant. In May-June 1944, two parallel trenches 370 m long were excavated. After smoothing and flattening, concrete was poured inside forming the *Biber* side foundations. Each arch was built, first 4.50 m thick, and then a further 1.50 m thick concrete layer was added.

Due to the American advancing, at the beginning of 1945, the *Biber* construction, arrived up to the 2nd arch was stopped and the site abandoned. After the war, the *Biber* arches and foundations were removed to avoid them to hinder the work of big excavators in the open-cast mine. The arches and foundations were destroyed with explosives and the metallic armour cut. Concrete portions were disposed by trucks in the exploited part of the open-cast mine, which, later, was filled by terrain and re-cultivated. Why in 1944 *Biber* was planned so far to the west and not in central or southern Germany is unknown. The advantages of the *Biber* site, certainly have not weigh alone against the danger posed by the allied air. *Biber* as launcher of *V2*, as reported by witnesses, remains controversial. In mid-1970s, with the complete removal of the remains, no trace of *Biber* was visible (Ehmke, 2005; Depcik, 2006; Kanzler, 2003). Therefore, no *Biber* site visit took place.

4. Weingut I

The *Weingut I* (Vineyard I) site (48°14'25.6"N, 12°27'8.2"W) was in Mühlendorf Hart, on the left side of the river Inn (**Figure 3**). 600 OT employees in their



Figure 3. Weingut I area—(1) KZ Waldlager I; (2) KZ Waldlager II; (3) KZ Waldlager III; (4) KZ Waldlager IV in project; (5)-(6) KZ Waldlager V-VI; (7) KZ Waldlager VII in project; (8) mass grave; (9) KZ Mettenheim I; (10) KZ Mettenheim Hart Süd—Russian forced workers; (11) KZ Mettenheim Hart Süd—Russian voluntaries; (12) KZ Grümer; (13) KZ Ecksberg; A: Amping; E: Ebing; H: Mettenheim Hart; K: Kraiburg; I: Inn; IB: firm *Innbau Beton*; Ik: Innkanal; M: Mühldorf; MH: Mühldorf Hart; WI: Weingut I site (Zoom Earth).

offices in Ampfing, Mettenheim and Ecksberg, were responsible for the planning and supervision of *Weingut I* construction as well as the work subcontracting to different firms, primarily Polensky & Zöllner (*PZ*) which was commissioned for the construction.

PZ transferred 200 workers and equipments from various parts of occupied Europe on the *Weingut I* site. 70% - 80% of *PZ* construction capacity was devoted to the *Jagersprogramm*. *PZ* received no formal contract from *OT*.

The *Schutzstaffel* (*SS*) supplied workers to *OT* and *PZ* and managed their work. Concentration camps were *KZ Waldlager I-III* for forced workers, *KZ Waldlager V-VI*, *KZ Mittergars*, *KZ Thalham* and *KZ Gensdorf* which formed the Mühldorf Ring named also Mühldorf Group or *KZ Mühldorf*. Other concentration camps were *KZ Mettenheim I*, *KZ Ampfing*, *KZ Grümer*, *KZ Ecksberg* and two *KZ*.

Mettenheim and two *KZ Mettenheim Hart Sud*, one for Russian forced workers and one for Russian voluntaries. Approximately 8.300 inmates were in these camps from July 1944 to April 1945. They were Hungarians, Polish, Greeks, Czechs, Yugoslavs, Lithuanians, Italians, Dutch, and Frenchs by nationality and Jews, POWs, *KZ Dachau* and *KZ Auschwitz* inmates, political prisoners and voluntary workers by category. They were in general classified auxiliary workers (*Hilfsarbeiter*). Their payment was 60 *Pfennigs* per hour due at the end of each month, but they never received payment. Overwork combined with beatings, starvation diet, unsanitary

living conditions and disregard for medical needs resulted in the death of 1800 - 3000 forced workers. The life expectancy was 40 - 60 days.

The *Weingut I* site was requisitioned and mid May 1944. Facilities were soon constructed comprising a carpentry, a cement shop and a cement brick bakery. The site was selected because of a nearby gravel plant with large gravel and sand deposits and water supply through the *Innkanal*. Light *Flak* artillery was onsite against low-flying enemy aircrafts. A fake construction site was built between Altötting and Burghausen for diverting the Allied air reconnaissance. A rail track was built between Mühldorf and Munich for the materials transport. A planned rail connection between Mühldorf and Rosenheim never took place. Rails gone from the onsite concrete depot to the *Weingut I* site.

The removal tunnel was parabolic shaped, 5 m high and consisted of precast hinged arches for reducing iron and concrete. The internal construction had 250,000 m² production area on nine levels. Plans were also drawn up for install stairs, elevators and pillars, all made by precast sections that had been assembled in workshops in Ampfing and Mittergars. However, these plans were never accomplished due to the worsening of the war situation.

Near the WW II end, *PZ* sent a bill of 25,867,592 *RM* (*Reichsmarks*) that *OT* refused to pay because of the worsening of the war situation.

At the end of April 1945, only arches 1 to 7 of the originally planned 12 were completed. Disruptions in the supply of materials and lack of skilled workers delayed *Weingut I* which was never bombed. The US Army in 1946 used 125 tons of TNT for demolishing *Weingut I*. This for testing *Weingut I* resistance to a full-scale bombing (Bankel, 2009; Müller, 2007; Paul, 1981).

5. *Weingut I* Visits

The *Weingut I* visits took place on 27th February 2005, 25th September 2005, 12th March 2016 and 4th May 2019. The access path started near the firm *Innbau Beton* (Figure 3) and proceeded in the forest up to the *Weingut I* site.

The 1st arch lay on the ground. Its structure was seriously fractured. Its front side showed that the collapse fragmented the arch in concrete blocks in the middle, larger blocks at the sides and two portions still in place at the extremities. Its rear side was masked by the 2nd arch front side. On its coverage formwork element traces and parallel aligned armour iron extremities, about 10 - 30 cm high, were well visible. Small plants grew sparse on its coverage (Figures 4(1)-(4)).

The 2nd arch lay on the ground. Its structure was seriously fractured. Its front and rear sides were masked respectively by 1st arch rear side and the 3rd arch front side. Two portions were still in their original position at its extremities. On its coverage formwork element traces and parallel aligned armour iron extremities were well visible. Young plants grew sparse on its coverage (Figures 4(4)-(5)).

The 3rd arch lay on the ground. Its structure was seriously fractured. Its front and rear sides were masked respectively by the 2nd arch rear side and the 4th arch



(1)



(2)



(3)



(4)



(5)

Figure 4. *Weingut I*—(1) 1st arch, overview; (2) front side; (3) coverage; (4) 1st and 2nd arches bases and details of the vegetation on the upper surface of the 2nd arch; (5) 2nd arch, fractured coverage with aligned extremities of the armour irons.

front side. On its coverage formwork element traces and parallel aligned armour iron extremities were well visible. Young plants grew sparse on its coverage (**Figure 5(1)**).

The 4th arch lay on the ground. Its structure was seriously fractured. Its front and rear sides were masked respectively by the 3rd arch rear side and the 5th arch front side. On its coverage formwork element traces and parallel aligned armour iron extremities were well visible. Young plants grew sparse on the coverage (**Figure 5(2)**).

The 5th arch lay on the ground. Its structure was seriously fractured. Its front and rear sides were masked respectively by the 4th arch rear side and the 6th arch front side. On its coverage formwork element traces and parallel aligned armour iron extremities were well visible. Hardwoods and conifers grew sparse on its coverage (**Figures 5(3)-(4)**).



Figure 5. *Weingut I*—(1) 3rd arch fractured coverage with aligned armour iron extremities; (2) 4th arch fractured coverage with aligned armour iron extremities; (3) 5th arch fractured coverage; (4) 30 cm gap between the 4th and 5th arch; (5) 6th arch coverage with traces of the formwork elements and aligned armour iron extremities; (6) worker's shoe prints on the 6th arch concrete.

The 6th arch lay on the ground. Its structure was seriously fractured. Its front and rear sides were masked respectively by the 5th arch rear side and terrain debris. On its coverage formwork element traces and parallel aligned armour iron extremities were well visible. Particularly touching were shoe prints left by a worker on the concrete. Hardwoods and conifers grew sparse on its coverage (**Figures 5(5)-(6), Figure 6**).

The 7th arch survived the demolition and remained erected in its original position. Its front side toward the 6th and 5th arches clearly showed the 30 cm thick concrete layer supporting the 5 m thick concrete layer. Part of its rear side fallen on the ground letting an empty space on the arch and part remained attached to



Figure 6. *Weingut I—7th arch:* (1) coverage rear side with 30 cm and 5 m concrete layers, in the foreground 6th arch coverage; (2) coverage with constructive segments; (3) coverage with constructive segments and aligned vertical protrusions; (4) dynamite holes on the rear side; (5) rear side with empty space of the fallen part and attached part; (6) coverage with aligned armour iron extremities.

the arch because of the internal armour irons. On its coverage formwork element traces and parallel aligned armour iron extremities were well visible. At the arch interior the coverage showed parallel constructive segments. On a lower side, extending from a constructive segment, were three aligned vertical protrusions. Near the protrusions, a partially collapsed rear side preserved 20 holes about 10 cm in diam. Small plants grew sparse on its coverage (**Figures 6(1)-(6), Figure 7**).

The removal tunnel emerging part departed from the 7th arch rear side for about 20 m toward West. It was formed by precast arches. The emerging arch portions were partially detached from each other by the internally accumulated



Figure 7. *Weingut I—7th arch, front side overview from the 5th and 6th arches.*

terrain pressure and the emerging silo valves were filled by concrete (**Figures 8(1)-(3)**). Each portion had a square hole about 10×10 cm, and was erected in its original position indicating a good preservation state of the buried arch. The removal tunnel entrance was buried in the terrain; therefore, the interior inspection was not possible. Tunnel precast arch components were laying on the nearby terrain (**Figures 8(4)-(6)**).

Traces of parallel foundations excavations were visible, but no traces of the ground formwork after the 7th were remarked.

A first and a second air intake/exhaust opposed to the *Weingut I* axis were identified. Each presented an external square wall about 20×20 m and 3 m high. Its concrete structure was in good preservation state showing construction formwork element traces. Armour iron extremities protruded from the upper portion. The internal square wall was about 10×10 m, about 3 m high and 2 m thick with lowered inner edges. Its concrete structure was in good preservation state showing construction formwork elements traces. The internal wall protected a well about 10 m deep with the floor inclined toward the *Weingut I* interior (**Figures 9(1)-(4)**).

Near the 7th arch rear side not far from the fallen and attached parts was an elongated rectangular concrete construction comprising a first entrance, a short corridor, a second entrance perpendicular to the first entrance and an internal elongated rectangular space. Its structure was in a good preservation state with traces of the construction formwork elements. The upper portion hosted protruding armour iron extremities (**Figures 10(1)-(2)**).

In the nearby Mühlendorf, at about 5 km from *Weingut I*, on the site of the former *PZ* Workshop Mühlendorf, now MBM Industrie GmbH, on 1943 *PZ* built an air-raid bunker (*Luftschutzbunker, L-S bunker*) ($18^{\circ}14'44.7''N$, $12^{\circ}20'25.1''E$), 12×9 m (**Figures 11(1)-(4)**). It comprised 558.151 m^3 concrete and 9111 kg of armour iron. Its basement was 1.20 m thick, the wall thickness 2 m, the coverage 2.50 m thick. The entrance had no anti-gas armoured door. The entrance corridor (a) joined a perpendicular corridor (b) at the end of which was an original armoured door provided with a circular hole grate. The door opened on a gas

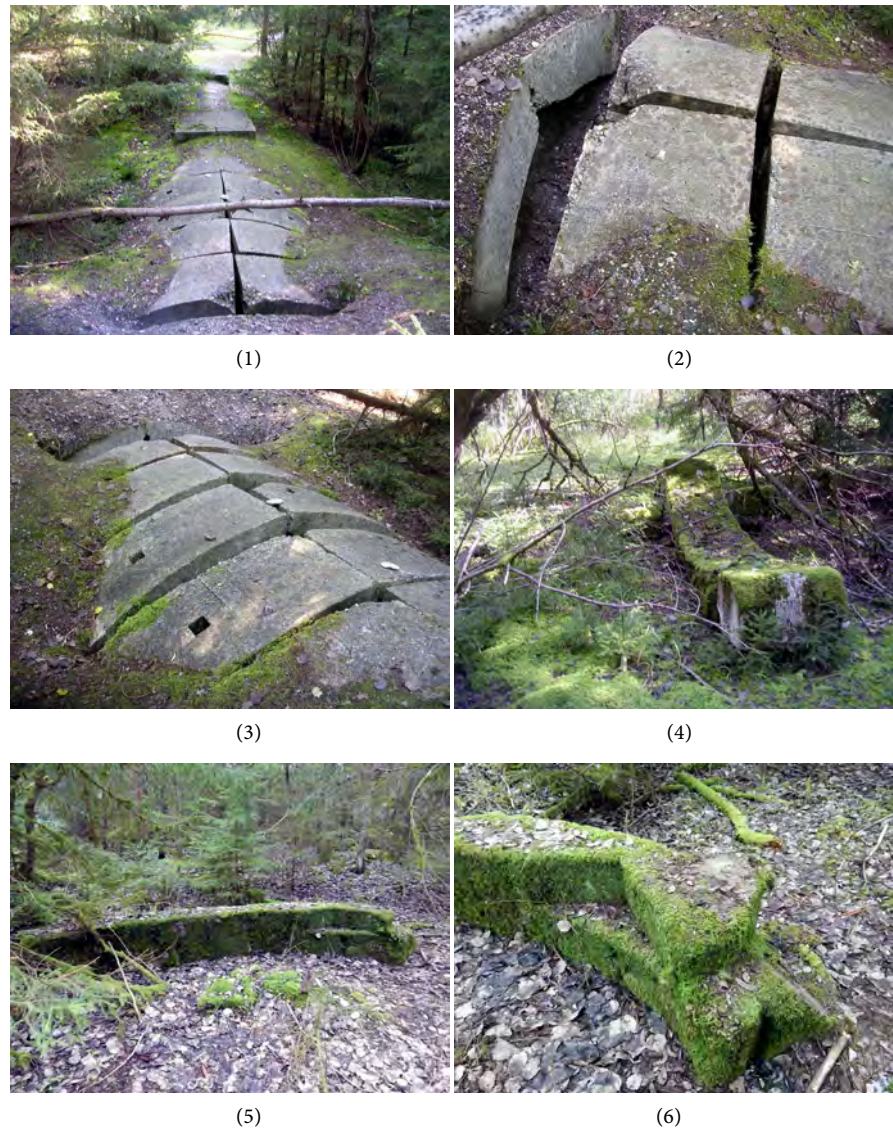


Figure 8. Removal tunnel: (1)-(3) partially detached arches and concrete filled silo valves; (4)-(6) abandoned removal tunnel precast arches.

lock room (c) in connection with a 5.40×5.00 m main room (d) for the protection of up to fifty persons. On a side the main room had an emergency exit (e). The exterior and the interior structure were in a good preservation state without damages due to combats or bombardments. A construction (f) having an entrance and three windows, hanging on the bunker wall and opposed to the emergency exit wall, disappeared.

6. Weingut II

Despite the bombardments of Augsburg on 1942 and Munich on 24th-25th April 1944 which caused 70,000 homeless, in the period March-April 1944 it was decided to locate *Weingut II*, *Diana II*, *Walnuß II* in the nearby Landsberg area (Figure 12), although materials and workers had always to come from the exposed Augsburg and Munich areas.



Figure 9. *Weingut I*—(1) first air intake/exhaust, square internal wall; (2) well entrance toward *Weingut I*; (3) well inclined floor; (4) second air intake/exhaust.



Figure 10. *Weingut I*—rectangular concrete construction: (1) entrances; (2) internal space.

However, Bavaria was not touched by combats, the roads and railway lines among Landsberg, Augsburg and Munich were still undamaged. The site was selected because it was a rural area without important military targets and its gravel layer, into which the bunker foundations had to be excavated and which provided gravel for the concrete, was sufficiently deep, the groundwater level was deep too and water was available from the Lech. In addition, the *Bayerische Wasserkraft AG (Bawag)* could provide electricity, the *Dynamit Aktiengesellschaft (DAG)* bomb explosives and ammunitions and the nearby Lagerlechfeld air field a place for testing the finished *Me 262s*.

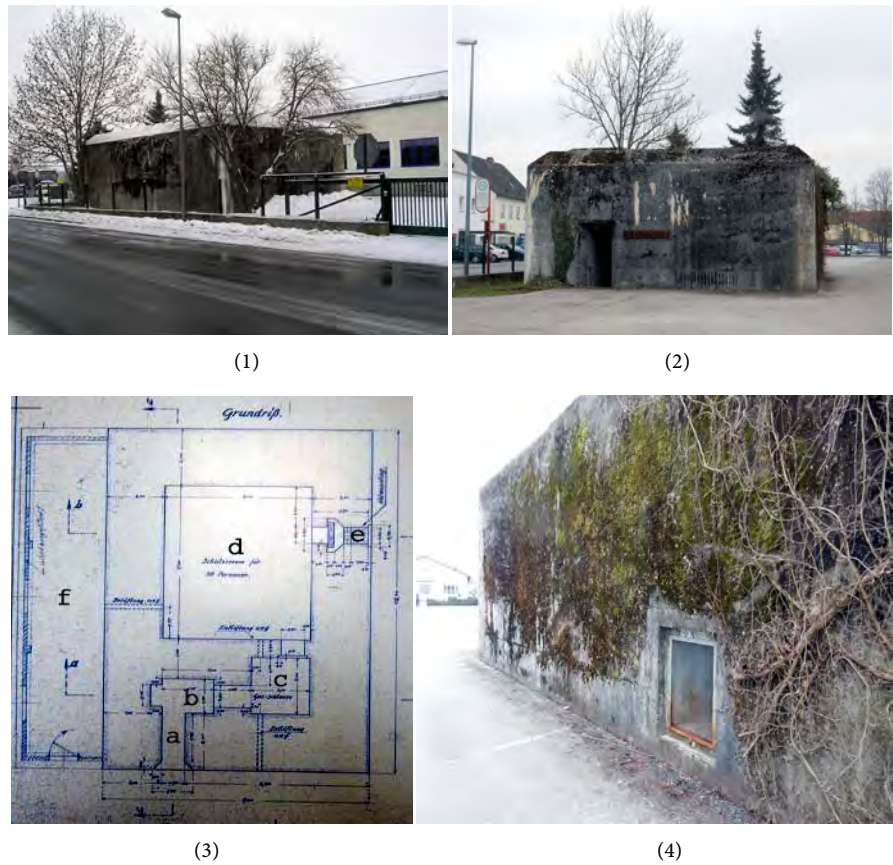


Figure 11. L-S bunker—(1) overview; (2) front side with entrance; (3) bunker plan: (a) entrance corridor, (b) perpendicular corridor, (c) gas lock room, (d) main room, (e) emergency exit, (f) annexed construction; (4) emergency exit, details.



Figure 12. Weingut II area—(1) KZ Kaufering I; (2) KZ Kaufering II; (3) KZ Kaufering III; (4) KZ Kaufering IV; (5) KZ Kaufering XI; A Federal Highway 96; DII: Diana II site; K: Kaufering; L: Landsberg am Lech; Le: Lech; I: Igling; WII: Weingut II site; WaII: Walnuß II site; We: Welfen Barrack (Zoom Earth).

OT mobilized 2000 - 3000 workers in service on the Atlantic Wall for the *Weingut II* construction, commissioned *Weingut II* construction to firm Moll and supervised the construction until the end of March 1945. *Weingut II* had to be delivered on 31st November 1944 and designated for the final assembly of the *Me 262s*, while *Weingut I* was designated for the production of the motors and other components.

On 15th May 1944 firm Moll started to clear the 230,000 m² of wood of the *Weingut II* site (48°04'07.4"N, 10°49'32.5"E) near Kaufering. Ten day after started the excavation of the *Weingut II* foundations. One million cubic meters of terrain had to be removed and 310,000 m³ of concrete to be used for foundations and coverage. Firm Moll calculated 20,179,700 *RM* the *Weingut II* cost. On 20 June 1944 the first thousands of Hungarian Jews arrived at the Kaufering station from the *KZ* Auschwitz. They were lodged in *KZs* around Kaufering and Landsberg built by *OT*. More than 13,000 forced laborers on the total of 22,000 workers employed were *KZ* Auschwitz Jewish inmates. In total 11 *KZs* were built, eight near Landsberg and Kaufering, two near Utting and one near Türkheim. The *SS* assumption of the direction of the Kaufering/Landsberg *KZs* caused a rapid increasing of inmates deaths through the annihilation by work (*Vernichtung durch Arbeit*). About 14,500 inmates died in the Kaufering/Landsberg *KZs*.

At April 1945, 200 m, i.e. seven arches, of *Weingut II* were built and half of the ground formwork removed through a rectangular, heavily dimensioned removal tunnel which hosted two rail.

At the beginning of May 1945, the Mühldorf district was liberated by the 47th US Tank Battalion of the 14th Division and the *Weingut II* site was placed under the US military administration. After the WW II, an unsuccessful attempt was made to demolish *Weingut II* and after it was used as ammunition depot. From 1960 to 1966 it was completed and adapted to protect components of the Matador flying bomb system. After the Matador decommissioning, since 1964 *Weingut II* was used by the German air force alone. Nuclear warheads were never stored inside. The bunker was further modified for hosting a storage and repair depot, a maintenance unit for avionics equipment, an air force materiel depot, and since 1980 an air force programming centre for airborne weapon systems (Posset, 2016; Odinius, 2004; Bankel, 2009).

7. Weingut II Visit

The *Weingut II* visit took place on 15 April 2002 guided by commander Odinius. *Weingut II* was on the area of the Welfen Barrack near Landsberg and therefore, taking images was not allowed. It was covered by a forested layer, as foreseen by the original project, and was practically invisible. It appeared not hosting ongoing military activities, but it is possible that sensitive areas were excluded from the visit. The interior was accessible through a lateral entrance. A white painted corridor brought to the Military History Collection Memorial *Weingut II* (*Militärgeschichtliche Sammlung Erinnerungsort Weingut II*) where the history, architecture and sufferings of the workers were evocated. Commander Odinius

declared that those were the last *Weingut II* days because it had to be closed so as to be one of the most obscure places in the world. A circular magnesium door, about 3 m in diam. and 1 m thick, was visible on a side of the exit corridor toward one main exit adapted for discharging vehicles.

8. Diana I, Diana II and Walnuß II

The *Diana I* site in the Sudetenland was not precisely defined (Raim, 1992) and the researches made did not provided its site location. Therefore, no visit took place.

At the end of November 1944 firm Stöhr, commissioned for *Walnuß II* construction, stopped the excavations and firm Holzmann, commissioned for *Diana II* construction, stopped the excavations (Posset, 2016; Odinius, 2004). The researches made provided no information about construction remains. Therefore, no visit took place.

9. Discussion

Ringeltaube was part of the general German effort to protect sensitive installations in caverns, caves and bunkers. Beginning in 1943, began extensive construction projects within the occupied states and the *Reich* against air raids: the extended air-raid bunkers (*erweitertes LS-Führerprogramm*), the V-weapons sheltered sites (Wizernes, Éperleques, Mimoyecques, Villaine-la-Carelle (Tomezzoli & Pottier, 2015) and the *Geilenberg-Programm*).

At the beginning, probably, each of *Diana I*, *Walnuß I*, *Weingut I* and the corresponding *Diana II*, *Walnuß II* and *Weingut II* were dedicated to the component production and finishing of respectively the *Me 262*, *Do 335* and *TA 152*. The decision to produce only the more promising *Me 262* restricted *Ringeltaube* to the construction of *Weingut I* and *Weingut II*.

Biber at the WW II end, was in an initial construction state with two arches already in place. The literature available let unknown the shape of its removal tunnel.

Weingut I, at the WW II end, was in a relatively advanced construction state with seven arches already in place, i.e. about 210 m in length on the total of 400 m planned. Images taken at the end of the WW II showed that the formwork under the first seven arches was already removed and the formwork for the following arches already in place. The six arches lying on the terrain and the empty 7th arch confirm that the ground formwork was removed up to the level of the original terrain. The constructive segments remarked on the coverage of the 7th arch correspond to the subsequent concrete casting construction of the arch. The aligned protrusions inside the 7th arch were probably references for a floor of the internal construction. The 20 holes on the outer edge of the rear side of the 7th arch hosted or had to host sticks of dynamite. The whole demolition technics and the reason for which it failed in the case of the 7th arch are unknown. The removal tunnel was dry built without concrete for joining and fixing

the precast arches. The square hole of each precast arch allowed its handling. The short aligned armour iron extremities on each arch coverage appear insufficient for fixing in place the corresponding forested layer. The protruding armour iron extremities on the upper portion of the external wall of the two air intake/exhaust and the upper portion walls of the elongated rectangular construction were probably intended for supporting and fixing upper structures. The *Weingut I* electrical power supply came probably from the Töging power plant (*Kraftwerk*) at the end of the *Innkanal* (Ik) (**Figure 3**). A monumental conversion project for preserving the *Weingut I* remains was formulated in the past, but not yet been started. Therefore, in few decades it is possible that only the 7th arch will be visible.

The bunker in the nearby Mühldorf was a special construction (*Sonderkonstruktion*) similar to *Regelbau R 501*. Its position on the parking of firm MBM Industrie GmbH ensures a long term preservation, although the annexed construction hanging on a wall disappeared for letting space to the actual Münchner road.

Weingut II, at the WW II end, was in a relatively advanced construction state with seven arches in place. Images taken at the end of the WW II showed that the formwork under the arches was already removed; no formwork was in place for the following arches and the wall for closing one of the bunker extremities was already started. The visit did not allow acquiring details of its internal construction and its floor organisation. The circular magnesium door assured radiation protection in case of nuclear attack. Notwithstanding the announcement of closure, *Weingut II* is today still open for visits.

Bearing in mind the 25,867,592 RM *Weingut I* bill presented, at the WW II end, by *PZ* to *OT*, the 20,179,700 RM *Weingut II* bill (Raim, 1992), assuming a similar *Biber* bill and ignoring the *Diana I*, *Diana II* and *Walnuß II* bills, it is possible to estimate at about 66,226,992 RM (1938), corresponding to 1,722,453,684\$ of today (Marcuse, 2005), the lower limit of the *Ringeltaube* bill. Note that, this amount is only a conversion value, with the modern constructional technologies the amount may be inferior, but the exact amount remains to be determined.

Bearing in mind the 14500 dead workers at *Weingut II*, the 1800 - 3000 at *Weingut I*, assuming a similar number at *Biber* and ignoring the *Diana I*, *Diana II* and *Walnuß II* possible other dead workers, it is possible to estimate between 18100 and 20500 the forced workers dead because of *Ringeltaube*.

10. Conclusion

This article, dealing with *Ringeltaube* as a whole, highlighted constructional aspects of its giant components and estimated its bill both in financial and suffering terms. Therefore, it represents a solid base for further *Ringeltaube* studies.

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Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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Major Geological Fissure through Prehistoric Lion Monument at Giza Inspired Split Lion Hieroglyphs and Ancient Egypt's Creation Myth

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Abstract

In search of textual references to a monumental lion at Giza predating the Old Kingdom, we focused our investigation on the earliest use of three ancient Egyptian hieroglyphs depicting the frontal and caudal halves of a lion and a fissure-like symbol. These symbols first appear in Egypt's proto- and early dynastic era and form part of Egypt's earliest known set of written language symbols. During the First Dynasty, these symbols were both carved into ivory tags and painted onto jars to designate the quality of oil shipped as grave goods to both royal and private tombs. The same iconography and symbols appear in the creation story recorded on the frieze and upper register of the *Edfu* Temple's enclosure wall, where the frontal and caudal animal parts are used to name two of seven personified creation words, the so-called *d3jsw*¹, uttered during the act of creating the world from the primordial flood *Mehit-wrt* by *Ptah*. Here, we show that the appearance of such unusual icons in such different contexts can be explained by a prominent physical feature (a geological fissure) affecting the appearance of the Great Sphinx, thus demonstrating that the original monument including this feature existed before these hieroglyphs were invented. We have previously argued that the Great Sphinx was remodeled from the much older monumental lioness *Mehit*. Here, we provide further evidence that this monument existed in the form of a lion or lioness at least seven centuries before the time of *Khafre* (circa 2500 B.C.E.) challenging the conventional model which attributes the original creation of the Great Sphinx to this Old Kingdom ruler.

Keywords

Great Sphinx, Giza, Lioness, Mehit, Buto-Maadi, Sumer, Edfu, JAW Sign

¹In this paper, we use the standard Egyptological consonants-only phonetic transliteration method with inferred vowel sounds in between omitted, except for widely known names. *d3jsw*, for example, may have been pronounced "Jai-soo". For the full transliteration set of all known Egyptian consonants used see Allen, 2014: pp. 18-20.

1. Introduction

The original creation of the Great Sphinx monument on the Giza Plateau (Egypt) is commonly attributed to the fourth king of ancient Egypt's Fourth Dynasty, *Khafre* and is consequently dated to circa 2500 B.C.E. (Reisner, 1912: p. 13; Hassan, 1949: p. 88; Ricke, 1970: p. 32; Lehner, 1991: pp. 405-411; Hawass, 1993: pp. 180-182; Lehner & Hawass, 2017: pp. 240-241). This orthodox historical model has been challenged by geological data (Schoch, 1992; Dobecki & Schoch, 1992; West & Schoch in NBC, 1993; Reader, 1997: p. 13; Schoch in Schoch & Bauval, 2017, appendices 6 and 7), astronomical evidence (Bauval in Schoch & Bauval, 2017, chapter 6), archeological data (Stadlmann, 2000; Dobrev, 2004), and textual evidence (Seyfzadeh et al., 2017; Seyfzadeh & Schoch, 2018), yet it continues to shape the main-stream narrative presented in major published media and academic circles. The alternative model based on this cumulative contrarian evidence proposes that an Old Kingdom ruler, for example *Sneferu*, *Khufu*, *Djedefre*, or *Khafre*, merely remodeled a much older, then circa 7000- to 8000-year old, already severely weathered stony lion (or lioness) statue at Giza into the Great Sphinx lion-human chimera we know today.

Despite the compelling nature of textual evidence, our investigations into Egyptological proof of an older Sphinx are naturally limited to that time interval before the time of *Khafre*, i.e. from circa 3300 to 2500 B.C.E., during which the ancient Egyptians are known to already have used symbols in writing, unlike is the case with other archeological, geological, and astronomical evidence which can reach back much further in time. Hence, our investigative focus on textual evidence aims to compellingly falsify the orthodox model with such written proof rather than to positively identify the date of the first time when the core body of the Great Sphinx and associated temples and causeway may have been carved and built from the limestone rock forming most of the Giza Plateau. Such a distant prehistoric time for the original carving of this monument, as suggested by the lines of evidence cited above, precedes the currently known advent of writing in the Nile Valley and Delta by thousands of years. In other words, any written reference to a megalithic lion monument at Giza dated to a time before the reign of *Khafre*, while not indicative of the date of its original creation, nevertheless powerfully falsifies the orthodox model with recorded evidence handed to us by the ancient Egyptians themselves and neutralizes most if not all of the other, less compelling, archeological or conjectural evidence brought forth in support of the Reisner/Hassan/Ricke/Lehner/Hawass model which proposes that *Khafre* was its original builder.

For example, the Inventory Stele explicitly states that *Khafre's* father *Khufu* repaired this monument, directly contradicting the idea that *Khafre* originally created the Great Sphinx. Even though the authenticity of the text inscribed on the stele has been put in question, we have concluded that most, if not all, of the criticisms against it are either inaccurate or imprecise (Seyfzadeh & Schoch, 2018). The story told on the stele, even if authentic as we have argued, however

does not falsify the more general historical model held by most historians and Egyptologists that the monument was likely still made sometime during the large megalithic Pyramid Age (Circa 2670-2450 B.C.E.), i.e. during the Third and Fourth Dynasty of the early Old Kingdom era, for example by *Sneferu*, *Khufu's* father, or even an earlier king of the Third Dynasty.

In another prior publication, nevertheless, we further pushed back the time of the earliest identifiable textual trace referring to a monumental lioness at Giza known as *Mehit* to the First Dynasty's *Horus Djer* (Seyfzadeh et al., 2017), the third king of a unified Egypt probably alive circa 2900 B.C.E., and, considering the earliest appearance of *Mehit* on sealings associated with unified Egypt's first king *Horus Narmer*, to a time five centuries before *Khafre*, i.e. circa 3000 B.C.E. Therefore, we have concluded that the core body of the Great Sphinx existed before the megalithic Pyramid Age of the early Old Kingdom in the form of a female lion the early dynastic Egyptians (First and Second Dynasty) knew as *Mehit*.

Here, we now present new textual evidence dating this primordial monument (later remodeled to become the Great Sphinx) even further back to the predynastic era before the unification of Upper and Lower Egypt by *Horus Narmer*, further solidifying our case that the orthodox model cannot be correct. Our evidence shows that the monument existed at least seven centuries before *Khafre* and before the known advent of fully developed writing in ancient Egypt. We conclude that the physical appearance of the megalithic lion (or lioness) at Giza may indeed have substantially influenced the later culture of the pre-historic and proto-dynastic Egyptians with respect to such diverse pillars of civilization as documenting economic transactions with written language and the theological myth of the creation of the world.

2. Observations and Results

Split Lion Symbols. We focused our attention on three hieroglyphs shown in **Figure 1**. The earliest attested of the three, Gardiner F22 depicting the hind (caudal) portion of a lion or other feline animal was first discovered in tomb B2 of the predynastic ruler *Jrj-Hor* (circa 3100 B.C.E.; Kahl, 1994: p. 496; Kaiser & Dreyer, 1982: p. 234a), the owner of the first and presumably oldest double tomb (B1/2) in *Umm El-Qa'ab's* cemetery B marking the transition from the earlier (i.e. more northeastern) single tombs of cemetery U (Helck, 1987: pp. 90-91), where the oldest known written symbols of Egypt were discovered in Scorpion I's tomb U-j (circa 3300-3200 B.C.E.; Dreyer, 1998). The other two, Gardiner F4 and F25, frontal lion and donkey leg respectively, are first attested in the First Dynasty in *Horus Narmer's* double tomb B17/18 (Kahl, 1994: p. 491) and the tombs B-o, B-z, and B-y of *Horus Djer* (circa 3000 B.C.E.), *Djet* (circa 2980 B.C.E.), and *Merineith* (circa 2950 B.C.E.; Kahl, 1994: p. 496). These three symbols, therefore, are part of the earliest known set of Egyptian hieroglyphs.

Oil Quality. The material cultural context in which these symbols were found are inscribed tags made from ivory (**Figure 2**) or wood, and ink-painted jars

	<i>h3t</i> before (someone) [preposition] F4 - X1 - Z1
	<i>h3t</i> front, forehead, forepart (of animal), prow (of ship), vanguard (of army) [noun - bod. - ani. - boat] F4 - X1 - Z1
	<i>h3t</i> beginning (of region), foremost, the best of, first F4 - X1 - Z1
	<i>h3t</i> Chief [noun - title] F4 - X1 - Z1
	<i>whm</i> hoof, ungulate [noun - ani.] F25
	<i>whm</i> ass [noun - ani.] F25
	<i>whm</i> repeat, ditto [verb] F25
	<i>whmw</i> / <i>whm</i> Herald, Reporter, legal Registrar, Mediator [noun - title] F25
	<i>phwy</i> reach, attain, finish, end by, attack, contest [verb] F22
	<i>phwy</i> spear, hit, surround, caught [verb] F22
	<i>ph</i> result, end [noun] F22
	<i>phwy</i> hinder parts, hind quarters [noun - bod.] F22
	<i>h3t</i> ape, baboon [noun-an.] E51

Figure 1. A compilation of translations of the Egyptian hieroglyphic symbols Gardiner F4, F22, and F25 from Vygus, 2015. The word for oil, *h3t.t* is derived from *h3t* front/first alluding to the first effluent fraction from the pressing of the substrate fruit containing a higher content of the aromatic fruit oil. Semantically and linguistically related to *h3t.t* is Gardiner E51 *h3t*, one of the Egyptian words for baboon possibly alluding to the fact that males of this animal issue the so-called morning “wahoo” when the Sun first appears.



Figure 2. The left pane shows an ivory oil tag dated to the First Dynasty (circa 3000-2800 B.C.E.) and the reign of *Horus Djet*. The king is depicted followed by his highest official *Sdjk3* presumably inaugurating statues or shrines to an Ibis *hbj* and two Lotuses *z3nj*, planning *h3* (note the corresponding symbol Gardiner M16 below the hole in the right upper corner) the building of a (double walled) cellar *hntj* and staying *aha* at the palace *hwt nbj* of the two mistresses. The oil grade is given as intermediate/repeat F25 (see Results), the quantity is 1100 fruit branches, and the origin of the oil is the south of Egypt. In the right pane, we show an example of first grade hand purification oil designated with Gardiner F4. Cairo Museum, photos by M.S., September 2018.

(**Figure 3**) where they designated the quality of an ancient luxury item, namely oil, shipped to royal and private tombs in Abydos and Saqqara, for example, as grave goods for the afterlife. F4 designated the best, prime, or first (i.e. *h3t.t*,

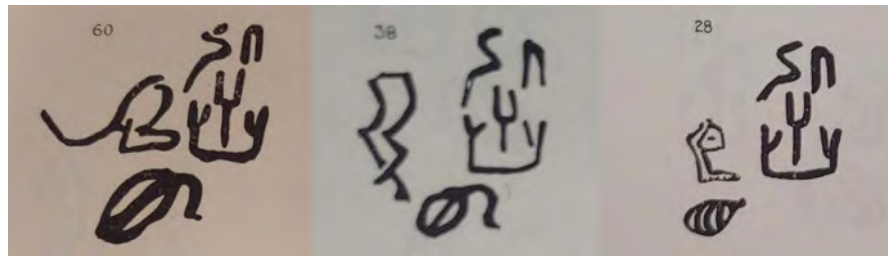


Figure 3. Examples of painted oil designations on jars of type C6 showing Gardiner F4 (right, 28) F22 (left, 60), and either F25 (middle, 38) or an unknown symbol resembling a fissure or lightning. With 38, we show the only example from several sources which closely resembles a hooved leg. The name on all three is the high official of *Horus Djet*, *Sdk3*, and the symbol at the bottom designates an unknown fruit (possibly a tiger-nut or an olive) from which the oil was pressed. Photo montage by M.S. from [Emery, 1954, Fig.’s 140-142](#)).

“front”) effluent fraction of the oil press, F22 designated the last, inferior effluent fraction (i.e. *ph* “end”), and F25 either designated an intermediate fraction or the lowest quality repeat-fraction (i.e. *uhm* “repeat”; [Figure 3](#); see discussion by [Helck, 1987: pp. 171, 173, and 175](#)).

At this point, we would like to interject an alternative interpretation for the symbol previously read as “donkey leg” in this context. The symbol in [Figure 2](#), left pane, has four bends which is not consistent with the three articulations of the leg of an animal, donkey or otherwise. Instead, we think this symbol depicts a crack, split, fissure, or lightning-like figure which might date the first-attested use further back to tombs U-546 and U-j ([Figure 4](#)) where a similar symbol can be seen in association with a half-moon like crescent sign on a jar and two bone tags ([Dreyer, 1998, Tafel/Plate 33, #142-143](#)). It is possible that the crescent stands for *hu*’ (tiger-nut), and that this jar ([Figure 4](#)) contained an intermediate quality of oil from that fruit. This would explain why the symbol is seen on an oil tag attached to jars found in the royal tombs of *Horus Djer*, *Merineith*, and *Horus Djet*. An intermediate quality effluent fraction designated by a “fissure” symbol is more consistent with this context than a poor-quality repeat-press fraction unlikely to be shipped to a royal tomb.

Furthermore, while the symbol occurs side-by-side with F4 in S3504-Q ([Helck, 1987: p. 175](#)), and possibly indicated a mixed fraction of “front” and “intermediate”, F22 almost always occurs in the context of private tombs likely because of its lower quality and supposedly only twice in a royal tomb context ([Helck, 1987: p. 173](#)). The first of these two supposed exceptions is an ebony tablet from the tomb complex of *Horus Djer* showing a full couchant lion next to a building with three baboons. This piece, contra Helck, may not be an oil tag at all since it contains none of the other identifying characteristics typically seen ([Petrie, 1901, Plate Va, 13](#); see also [Figure 20](#) below under **Discussion**). The second supposed exception is a wooden fragment ([Petrie, 1901, Plate Va, 2](#)) on which a lion, front or back, is impossible to make out to the left of the building on the right end of the piece with three squares inside. Instead, the carved



Figure 4. The top pane shows a bone tag from Tomb U-j (circa 3300-3200 B.C.E.). Image: https://upload.wikimedia.org/wikipedia/commons/5/57/Design_of_the_Abydos_token_glyphs_dated_to_3400-3200_BCE.jpg, courtesy of Günther Dreyer; modified. Bottom pane, Class W wavy-handled prehistoric pottery jar discovered in predynastic grave U-546 from *Abydos* cemetery U showing the same crescent and “fissure”. Cairo Museum; photo by R.M.S., June 2019; modified.

symbols may be the commonly seen falcon-hobble-throne triad, which Helck interprets to be a native-*Buto* spelling of “Horus Tree Garden” (Helck, 1987: p. 171-172).

We therefore propose that the “split-symbol” used on oil tags and jars is not the donkey leg F25, but a “fissure”-depicting symbol designating intermediate-quality oil from a fraction in between *ḥ3t.t* (F4, “front”) and *ph* (F22, “end”). This also explains, why the symbol may have been written with varying numbers of bends and logically places it between the frontal and caudal halves of a lion.

The typical content recorded on the ivory tags was an account of significant events during a given year experienced by the reigning king not unlike the entries in the registers of the Royal Annals of Ancient Egypt, and the amount and origin of the oil shipped besides the aforementioned quality designation (Helck, 1987: p. 173). On ink-painted jars, the name of the royal agricultural estate director is given (*Sḏk3* in the three examples in Figure 3) and the fruit is shown from which the oil was pressed.

Baboons. Given the known repertoire of symbols extant during the first dynasty which includes the body of symbols recovered from tomb U-j, the depiction of any animal, let alone a lion, split in two is unique and highly unusual in this time. We therefore asked what may have prompted early scribes to conceive this imagery and use it to write the words for Beginning, Middle, and End. A key finding in this regard is a symbolic synonym for *h3t.t* depicting a baboon which also means “adoration” (Figure 1, bottom). The baboon can be seen on a limestone slab found in the First Dynasty mastaba tomb S3507 in the sarcophagus chamber of *Herneith* (Figure 5) where it is shown facing the approaching figure of the king of lower Egypt. In the same tomb, couchant lions are depicted in raised relief on the lintel over the sarcophagus chamber (Figure 6) demonstrating the close association between these two animals perceived by these early dynastic tomb designers. In later depictions, the baboon is usually shown facing east, towards the Sun, and was believed to be a manifestation of *Thoth*. Baboons are well known for their loud morning call² when they issue “contest *wahoos*” (Fischer et al., 2002: p. 1465).

Edfu’s Memphite Creation Myth. It is this behavior which may have inspired an aspect of the Memphite creation myth where baboons personified the seven uttered words (*d3jsw*) of *Ptah* in the act of creating the world and the first seat of the gods on Earth from the waters of the primordial flood (Kurth et al., 2014, pp. 23-26; Chassinat, 2014: pp. 14-15, 18). The seven counterparts of the *d3jsw* in the myth are the seven *hnmw*, the potter spirits who shape the words into beings from clay. The western half of the north frieze on the inner girdle wall of the *Edfu* temple has been translated into German by the *Edfu* Project (Kurth et al., 2014: p. 322/Émile Chassinat 181, 11) and here, we provide the English translation:

This is a faithful reproduction of the text which Thoth prepared according to the speech of the D3jsw of Mehit-Wrt and which one calls “specification of the places of the first epoch”.

This passage clarifies that the text inscribed on the *Edfu* Temple comes from an older source and identifies the *d3jsw* as manifestations of the Great Flood (*Mehit-wrt*), deified as the great cow who appears as *Hathor* in the New Kingdom Myth of the Destruction of Mankind also known as the Myth of the Heavenly Cow. In this myth, *Hathor* is sent to Earth by the vengeful Sun *Re* to exact his revenge against an irreverent mankind (Guilhous, 2010: p. 2). This destruction forms the pretext from which the world gets reorganized and eventually repopulated during the creative act performed by *Ptah* which separates *Re*’s dominion in the sky from that of humans on Earth but maintains a bridge between them with the creation of the primordial mound on which *Re*’s Earthly emissary *Horus* settles and in whose manifestation the *Horus* kings rule over Egypt.

The key idea we want to convey here is that according to the *Edfu* texts the seven baboons represented the first seven words of creation as the *d3jsw* and the material substance from which these words were made “on the lips of *Ptah*” so to

²For a sample recording see this YouTube video at URL: <https://youtu.be/za839cpwUh0>.



Figure 5. Limestone slab showing a baboon facing approaching king figures from the mastaba tomb of *Herneith*, S3507 at *Saqqara*. Photo by M.S. from Emery, 1954, Plate 97.



Figure 6. Lintel from the sarcophagus chamber of the mastaba tomb of *Herneith*, S3507 at *Saqqara* showing a row of couchant lions. Photo by M.S. from Emery, 1954, Plate 96.

speak was the primordial flood water which drowned the previous rebellion of man against the Sun. This flood was named *Mehit*, the same name given to the lioness guarding the provisional administrative tent of the first kings of Egypt, which we previously located at Giza (Seyfzadeh et al., 2017). The identical connotational link exists between the five English words sphinx, water, announcing speech, ritual chisel, and flood, which all can translate into the Egyptian words *ḥw* (Vygus, 2015: pp. 2215-2216) and *ḥwḥw* (Vygus, 2015: p. 2217). From this semantic family, we have previously argued, stems another Egyptian, not Canaanite (contra Selim Hassan) name of the Great Sphinx: *Hwrn* or *Hwrwn/Haurun/Hwrna*, etc., as seen on New Kingdom votive steles and the Inventory Stele (Seyfzadeh & Schoch, 2018: pp. 106-109). This name of the Sphinx, *Hw-Rn*, can thus be interpreted to refer to a divine utterance of *Ptah* which became physically manifested as the image of a lion or lioness chiseled from the living rock which emerged from the Great Flood in the same way as the seven words of creation became baboons.

These seven *d3jsw* are individually named and depicted together with the two *šbtjw* (see below) on the upper third register of the western inner girdle wall of the *Edfu* Temple (Figure 7). Their epithets/names are (from top right): *The Hurrying One*, *The Bull*, *The Falcon*, *The Speedy One*, *The Perfect Front*, *The Equipped End*, *The Lord of the Red Ones* (Kurth et al., 2014: p. 296). In Figure 8, we show a magnified image of the last three *d3jsw* with their epithets/names inscribed in front of their heads; all three are depicted as baboons both in relief and via the context symbol Gardiner E35 (sitting baboon). *The Perfect Front* (*nfr ḥ3t*) shows the frontal half of an ape or lion, the *Equipped End* (*aprw ph*) shows Gardiner F22, and the *Lord of the Red Ones* (*nb dšrw*) is an allusion to the blood-tinged faces of feasting lions as well as the appeased wrathful *Hathor* in the Myth of the Destruction of Mankind, who drinks red-colored beer and falls asleep taking a rest from her mission of completely destroying humankind (for the various meanings of *dšrw* see Vygus, 2015: p. 280).

Of help in this regard are also utterances by the seven *d3jsw* inscribed on the opposite side of the temple into the inner face of the eastern wall at the third register. There, the seventh and last *d3jsw Mnqb*³ is quoted as saying (Kurth et al., 2014: p. 583/Émile Chassinat 322, 13; our English translation from German):

We have provided the House of Life in/with glorifying words. [ḥtm.n pr 'nh m dšrw]

The House of Life was a later Egyptian word for library, initially representing the palatial subterranean hall where life-provisions were given to the king and his closest associates (Helck, 1987: p. 236). This interpretation that the House of Life was also a library is justified because the sixth *d3jsw Baq-baq* whose pronouncement immediately precedes that of *Mnqb*, refers to the “Book House” *pr md3t*.

Kurth et al.’s interpretation of *dšrw* as “glorifying words” is based on a context they believe is developed by the pronouncements of the fourth through sixth *d3jsw*’s referring to praising words (*b3w*; see footnote 4 in Kurth et al.’s citation above). A closer look at these pronouncements of the last four of the seven *d3jsw* inscribed on this side of the temple however reveals that the first two deal with *how* the gods are being exalted, i.e. with written words of praise (*b3w*), while the last two deal with *where* this occurs (Kurth et al., 2014: pp. 582-583/Émile Chassinat 322, 8-13). We therefore reason that *m dšrw* was not meant to refer to the written words of praise and glory themselves, but their location. If *dšrw* in both these passages of the *Edfu* Texts was in fact meant to allude to lions, then while the prepositional phrase *m dšrw* here was meant to be literally read as “in the red ones”, it was actually meant to be understood as “in the lions”. Evidence that this could be the intended meaning of *m dšrw* is that *b3w* can also mean leopards (*b3*: leopard; Vygus, 2015: p. 331), an allusion to the leopard hide worn by the *sm* priests and *Seshat*, the patron goddess of libraries in ancient Egypt⁴. In other

³Here presumably his name, not his epithet.

⁴The dotted skin of leopards was reminiscent of the starry sky where the souls were believed to dwell.

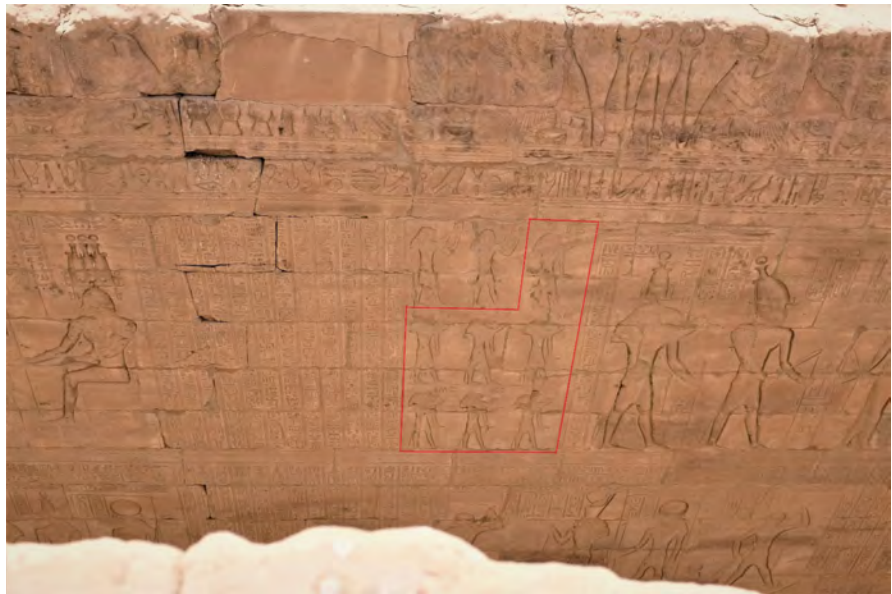


Figure 7. The seven *dj3jsw* (red frame) and the two *šbtjw*. The former are the seven personified words of creation in the Memphite creation story and are manifested as baboons. Their names are written in front of their heads. From the inner western girdle wall of the *Edfu* Temple. Photo by R.M.S., May 2019; modified.

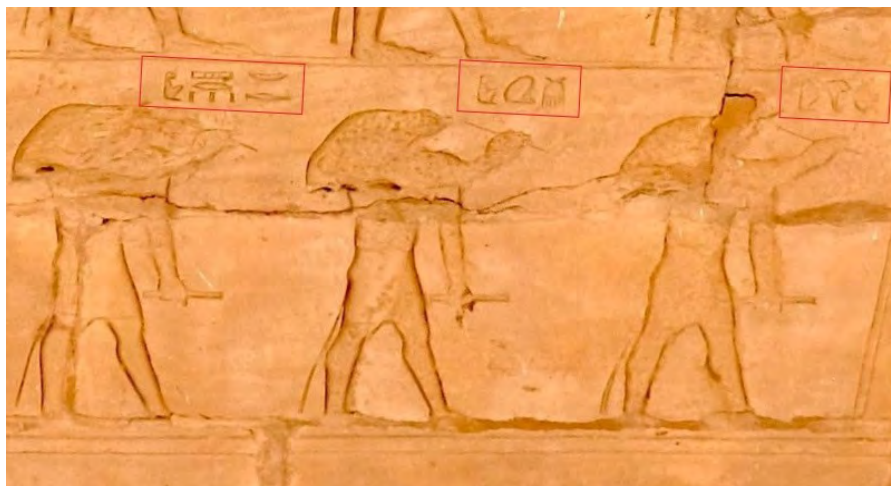


Figure 8. The three of seven personified creation words (*dj3jsw*) associated with the split lion iconography with their hieroglyphic epithets/names framed in red (from right to left): *Nfr h3t.t* The Perfect Front, *3prw ph* The Equipped End, and *Nb dšrw* The Lord of the Red Ones. Photo by R.M.S., May 2019; modified.

words, the *dj3jsw* quoted in this passage of the *Edfu* texts appear to invoke the prehistoric shaman magician and the early historic patron of writing *Seshat* with *b3w* and lions with *dšrw* using *Heka*, the magical language of phonetically activating magical formulas using speech which appears to mean something different or more mundane. At a deeper level of intended meaning therefore, it is possible that in these last four pronouncements of the seven *dj3jsw* magicians and scribes were incidentally being called into existence in order to operate in-

side libraries to be guarded by, or exist within, red lions.

Evidence of this association between “red” and a subterranean location is the fact that the “Red House” *pr dšr* was the royal treasury in the cellar of the first known palace in the north at Buto (*P Hr msn* established by *Horus Djer*) where the House of Life was later also situated (by the time of *Horus Den*) all being part of the *pr nswt*, the king’s private, and presumably cooler and more secure, basement sanctuary within the palace *pr ʿ3* (Helck, 1987: p. 228). Some of the recessed walls of the subterranean burial chambers of *Horus Djer* and *Horus Djet*, for example, were also painted in red (Petrie, 1901: p. 8). Another association between “red”, “writing”, the double lion *Aker* who guards the entry and exit of the netherworld (*dw3t*), lions, and the Great Sphinx is the library patron goddess *Seshat*-associated title called *Director of the Rwt Women* (*rwt* = gateway, *rwtj* is a later synonym for the double-lion *Aker*), a title possibly referring to the facility where red paint was produced (Helck, 1987: p. 264) and used, for example, to color reliefs, to write on papyrus, and to paint the Great Sphinx’s face and possibly the entire body.

When Giovanni Battista Caviglia (1770-1845) cleared the area between the paws of the Great Sphinx in his 1816-1819 excavation campaign, he discovered a small temple with three steles by *Thutmose IV* (i.e. the Dream Stele) and *Ramses II*, a small lion statue, fragments of lion statues and a sphinx, and beard and *uraeus* fragments which had fallen off the Sphinx. All of these, including the temple wall, were painted in red (Hassan, 1949: p. 11). In addition, even the masonry blocks used to repair the monument were apparently stained in red, an unusual treatment in ancient Egypt’s monuments (Mariette, 1857: p. 95).⁵ This cumulative evidence establishes the necessary context for the idea that *dšrw* is an allusion or epithet which was meant to refer to lions and that the *d3jsw* *Lord of the Red Ones* (*nb dšrw*) was their master. There is even the possibility of a word play alluding to a lion split in half by a fissure. When separated into two words, *dš rw* becomes a subordinated clause with an active participle predicate literally translating to “he who/that which separates the lion” (Vygus, 2015: pp. 282, 393). Then, *h̄tm.n pr ʿnh m dš rw* should be understood as “we have provided the House of Life in *that which separates the lion*”, i.e. the space which splits the lion, like, for example, the major fissure through the Great Sphinx (see below in this section) at the bottom of which Auguste Mariette in fact discovered a chamber (see **Discussion** Re: “Hall of Records”).

Evidently, ancient Egyptian theologians viewed the iconography of a split lion not only as part of the exclusive linguistic set of symbols used to describe the story of Egypt’s creation after its destruction by an epic flood instigated by the Sun, but part of the very first seven words of the recreation of the world after this epic disaster. To underscore the significance of this choice, the correspond-

⁵Quote from Mariette in its original French: *Les fouilles ont montré que tous les blocs de la maçonnerie avec laquelle le corps de l’animal symbolique a été façonné, sont enduits d’un badigeon rouge pâle, de peu de consistance et tel qu’on n’en trouve jamais sur les monuments égyptiens de la bonne époque.*

ing analogy in the Abrahamic religious creation story might be considered to be the creations by God in the first seven days, i.e. light, the sky, the Earth and plants, the heavenly bodies, birds and fish, animals and humans, and rest.

We conclude that the concept of the split lion found its way both into the recording of economic transactions and theological myth, two different cultural aspects of a civilized people who used symbols to write, i.e. record language. The question we therefore asked is from where the notion of a split lion came and how this notion was able to so profoundly influence such diverse expressions of Egyptian culture.

Major Fissure through the Great Sphinx. The American Research Center in Egypt (A.R.C.E.) conducted a survey of the Sphinx and its temples (The Sphinx Project) from 1979 to 1983. This involved establishing and orienting a grid and using photogrammetry to measure elevations down to individual rock layers. Among the findings was the stratigraphic definition of an easily observable feature: A wide, >2-meter gap traversing the caudal portion of the Great Sphinx down to the ditch and extending both northwest and southeast across to the north and south enclosure walls and onto the causeway of the pyramid of *Khafre* (**Figure 9**; Lehner, 1991, 1992: p. 12). This composite geological defect composed of a series of converging fissures is most pronounced in the middle member of the Mokattam Formation, also known as Member II, but extends through the lower Member I (Lehner, 1991: p. 203). The gap in the back of the Sphinx, officially explored in late 1853 by Auguste Mariette though likely helped by much earlier accounts and unpublished excavation reports, is still visible on an early photo taken during the 1926-1935 excavations by Émile Baraize (**Figure 10**), but was soon cemented over by his restoration team (Lehner, 1991: p. 48). The traces of the fissure are still visible today both across the monument, the ditch, and the enclosure (**Figures 11-14**). This fissure extends to a depth of at least 5 meters into the bedrock of the ditch and enclosure wall (Lehner, 1991: p. 159); the weak zone through which the fissure runs most likely existed before the monument was carved from the rock, and at some point after the initial monument was carved, the fissure opened and/or eroded out. A possible hint of it is noticeable on a New Kingdom stele found near the Sphinx (Hassan, 1953: p. 71) dedicated to *Thutmose III*, at a time when the monument had not yet been excavated and restored by his grandson *Thutmose IV* (**Figure 15**). It is possible that the fissure was meant to be depicted on this stele, but it could also be an accidental scratch on the stele. The symbolic fan of $\dot{S}w$, the air (or $\dot{s}wt$, the shadow), seems to be inserted into the same place on the back of the Sphinx where the fissure is located.

As is typical in Egyptian relief, the fan is in the same plane as the profile of the Sphinx but could also possibly be imitating the actual physical widening of the fissure as it courses into a deeper plane behind the Sphinx from this perspective and expands into a fan-shaped crevice as it traverses the ditch and enclosure wall on the north (**Figure 14**). Lehner found ancient cultural deposits (e.g. pottery shards) in this crevice (Lehner, 1991: p. 158-159) and speculated that the entire

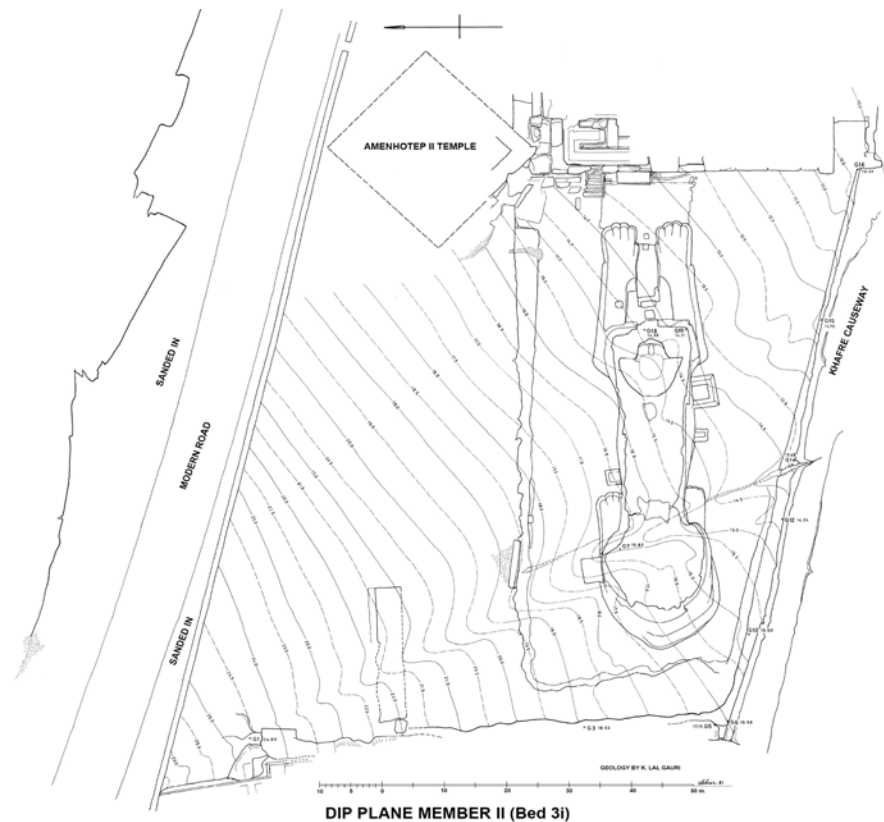


Figure 9. Middle Member of the Mokattam Formation, elevations in 0.5-meter segments showing the position of the major fissure through the body of the Sphinx, the ditch and the enclosure walls relative to the contour of the limestone’s layered sediment as it slopes down from northwest (lower left) to southeast (upper right). The fissure coincides with the contour shift. Drawing courtesy of Mark Lehner. “Drawing d-sa-005 from Egypt/Giza/Khafre Causeway”. (2017) In *ARCE Sphinx Project 1979-1983 Archive*. Mark Lehner, Megan Flowers, Rebekah Miracle (Eds.). Released: 2017-12-23. Open Context. <<http://opencontext.org/media/52204672-a08a-4ef1-915c-558689809227>> ARK (Archive): <https://n2t.net/ark:/28722/k29s2043b>.

fissure explains why the builders had to unnaturally extend the body of the Sphinx relative to the size of the head (Lehner, 1991: p. 409) suggesting the fissure existed before the creation of the monument. This would be a way to account for the disproportionately small head relative to the body of the Great Sphinx; an alternative view is that the current head on the Sphinx is not the original head (the original, subsequently weathered, head was re-carved and thus is too small for the body; see West and Schoch in NBC, 1993; Schoch & Bauval, 2017; Seyfzadeh et al., 2017). The most important piece of evidence presented by Lehner, however, is his observation that the interior of the fissure walls inside the body of the Sphinx appear worked, i.e. squared, suggesting ancient repair attempts (Lehner, 1991: p. 203).

3. Discussion

In summary, we have identified a significant cultural role for three symbols which date to the earliest phase of writing in ancient Egypt: The frontal and



Figure 10. Southwest looking north (top) and northeast looking southwest (bottom) views of the Great Sphinx taken before and during the early phase of Émile Baraize's excavation campaign (1926-1935). The major fissure through the waist as shown in these two photographs is still open before repairs during which it was cemented over. (Top Photo: A postcard published by N. and G. Chrissanthou, Alexandria and Cairo, circa late 1920s or early 1930s. Bottom Photo: Photograph circa 1880 attributed to Pascal Sébah (1823-1886; see Woodward, 2003, for a discussion of the Sébah family business). Postcard and photograph from the collection of Robert Schoch).

caudal lion symbols and a split or crack-like image likely representing the dividing line between these two halves. These symbols prominently appear in proto-dynastic and early dynastic labels used to designate the quality of oil. The frontal and caudal lion halves also feature prominently in the Memphite creation myth recorded on the inner western wall of the *Edfu* Temple. One way to explain the creation of these unusual symbols is that their prehistoric inventors witnessed a physical monument in the shape of a lion split into two halves by a fissure, such as is seen in the core body, ditch, and enclosure of the Great Sphinx at Giza. The sight of this awe-inspiring lion(ess) could explain why the iconography pervaded diverse aspects of Egyptian culture such as economic record-keeping and theology.



Figure 11. The repaired major fissure on the south side of the Great Sphinx's waist can be seen to course through the hind paw and on through the ditch. Photo by M.S., June 2019.



Figure 12. The southern extent of the major fissure through the enclosure wall viewed from the northwest along its course through the ditch floor. Modern masonry repairs have covered the fissure. Photo by M.S., June 2019.



Figure 13. The repaired (beginning with Baraize, circa 1926) major fissure through the left waist of the Sphinx as seen from the north. Photo by M.S., June 2019.

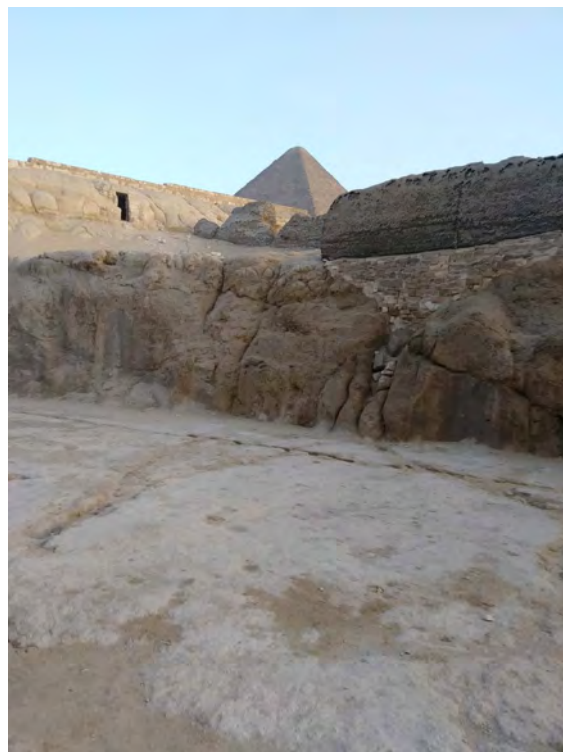


Figure 14. The northern extent of the fissure coursing through the ditch and enclosure wall as it broadens into a fan-shaped wider crevice. Photo by M.S., June 2019.

Dating the Origin of the Creation Myth. While the economic use of these symbols evidently pre-dates the Old Kingdom and the time of *Khafre*, the formulation of the creation myth before this time needs further evidence. Even though the *Edfu* texts were inscribed during Egypt's Ptolemaic dynasty, they



Figure 15. Stela Number 7, dedicated to *Thutmose III*, paying a royal visit to the Great Sphinx, probably while hunting in the area. A light-colored line appears to course through the waist of the Sphinx seemingly imitating the major fissure though an accidental scratch cannot be ruled out. Into the defect is inserted the fan *Šwt*, the shadow or divine spirit as if personifying the fissure through the Sphinx and crevice on the north side of the enclosure (**Figure 14**). Cairo Museum; photo by R.M.S., June 2019; modified.

probably stem from earlier documents, since several passages in the texts state that this is so. But how old could these original source texts be? The Myth of *Horus* narrated on the second register of the inner walls of the *Edfu* Temple for example, features an epic victory of good versus evil in the killing scene where *Horus* the Son of *Isis* impales *Seth* in the form of a red Hippopotamus (Fairman, 1935: p. 27). The concept of such an encounter can be traced back to pre-historic *Hierakonpolis*, where the figurines of a falcon and a hippopotamus were found buried together inside a post-hole as a foundation deposit in the southeast corner of a pillared hall (structure 7) in the elite cemetery HK-6 (Droux & Friedman, 2007: pp. 7-9). This structures dates to the mid-4th Millennium B.C.E. The southeast corner hints that the two contenders were imagined dwelling in that area of the horizon where Sirius, Venus, and Mercury at times hover (Krauss, 1997: pp. 233-234; 235-238).

Further evidence of a much older date of the creation myth may be detected in the architecture of the *Osireion* at *Abydos*. The *Osireion* is a still enigmatic temple featuring a central island surrounded by a deep moat onto which two sets of steps emerge. The center of the island features two four-cornered depressions

and two rows of five granite pillars with four more sandstone pilasters ostensibly completing two rows of seven columns or supports on which granite blocks were placed (Figure 16 and Figure 17). The moat is surrounded by two sets of eight cells with one central cell on the eastern side (Figure 16). The temple is commonly interpreted to be a symbolic tomb of Osiris who was intensely worshipped in this area since at least the Old Kingdom in his identity of the Foremost of the Westerners (*hntj jmntjw*). The *Osireion* is tentatively dated to the reign of Seti I (second king, 19th Dynasty, circa 1290-1279 B.C.E.), whose votive temple is immediately west and whose *temenos* wall surrounds the *Osireion*. The most compelling piece of evidence dating at least the *Osireion*'s sandstone enclosure walls of the temple to Seti I is a granite dovetail stone block connector bearing his cartouche found *in situ* embedded into the masonry of the northwest corner by Henri Frankfort (Hamilton, 2018: pp. 62-65). The central island made of sandstone, with its granite pillars on top, physically connects to the enclosure wall by thrust beams of the same type of sandstone thus creating a speculative temporal link between it and the placement of this dovetail in the 19th Dynasty (Hamilton, 2018: p. 80). The temple foundation's depth, on the other hand, the source of the water of the moat, and the rate of the rising water level over time alongside the Nile leave doubt about when the island and moat were originally made even if the enclosure may be dated to the New Kingdom.

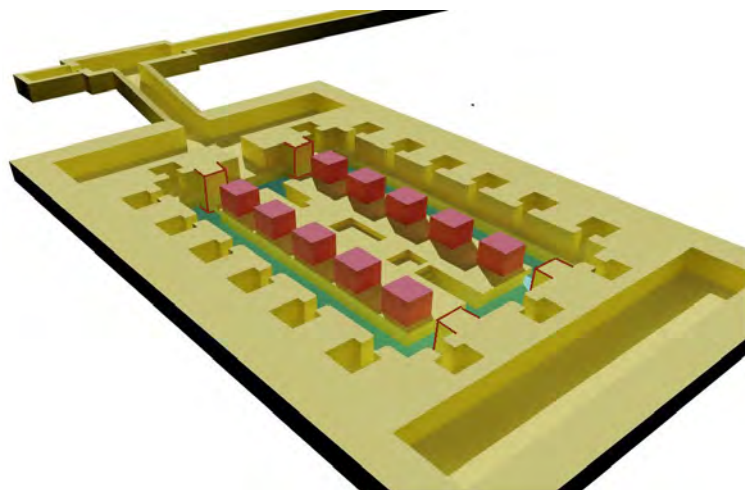


Figure 16. Graphic reconstruction of the *Osireion* looking west from the east corner of the Central Hall. At the top are shown the entrance corridor onto whose interior west and east walls are inscribed the Book of Gates and the Book of Caves, respectively. From Murray's Hall the sloping passage leads into the main temple, through the First Transversal Hall (Hamilton, 2018). The temple walls are made from hewn blocks of sandstone and limestone. On the central island, granite pillars are highlighted in coral color. The water-filled surrounding moat is featured in blue. The sandstone pilasters/piers are framed in coral to indicate that they may have been part of an architectural design theme inspired by the seven *d3jsw* and *hnmw* in the creation story of the Memphite Theology (see Discussion). Graphic design courtesy of Keith Hamilton; modified with permission.



Figure 17. Top: *Osireion*, approximate south view looking north. Bottom: Graphic simulation of a vertical axial view of the *Osireion* as seen from the southeast looking northwest. This view gives a sense of the depth of the temple foundation including the observed (east) and predicted (west) horizontal thrust beams anchoring the temple walls to the island, and visualizes the stairs leading from the moat onto the island platform with its two quadrangular depressions possibly representing the two *šbtjw, w3j* / The Far and *‘3* / The Great (see **Discussion**). The northwest row of granite pillars is highlighted in coral color and the sandstone pilasters/piers (outlined in coral) adjacent to these complete an apparent set of seven total pillars. Photo by R.M.S., June 2019; graphic design courtesy of Keith Hamilton; modified with permission.

We would like to propose a new interpretation of the idea behind the design of the *Osireion*: The two sets of seven pillars on the north and south side of the temple represent, respectively, the seven *d3jsw* and the seven *hnmw* of the *Edfu* creation story symbolically having emerged from the waters of the moat representing *Mehit-wrt* the Great Flood on the steps to the island in the moment of utterance. *The Perfect Front* and *The Equipped End* could then be represented by the sandstone pilasters on the northeast and northwest sides. The two depressions on the island would represent “The Far” (*w3j*) and “The Great” (*‘3*), i.e. the two *šbtjw*, who personified the two concepts of a distant creative thought by *Ptah* and this idea then brought into focus during the act of conceiving the world (Kurth et al., 2014: pp. 312, 323/Émile Chassinat 177, 7-9; 181, 13-16). In the creation story written on the frieze of the western inner girdle wall of *Edfu*, the *šbtjw* weave the net of reeds into which *Horus* lands to establish the seat of *Re*’s

representative on Earth (Kurth et al., 2014: p. 23/Émile Chassinat 14, 14-15, 1; translated by us into English from German):

The Land is still pervaded by the primordial sea when his majesty reaches the Far and the Great at the place of creation and the first reeds emerge from it at that place where the two gods tie the reeds in the flood waters so that the wing of the circling one can visualize. When Horus arrives, he is carried by the Nebit Reeds and thus comes into existence Edfu and the seat of the throne of Horus.

The *Osireion* can thus be viewed as a megalithic, concrete representation of the conversion of divine creative thinking, i.e. the act of conceiving a distant idea and bringing it forward into focus by catching it with a woven net, into uttered words and the conversion of these words, in turn, into the substance of the world, stone in this case resting on a firm foundation, the primordial mound. In the Memphite creation story, this mound is personified by *Tatennen* and is represented, we propose, by the central island of the *Osireion*, floating in the middle of the primeval flood waters represented by the water in the moat. The seventeen cells surrounding the central island and moat could represent the *Ogdoad* and the *Ennead* (8 + 9), the two pantheons of the *Hermopolitean* and *Heliopolitean* cosmogony of ancient Egyptian theology governed by *Thoth* and *Re*, respectively. The architecture of this temple, therefore, appears to symbolically express the elements of the *Edfu* creation story thus dating it to at least the New Kingdom and maybe much earlier depending on the still debated provenance of the *Osireion's* foundation and granite pillars.

Conspicuously, the quasi-square Sphinx Temple, like the *Osireion*, has fourteen pillars in its central court divided into two rows of six bridged on each north and south side by a central pillar on the north-south axis of the temple (Figure 18). Ricke points out that ancient plundering of the Sphinx Temple, its unfinished state, and the complete lack of evidence of a priestly Sphinx cult in any of Giza's tombs make possible a wide range of interpretations of the meaning of the Great Sphinx and Sphinx Temple (Ricke, 1970: p. 32). Here, we would like to offer a variant opinion. *Khufu's* eldest son *Kawab* carried the priestly title of "Arm of *Dw3w*" (see tomb of *Meresankh* III), the personified day-gate (i.e. "Today") of *Aker*⁶, the double-headed lion above which the *dw3t* extends. This suggests to us, that a Sphinx-related cult in fact existed during the time of *Khufu*, before *Khafre*, and hints of it have simply been missed due to the prevailing opinion then and now that the Sphinx was made by *Khafre*, in part prompted by an only partially preserved, ambiguous line of text on the Dream Stele (Ricke, 1970: p 32; see also discussion in Schoch & Bauval, 2017). In other words, the east-facing Sphinx, or a lion or lioness sculpture before it was re-carved, was "Today" and a hypothetical counterpart was the personified night-gate *Yesterday* (*sf*).

⁶We consider a possible alternative explanation that the two heads of *Aker* represented the Morning and Evening Star based on Rolf Krauss's astronomical analysis of the Pyramid Texts that *nꜥr dw3w/j* or *sb3 dw3w/j* referred to Venus in its east and west horizontal manifestations (Krauss, 1997: pp. 216-234).



Figure 18. North view of the Sphinx Temple looking south along the central north-south axis with the tops of the three north-side pillars seen head-on in the front. Photo by M.S., June 2019.

Ricke interprets the bilateral symmetry of the temple along the east-west axis as evidence that it was meant to monumentalize the path of the Sun in its transient manifestation as *Kheprj* at sunrise in the east, *Re* at noon in the south, and *Atum* at sunset in the west. Thus, the Sphinx Temple was meant to monumentalize the Sun cult and the 24 square pillars (4×6) lining the perimeter of the court to be that of the 24 hours of the day and night symbolically dividing the circular path of the Sun around the world, and the two pairs of remaining pillars, east and west of this perimeter symbolized the arms and legs of *Nut*, the night sky (Ricke, 1970: p. 36).

With respect to the central court, Ricke speculates that since there was not enough room, only ten emplacements for statues were made next to pillars, five west and five east. He observes that the statues were of different heights. To make up for the two-statue short-fall from twelve, the two terminal emplacements on the north-south temple axis were supposedly made larger to hold a broader statue which may have represented two entities (Ricke, 1970: pp. 37-38). We think this is the weakest aspect of Ricke's interpretation. The central court has fourteen pillars, as does the *Osireion* when its sandstone pilasters are included, and ten statue emplacements matching the number of granite pillars (i.e. ten) of these fourteen. At the north end, a water channel feeds a basin, possibly a symbol of the watery origin of what the pillars represent. We take the number of fourteen pillars at face value and think that they represent the seven *d3jsw* and the seven *hnmw* which would explain why each pillar had a different height, since each of these fourteen creative forces of nature was uniquely named. Thus, the central court of the Sphinx Temple fulfilled the same function as the central island of the *Osireion*, where three of ten granite pillars were made from two

pieces and the four pilasters were made from sandstone instead of granite (Hamilton, 2018: pp. 54, 57): It was the symbolic place of the origin of the world made from the unique creation words and their material manifestations in attendance. The primordial watery substance from which they were made, the Great Flood, was represented by *Mehit*, the lioness monument adjacent to the Sphinx Temple in our model, later remodeled into the Great Sphinx. Is there any evidence to support this theory?

When viewed from the south, for example from the roof of the Valley Temple, the Great Sphinx might have appeared to look over three pillars seen head-on from this perspective (Figure 19). This imagery symbolically is again reminiscent of the three lion-related *d3jsw* and such an iconographic image was found by Petrie in the tomb of *Horus Djer* at Abydos carved into an ebony-wood tablet (Petrie, 1901, Pl. Va, Number 13; Figure 20). This wooden tablet shows an unusually elongated, couchant lion, possibly split into frontal and caudal halves, next to a square enclosure within which a row of three baboons are sitting. Judging by their heads and faces, Petrie's contention that these are captives is less likely.

The presence of baboons on this tablet is yet another piece of evidence that the early dynastic Egyptians viewed the lion monument, which we think already then existed at Giza, as a mythical being associated with creation and the great flood. In this context, the burial of seven young lions in the northeast most of *Horus Aha's (Mena)* subsidiary graves at B16 in *Umm El-Qa'ab*, further supports the significance of lions and the number seven in the earliest phase of

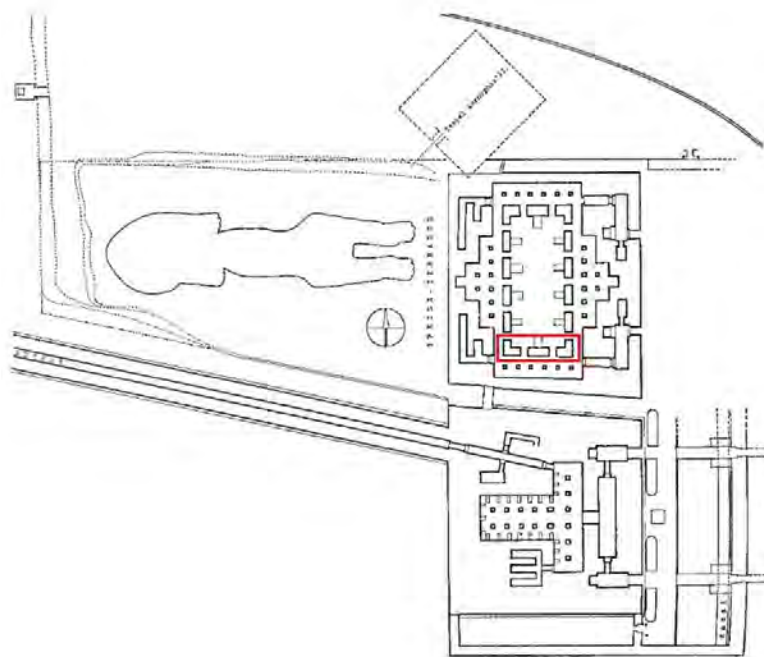


Figure 19. The Sphinx complex and Valley Temple viewed along the south-to-north axis highlighting the three southernmost pillars inside the court of the Sphinx Temple. Drawing based on Ricke, 1970: p. 5; modified.

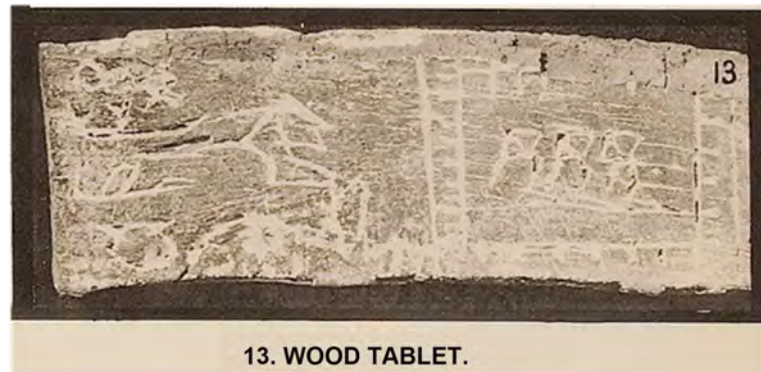


Figure 20. Ebony tablet from the tomb of *Horus Djer* discovered by Petrie showing an elongated couchant lion, possibly in two halves, and a rectangular structure with three baboon-like animals sitting in profile. Photo by M.S. from Petrie, 1901, Plate Va, Number 13.

dynastic Egypt (Bestock, 2009: p. 29). Archeological proof of a physical association between baboons and the Great Sphinx temple complex comes from Uvo Hölscher's excavation in front of the Valley Temple. There, apparently fallen to the ground of its south entry (the Hathor gate), he found a colossal statue of an ape made from black granite, which once towered above this portal from a recessed east-facing niche high above the entry likely matched by another like it in a similar niche over the north entry, also known as the Baset Gate (Hölscher et al., 1912: p. 42). Both entrées were probably flanked by pairs of likewise colossal Sphinxes again demonstrating the close association between baboons and lions (Hölscher et al., 1912: p. 15; Blatt VIII).

The Fissure. What might have caused this fissure and the elevation contour shift of the rock layers sloping down traversing the area of the Great Sphinx? One possibility is a seismic event which might explain the contour shift of the sedimentary rock thereby weakening it and leading to gap formation. Another possibility is mentioned in the Inventory Stele which tells the story of how *Khufu* inspected the Sphinx and repaired it while examining a nearby Sycamore tree damaged by lightning (Seyfzadeh & Schoch, 2018). Might this same event have damaged the Sphinx by blowing off its *nemes* tail and cracking open the waist, ditch, and enclosure? The Giza Plateau near the pyramid of *Khafre* and to its east shows several areas of vitrification including grooves and crevices with a vitrified lining and interior (Schoch, 2016; Catherine Ulisse, Robert Schoch, and Mohamed Ibrahim, personal observations). In the Osiris shaft's second level, there are possibly vitrified veins of reddish-to-black rock extending an estimated ten meters or more deep into the limestone (Robert Schoch and Catherine Ulisse, personal observations). The overall pattern of this ostensible rock melting and glass formation appears to run in a west-to-east (or east-to-west) orientation from pyramid to Sphinx suggesting that this was a single impact event of extremely high heat (tens of thousands of degrees) such as could be modelled with a solar plasma beam powerful enough to be able to pierce the Earth's electro-

magnetic shield and strike the surface of Earth and also penetrate deeply beneath.

No such event, i.e. a Super Solar Proton Event (Super SPE), Coronal Mass Ejection, or some other form of a major solar outburst, is known to have occurred on Earth in the last 10,000 years. However, radioactive atmospheric isotope data (^{14}C and ^{10}Be), corresponding temperature patterns, atmospheric ionization proxies, contemporary megafauna extinctions, contemporary petroglyphs found around the world imitating the hypothetical shapes of such massive ion strikes (van der Sluijs & Peratt, 2010: pp. 39-41) through the atmosphere⁷, and mythical lore, such as the Egyptian Myth of the Destruction of Mankind telling the story of a vengeful Sun on a mission to punish mankind, hint that such violent solar storms of various intensity may have hit Earth at the beginning (circa 10900-10800 B.C.E.) and end (circa 9700 B.C.E.) of the Younger Dryas (LaViolette, 2011: pp. 305, 309; Schoch, 2012: pp. 87-92, 173-179), as well as repeatedly during this period, culminating in world-wide ocean level rises and epic flooding just as told by the many ancient flood myths of the world.

In order to test this theory, we propose that rock samples should be obtained from the interior of the major fissure within the body of the Sphinx and its extensions across the ditch and enclosure, as well as the Osiris Shaft and the various apparently vitrified surface features higher up towards the pyramid of *Khafre*, and geologically tested for evidence of such vitrification. According to Lechner, the interior surfaces of the fissure in the Sphinx's body did not appear weathered and were possibly worked (thus removing any earlier weathering), but the examination was hampered by repair debris from Émile Baraize's restoration (Lechner, 1991: pp. 48, 203).

Male or Female Lion Monument. Previously, we proposed that the first kings of Egypt, operated a scribing facility and archive at Giza protected by a monumental lioness called *Mehit*/The Northern One (Seyfzadeh et al., 2017). The evidence for this comes from a sealing associated with *Horus Djer* where the facility is marked with the *st3w* symbol (suggesting *Ro-st3w*, i.e. Mouth of Caves, a.k.a. the Giza plateau) and the fact that the scribes' names associated with this facility are written in the now-lost pictographic script of *Buto* indicating that they came from the north. Furthermore, the same sealing contains the symbol for north and the lioness *Mehit* is facing in the direction of the symbol for east hinting at its equinoctial orientation. The bent-rod symbol in the back of the lioness unequivocally identifies her in an inscription dated to the later Fourth Dynasty high official of *Khufu*, *Wepemnefret*, where she is mentioned by name on his mastaba's slab stele and her gender appears unequivocally female both in the depiction and because her name ends with the letter for the sound "t", the usual form of female gender identification in Semitic languages. The tandem title "The King's Chief Librarian (Scribe) and Guardian of the Royal Archives of *Mehit*" is topographically grouped on the stele with a priestly title associated with a ⁷~125 times as powerful as the 1956 Solar Proton Event based on ^{14}C atmospheric generation (LaViolette, 2011: p. 310).

royal library under the patronage of *Seshat*, Egypt's goddess of writing and astronomy first mentioned during the reign of *Horus Djer* on the Palermo Stone segment of the Royal Annals of Ancient Egypt. We therefore concluded that the prehistoric monument from which the Great Sphinx was later made was already a 7000- to 8000-year old weathered lioness when an Old Kingdom ruler first laid hands on it. It is possible that weathering had obscured the head and neck features leading to ambivalent gender identification by various observers.

The evidence we present in this paper suggests that the lion's frontal half shown in at least some of the oil and wooden tags we propose to have been inspired by a stony lion monument at Giza may be that of a male lion is at odds with our previous proposal that the monument represented the female *Mehit*. However, the phonetic value of this symbol was in fact female, i.e. *ḥ3t.t* (Front/Oil), the precious initial, therefore *front* fraction, fluid pressed from the substrate fruit. In other words, while the carvings of the lion's front into ivory and wood, at times in the extant record from the First Dynasty, may appear male, the word encoded by it was definitively female⁸. We therefore think that the observed apparent gender variability may either be a case of observer variation due to the weathered state of the monument or some of the scribes active in the oil trade took liberties and depicted what they originally recognized as a female monument with a male symbol. On some First Dynasty sealings evidently depicting the known female lioness *Mehit* identified by the bent rods above her back, for example, a male lion mane can nevertheless be seen demonstrating this occasional liberty taken by some scribes (Kaplony, 1963, #145, 146, 163).

Association between Lioness and Writing. The *Mehit*-guarded administrative facility sealed luxury goods destined for both royal and elite private tombs in the first half of the First Dynasty (Helck, 1987: p. 186) presumably to administer tributes from the northern territory of the Delta after unification. By the time of *Horus Den*, a permanent palace bureau (*ḥwt*) had been established at *P Ḥrw Msnl Seat of the Harpooning Horus*⁹ for these scribes and the provisional satellite facility was no longer used (Helck, 1987: p. 213, 4.). Nevertheless, *Mehit* remained their patron (Figure 21).

At least two more such administrative satellite facilities identified by distinct sealings were initially in operation immediately after unification by *Horus Narmer*, “Animal Rows + Trap” (Figure 22, right pane) and “Dual Royal Banner”, both of which soon disappeared from the record (Helck, 1987: p. 179). The animal trap symbol *sh̄t* (ensnare, trap, hunt; Gardiner T26; Figure 22, left pane) is similar in shape to the depiction of the *Mehit*-guarded facility which appears as an animal-surmounted building with a door and chambers, conventionally referred to as *Pr wr*/The Great House/Great Hunter Hall (Figure 23). This

⁸For comparison, on some tags the symbol looks female (e.g. <http://xoomer.virgilio.it/francescoraf/hesyra/labels/xxqaa16.htm> and <http://xoomer.virgilio.it/francescoraf/hesyra/labels/xxdjer1.htm>) and in others it looks male (e.g. <http://xoomer.virgilio.it/francescoraf/hesyra/labels/xxaha1.htm> and <http://xoomer.virgilio.it/francescoraf/hesyra/labels/xxnarmer1.htm>).

⁹This palace had previously been established in *Buto* by *Horus Djer* (Helck, 1987: p. 152).



Figure 21. Seal impression of *Sdk3* during the reign of *Horus Den* originating from the newly established scribe’s bureau at the Seat of the Harpooning Horus in *Buto*, the northern palace of the *Thinite* kings. *Mehit*, now established as the scribes’ patron goddess, is shown within a *hwt*, i.e. inside a walled facility presumably in the palace basement. Photo by M.S. from *Kaplony, 1963, Tafel 53, Image 197.*

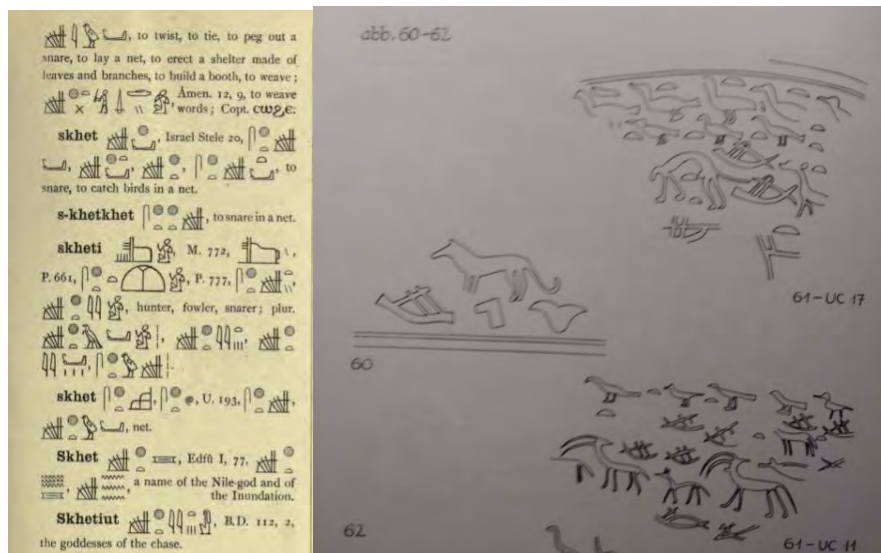


Figure 22. Left pane shows Gardiner T26 with phonetic and logographic value of *sht* snare, trap, catch, hunt. From *Budge, 1978: p. 695a.* Right pane shows a selection of sealings from the Animal Row + Trap dynastic state satellite facility. Photo by M.S. from *Kaplony, 1963, Tafel 26, Images 60 and 61.*

building depiction is one of the oldest icons used as a symbol in writing in ancient Egypt dating back to pre-dynastic *Scorpion I*’s tomb U-j and possibly depicts a central structure at the large prehistoric settlement of *Hierakonpolis/Nekhen*¹⁰. Invariably, this building is shown on these nine ivory labels with a couchant animal, in one case closely resembling the shape of a lion (*Dreyer, 1998, Tafel/Plate 30, #61-69*).

¹⁰HK29a. See URL:

<https://www.hierakonpolis-online.org/index.php/explore-the-predynastic-settlement/hk29-the-ceremonial-center>.

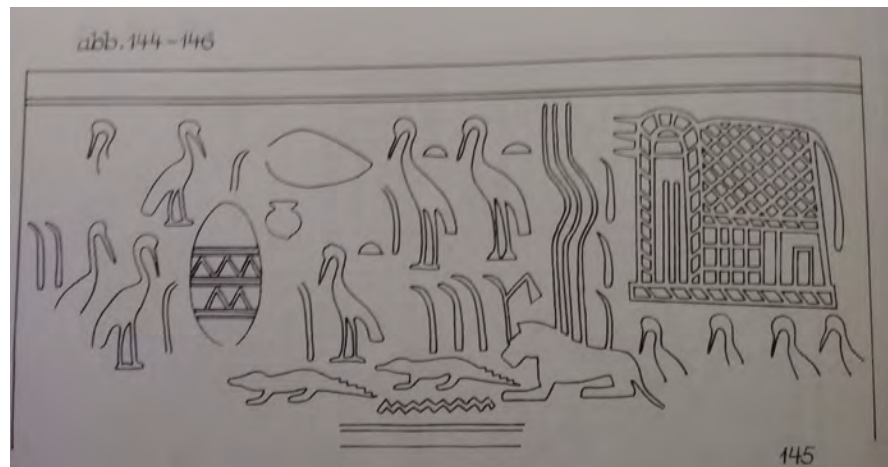


Figure 23. *Mehit*-sealing showing the Great Hall *Pr wr* in detail. Photo by M.S. from Kaplony, 1963, Tafel 42, Image, 145.

On the inner wall of the *Edfu* Temple, a monumental stone-scroll in the form of a girdle wall surrounds the temple proper. Into it the Egyptian *Horus* Myth is inscribed, and the netting and catching of birds, animals, and humans is a prominent theme (**Figure 24**). The Memphite creation story also recorded there on the western frieze describes how the two *šbtjw* tie the first reeds emerging from the waters of the Great Flood into a secure foundation onto which *Horus* can descend to establish his throne on Earth, in other words the foundation of the mythical *Edfu* Temple sitting on the original mound of creation. The image of a falcon landing on a nest of woven reeds is not far removed from the hunting and catching of birds with a net made from papyrus stalks.

A common context between woven flax to make textiles and rope for nets and traps, and woven papyrus stalks to make papyrus sheets for writing is also demonstrated in mastaba S3035 of the First Dynasty's high official *Hemaka* under *Horus Den*, who had these materials protected in specially-made wooden boxes and had them all stored in the same chamber, magazine room Z located behind the east wall of the niched tomb (Emery, 1938: pp. 41, 43-44).

From the large cache of animal bones found near the ceremonial center HK29a at Hierakonpolis (Friedman, 1996), it becomes clear that centuries before *Horus Narmer* and the beginning of dynastic Egypt (circa 3000 B.C.E.), prehistoric sedentary Upper Egyptians hunted wild animals not for immediate killing and consumption, but to keep them alive in captivity and slaughter them later ritually (Hendrickx et al., 2010: p. 21)¹¹. Animals were also ritually sacrificed and buried as retainers around elite tombs (e.g. tomb 47 in cemetery HK6) and there is at least one example of a shaman-like dwarf burial (tomb 50) surrounded by baboons, a leopard, an aurochs, an ostrich, and a crocodile¹². The role of the later

¹¹See also Stan Hendrickx, 2012, lecture. Sunday at the Met: The Dawn of Egyptian Art. URL (time-cued): <https://youtu.be/2G4C1SkPBWs?t=470>.

¹²Hierakonpolis Online. URL:

<http://www.hierakonpolis-online.org/index.php/explore-the-predynastic-cemeteries/hk6-elite-cemetery>.



Figure 24. Part of a large relief depicting a net made from papyrus entrapping birds, animals, and captive humans. From the narrow alley at the east wall of the *Edfu* Temple. Photo by M.S., May 2019.

leopard-skin donning *sm* priest, entitled *tt* in front of *Horus Narmer* on the Narmer Palette, was to catch the shadow of a deceased as part of the statuette-making ritual recruiting the help of invoked animal spirits (Helck, 1987: pp. 21-30). This *sm*-shaman ritual, and the Mouth-Opening Ceremony which evolved from it, may have had their beginnings in the dwarf tamers and handlers of captured animals in predynastic Egypt. As tamers of wild animals, they were likely held in high regard explaining their possible role as later handlers of the shadowy netherworld spirits of both animals and humans, i.e. as the shamanesque *sm* priests.

When viewed within this prehistoric context of over-powering and taming wild animals, the concept of writing from its earliest known beginnings to its full expression on the walls of Ptolemaic era temples three thousand years later appears to have been conceptualized by Egyptian scribes as an act of hunting and catching something alive, deeply rooted in now archetypal hunting rituals of an already sedentary people reaffirming their power over nature and, at once, seemingly imitating primordial creation. By analogy to the building of monuments on the ground below to recreate the sky above, writing in ancient Egypt can be similarly understood as a captive act of creation on Earth recreating the natural creative powers of the sky and the regenerative power of the *dw3t*/the netherworld. This evidence suggests that the idea to use symbols to write in ancient Egypt was born from within the culture and mind-set of hunter-gathers, not sedentary agriculturalists and animal herders. We see evidence of the same phenomenon at Göbekli Tepe (Seyfzadeh & Schoch, 2019).

With this context in mind, the association between the lioness *Mehit* and writing becomes more apparent: Witnesses who came to prehistoric Giza, the gate to the northern Delta territory of Egypt, viewing a lioness monument, split-in-two (which at times distant may have been partially flooded at its base),

imagined the ultimate huntress of the animal world at the original place of creation, where the first words of creation had been spoken, thus arising from the flood waters and assuming megalithic material existence as living symbols of this creative act, where islands of reeds had initially grown on the shallower water of the receding flood (Figure 25) and birds like falcons had begun to settle, where animals congregated on the banks of the new river shore to drink, creating a hunter's paradise. The carved, chiseled, and inked outlines of written symbols in ivory, wood, stone, and woven papyrus sheets thus became the living shadows of the animals symbolically captured exactly like the divine words of creation were imagined as having manifested as monumental images in stone. The front and back of the lioness along with the shadowy crack in-between became the symbols of precious goods for the afterlife, the first words of creation of a newborn civilization, and the still visible, but immaterial shadow representing the invisible air ($\dot{S}w$) of a new world created after the destruction of the old one by *Re* and *Mehit-wrt*. Thus mythologically, *Mehit* is equivalent to or another form of the entity otherwise known as *Tefnut*, the Earthly moisture and watery counterpart to $\dot{S}w$ (Mohamed Ibrahim, personal communication)¹³.

In fact, the very name *Mehit* is synonymous with “north” (Lower Egypt) and “papyrus” (Figure 26), and related to the word for cubit *mh*, used to measure the height of the yearly inundation, and also the word for flood in the personified name of *Mehit-wrt*, the *Great Flood* from which the $\dot{d}3jsw$ emerge in the story of creation as told in the *Edfu* Texts. The symbol of the papyrus bunch, Gardiner M16, on First Dynasty inscriptions denoted the concept of planning, conceiving, and creating (Helck, 1987: p.155-156; see also left pane of Figure 2, second symbol below the hole in the right upper corner). Therefore, the linguistic root of $h3t.t$, the frontal lion symbol representing the concept of *front* and *first*, is $h3$, the primordial concept of creative conception as in *first* thought or *idea*. We conclude that prehistoric Egyptians not only intimately associated the lioness with the concept of writing, she personified the creative aspect of writing (*catching ideas with a net of papyrus*)¹⁴ immanently as the creative power of nature (*ntr*, Allen, 2014: p. 54; Mohamed Ibrahim, personal communication) later also expressed in *hk3* (magical power; using Gardiner F22 on a standard; see e.g. the *hk3 Mehit* title of *Wepemnefret* atop his stele), and thus also became the icon of original creation timed to the First Time *zp tp*, when *Mehit* on Earth at Giza faced due eastward looking at both the Sun and her male counterpart *Horakhty* in the sky at dawn (Schoch & Bauval, 2017: p. 210). This primordial, ancestral aura of Giza at the gate to the Nile Delta as the spiritual origin and place of creation is subtly captured in the royal throne (prenomen) title *nswt*

¹³Mohamed Ibrahim has suggested that *Mehit* might have been pronounced “*Mouhet*” to indicate the connection with moisture and water (*mw*).

¹⁴Perhaps in contrast to *Seshat* (*shyt 3bwj*/The Seven-Horned) who personified the reed and ink used to “affix” the shadowy symbols onto palm leaves and papyrus. In fact, the name *Seshat* has Sumerian roots, i.e. $\dot{S}e\dot{S}w$ (hunt/net) indicating that her origins may locate to the prehistoric *Buto-Maadi* Culture of Egypt's Delta, whose pictographic bi-syllabic script is now lost (Helck, 1987, ch. 11).



Figure 25. An island of reeds on the Nile in southern Egypt. Photo by R.M.S., June 2019.






- 
mḥyt papyrus plant, clump of papyrus [noun - flora] M15 - M17 - M17 - X1 - M2
- 
mḥw s / mḥws crown of Lower Egypt [noun - clo.] M15 - S3 - O34
- 
mḥyt papyrus plant, clump of papyrus [noun - flora] M15 - X1 - M2
- 
[ibw] *mḥw* (a plant from) Lower Egypt [noun - loc.] M15 - Z7 - N33 - Z2
- 
mḥw Lower Egypt [noun - loc.] M16

Figure 26. The name of the lioness *Mehit* is synonymous with the Egyptian words for north (Lower Egypt) and papyrus. From [Vygus, 2015: p. 1005](#).

bjtj/Sedge and Bee of Egypt’s king: The sedge, while typifying the south also represents the word king in general while the bee, symbolic of the north, also represents the legacy of the royal lineage ([Allen, 2014: p. 83](#)). Referring to the *Shabaka Stone*, Allen explains the relationship between creation and symbolic writing in the Memphite Theology as follows ([Allen, 2014: p. 206](#)):

It is significant that the text equates the creation of “everything” with the creation of “every divine speech”. “Divine speech”—mdw-nṯr, literally, “god’s speech”—is the same term used to describe hieroglyphic writing (§ 1.4). As we have learned, hieroglyphs have a dual nature: they are images of things in the real world, but they are also representations of ideas. By using the term “divine speech” to describe the created world, the author of the Memphite Theology implies that everything in creation is itself a kind of hieroglyph of the creator’s original concept. In the same way, the beginning of the text refers to “evolution into the image of Atum” The word “image”—tjt—is also used of hieroglyphic signs (the determinative is an adze, with which such signs could be carved). The

physical world is thus an “image” of the original raw material of Atum in the same way that a hieroglyph is an “image” of a physical thing.

Therefore, we conclude that the original lion (or lioness) monument surviving the aftermath of the end of the Younger Dryas (circa 9700 B.C.E.) was possibly again witnessed, at the earliest, by prehistoric pastoralists and nomads seasonally venturing to the still flooded Nile Valley and Delta region from the western desert after the mid-9th Millennium B.C.E. (Hendrickx et al., 2010: p.18) or from the Levant. Possibly, however, the monument was still largely or completely submerged¹⁵ and not witnessed until after the Nile’s east-west expanse began to narrow when North Africa’s climate began to dry during the Nile Delta’s early Neolithic period¹⁶ (circa 5000 B.C.E.) permanently driving western desert pastoralists, perhaps such as the ancestors of the *Tasians* and the *Merimde*, to the Nile Valley and Delta (Hendrickx et al., 2010: pp. 15-35; Tristant & Midant-Reynes, 2011: p. 46). Such early settlers might have witnessed the megalithic lion emerging from the Nile and seen it as the living manifestation, shaped from rock, of the original idea of creation, a gigantic set of three symbols¹⁷, Front, Fissure, and End, ascending from the waters of the receding waters of the epic flood which had been caused by a cosmic (solar) strike and Earthly upheaval.

This model predicts, or rather arguably generates the expectation, that the iconography of a split lion might have been depicted on later decorated-ceramic wares, votive items, and related objects from the Delta’s mid-Neolithic material culture, after the Western Desert became uninhabitable (circa 4900-4400 B.C.E.; Hendrickx et al., 2010: p. 18). The extant material cultural remains of the Neolithic Nile cultural record discovered to date are still sparse, especially in the north of Egypt, possibly obliterated due to centuries of heavy intermittent Nile flooding explaining why no such evidence has surfaced to date, for example in *Merimde* layers I-V (circa 5000-3800 B.C.E.), in remains of the contemporary *Fayum A* and *Badarian* cultures, and the later (after circa 3500 B.C.E.) *Buto-Maadi* culture from the western Delta, nor on ceramic ware from other sites in the middle Nile Valley like the earliest known Neolithic culture, the *Tasians* (Hendrickx et al., 2010: pp. 15-35).¹⁸

Other circumstances explaining the absence of the lion iconography in the extant Neolithic, prehistoric record of the Nile Valley and Delta is that neither the *Tasians* nor the *Maadi* decorated their black-topped, red-, and black-polished pots and only used geometric patterns on their “Tulip Cups” (Czerny et al., 2006: pp. 46-52; Caneva et al., 1987: pp. 108-109) while the *Merimde* people rarely included grave goods with their burials (Hendrickx et al., 2010, table p. 17). In

¹⁵The top of the head of the Great Sphinx is circa 100 feet above sea-level.

¹⁶The Neolithic period began at different times in different parts of the world. Egyptologists would refer to this period of human presence by the Nile as the early Neolithic (Tristant & Midant-Reynes, 2011: p. 46).

¹⁷Selim Hassan analogously interpreted the Great Sphinx and pyramids as a monumentalized composite hieroglyph representing the setting Sun over the horizon between the mountains (Hassan, 1953: p. 243).

¹⁸Earlier Neolithic cultures in Egypt’s western desert existed at Bir Kiseiba and Nabta Playa.

common with the Great Sphinx monument's orientation towards the equinoctial sunrise however, predynastic Lower Egyptian burials positioned the deceased with the head south facing east (Stevenson, 2009: p. 6) in contrast to *Naqadan* burials in Upper Egypt which tended to place the head south facing west (Stevenson, 2009: pp. 3-4).

Regardless, we acknowledge an ostensible gap in the plausibly expected archeological record from the middle Nile Valley and Delta of circa 1600 years from 4900 to 3300 B.C.E., only at the end of which exists the so far earliest-documented evidence of the lion iconography in the *Naqada* culture of Upper Egypt's *Abydos* from tomb U-j (Dreyer, 1998, Tafel/Plate 30, #69).

In late 4th Millennium proto-dynastic Egypt, as in the Early Neolithic pre-pottery phase Anatolia of the 10th Millennium B.C.E. (and earlier), we thus find evidence of the cultural imprint left by the power of such symbols when carved into megalithic stone structures. In our model, the awe-inspiring appearance of megalithic symbols became the true seed of civilization, not the method of food production. Symbols, then as now, inspired people to congregate, collaborate, invent, and implement new methods to produce food. The surpluses of such production enabled people to settle instead of wander and reduced the plight of making a living on-the-go. A sedentary lifestyle thus allowed mankind to shift its focus from making a living to observing the world, search for its meaning, and imitate it creatively in art and architecture, but it only became possible after, not before, hunter-gatherers built symbolic monuments and congregated (Seyfzadeh & Schoch, 2019). This sequence may also explain the sparse cultural footprint surrounding some megalithic sites used for pilgrimage but not as a dwelling zone.

At Giza, another explanation may explain why no prehistoric remnants of hypothetical Sphinx builders have been found: Removal and appropriation. In his preliminary report, Kromer concluded that the footprint of a pre-¹⁹ and early dynastic culture was apparently razed from its original location somewhere within the pyramid district and on the plateau and the destroyed remnants and rubble were deposited outside of the district to the south of the Great Sphinx, the central field, and the causeway of *Menkaure's* pyramid (Kromer, 1972: pp. 34-35). The early dynastic style niched walls on the rock-cut mastabas of *Kai* (Figure 27; Hassan, 1941: pp. 29-40) and *Khentkawes* in the central field also suggest the presence of an older culture long before *Khufu* began to build at Giza (for a summary of the evidence see Reader, 2005: p. 54)²⁰. We speculate, that the unique, rock-cut niching seen on the walls of these two mastabas, if they date to prehistoric times, may have even inspired this architectural style seen in the niched and paneled mudbrick structures used as tombs for the elite during the

¹⁹The evidence for a pre-dynastic presence comes from the way some of the pottery was painted which Kromer dated to *Naqada* II (circa 3500-3200 B.C.E.; Kromer, 1972, p. 32).

²⁰Early dynastic Egyptian mastabas with niched exterior walls were made with mudbricks, for example at *Giza* (Mastaba V), *Saqqara* and *Tarkhan*. Niched mastabas conventionally dated to the Old Kingdom's Fourth Dynasty exist at *Meydum*.

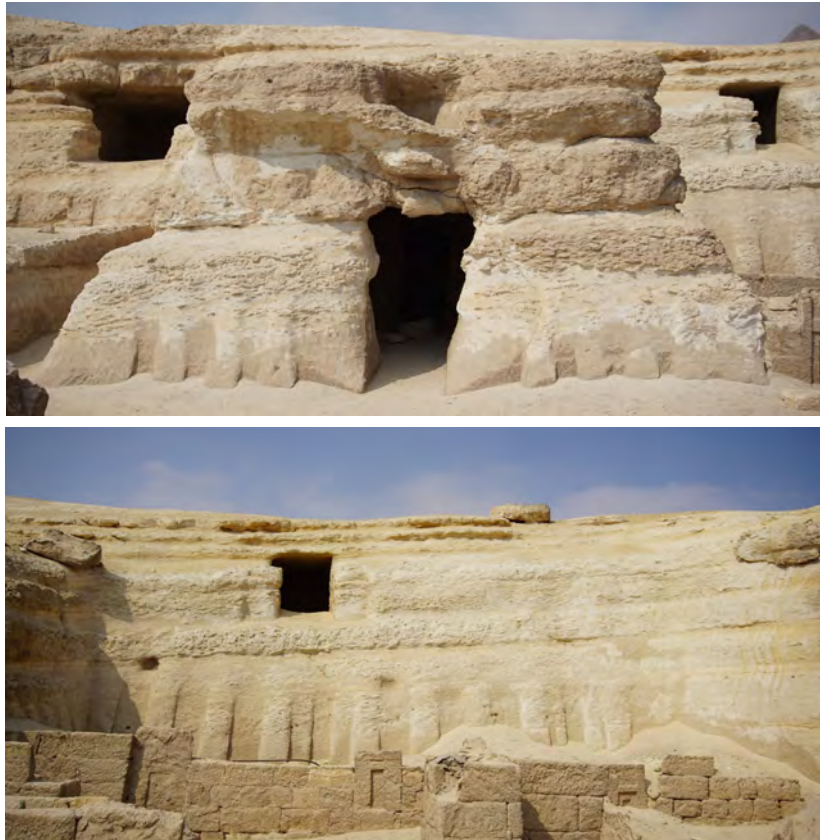


Figure 27. G8720, the lion face-like, rock-cut mastaba attributed to Prince *Kai* (late Fourth or early Fifth Dynasty) in the Central Field south of the causeway of *Khafre's* pyramid (top pane; [Hassan, 1941: pp. 29-40](#)). The niched and recessed exterior walls are more typical of early (First and Second) dynastic architecture and this façade style is depicted on a sealing found nearby ([Kromer, 1972: p. 27](#)) suggesting that *Kai* used a preexisting structure as his tomb (see also [Reader, 2005: p. 54](#)). The horizontal wind-and-sand erosion pattern of the limestone rock layers appears somewhat similar, but not identical, to that on the Great Sphinx and its enclosure walls, but the vertical and oblique erosion pattern observable there is not seen here (compare the bottom pane view of the mastaba attributed to Prince *Kai* to the views of the Great Sphinx enclosure walls seen in [Figure 12](#) and [Figure 14](#)). A more typical, later added, Old Kingdom wall is seen in the foreground. Photos by M.S., September 2018.

early dynastic times of unified Egypt and the palace discovered at *Hierakonpolis* ([Friedman & Bussmann, 2017: p. 81](#)).

The Idea of an Archive under the Monumental Lioness, “The Hall of Records”. The foregoing discussion raises the question where megalithic building skills and symbolic writing originated, if not grown out of a sedentary lifestyle but a nomadic, hunter-gatherer lifestyle. Did these early pillars of civilization originate locally and independently at different prehistoric megalithic sites around the world, or did they originate in one place and diffuse to other areas, or should we consider a combination of these two modes? A related idea, the esoteric, alternative theory of the “Hall of Records” under the Sphinx, is based

on the idea that a prior people (iconized by Plato's Atlantis Story), observed the Earth and the sky, formed advanced knowledge, developed sophisticated tools, built stone monuments, recorded and stored their heritage for posterity in an archive physically and symbolically protected under the Great Sphinx monument. From this archive, the stored knowledge and skill seeded civilizations around the world. In a related theory, the knowledge and skill were carried to these other places by mythical beings or sages, and this is where the number seven prominently features: The seven baboons *d3jsw*, the seven fish and bird *Apkallu/Abgallu* of Sumer (Oppenheim, 2004: pp. 171-173), both water-born agents, and the seven-horned *Seshat* (*sfht 3bwj*), patron goddess of writers, archivists, surveyors, and astronomers, for example.

According to our model of megalithic symbols, the monuments themselves could have served as the archives which means the "hall" is symbolic and the "records" are monumental serving as the seeds of civilization. Another way to explain the idea of an archive of accumulated knowledge is a physical space under a monumental shrine serving as a depository and repository. This concept was documented by the ancient Egyptians themselves in the theological (e.g. Coffin Texts), literary (e.g. Papyrus Westcar), and medical (e.g. Papyrus Ebers) literature (Sherbiny, 2017: pp. 136-151). The term *'fdt* variously referred to a chest, box, or even a space, cabin, chamber, or cave, under the feet of a statue or shrine of a deity in which written records (*'ftt*) were stored (Sherbiny, 2017: pp. 149-150). In Harris Magical Papyrus 501²¹, for example, a document attributed to *Thoth* is said to have been kept under the feet of *Re-Horakhty* at Heliopolis²². *Horakhty* is a name associated with the Great Sphinx on the New Kingdom Dream Stele and several votive steles found in the vicinity (Hassan, 1953: pp. 234-268); *Horakhty* is synonymous with *Re-Horakhty*, the father of *Horus Behedety* from the *Edfu* Texts, and Robert Bauval has found textual evidence that this was the name of the celestial sphinx recognized in the constellation Leo in the Pyramid Texts of the Old Kingdom (Schoch & Bauval, 2017: pp. 193, 205, 221-226). The *Edfu* Texts speak of "a book which fell from the sky north of Memphis" (*md3t tn h3j n pt mhjt jnbw hd*) in which instructions were written according to which *Ptolemy* X or XI was to build the girdle wall enclosing the temple (Kurth et al., 2014: p. 7/Émile Chassinat 6, 4).

Finally, the oldest evidence of a papyrus scroll hidden underground comes from the First Dynasty: This papyrus sheet was uninscribed and is the first known example to date of this material used in the history of Egypt. Here it was symbolically placed by itself in a finely made round wooden box and buried with *Hemaka* (circa 2900 B.C.E.) inside a magazine room in his tomb at *Saqqara*,

²¹New Kingdom, 20th Dynasty. URL:

https://www.britishmuseum.org/research/collection_online/collection_object_details.aspx?objectId=114260&partId=1.

²²See Budge, Sir E. A. W., 2018. URL:

<https://books.google.com/books?id=ONKSDwAAQBAJ&lpg=PT236&ots=vil0o3Ng1W&dq=papyrus%20harris%20hymn%20shu&pg=PT236#v=onepage&q&f=false>.

S3035 (Emery, 1938: p. 41; Plate 23a). The Pyramid Texts of *Unas* (circa 2350 B.C.E.) from the end of the Fifth Dynasty are of course an underground pyramid chamber-and-corridor system onto whose walls the accumulated records of Egyptian theology were carved.

The concept of written scrolls hidden underground as in a “Hall of Records”, generically at least, is therefore much older than even the Egyptian Middle Kingdom (2040-1782 B.C.E.) and long predates the later lore generated during the Hellenic, Coptic, Arab, and Modern Western eras, which have popularized a cultic caricature of it across the world dismissed as a myth nowadays by scholars and sceptics. With respect to the Great Sphinx, nevertheless, a subterranean, ostensibly man-made void (estimated to be approximately 12 meters × 9 meters at an approximate depth of 5 meters) has been seismically located (Low Velocity Anomaly A; Dobecki & Schoch, 1992; Schoch *in* Schoch & Bauval, 2017: pp. 81-82; **Figure 28**). Several drillings around the Great Sphinx have been conducted since 1978 (Lehner, 1991: pp. 88-89), but none where this seismic signal appears (**Figure 29**). The possibility of another man-made chamber under the Great Sphinx is further supported by what Auguste Mariette observed at the bottom of the major fissure when he first cleared it (Mariette, 1857: p. 95; bold emphasis ours):

Un autre trou existe dans le dos et vers la naissance des cuisses. Le P. Vansleb en parle ainsi: “...elle a par derrière une cave sous terre, d’une largeur proportionnée à la hauteur de la teste, dans laquelle j’ay regardé par une ouverture qui y est, et qui n’a pu servir à autre chose, qu’à y mettre le corps de quelque mort”. J’ai fait nettoyer le trou jusqu’au fond, et, en effet, quand on y regarde d’en haut, il semble qu’il se termine par une chambre. Mais, malgré son apparence de puits funéraire, ce n’est qu’une fissure agrandie qui va en s’élargissant, et qui se termine par un vide assez spacieux ménagé précisément dans le plein des cuisses.

This chamber, if it exists, may correspond to Low Velocity Anomaly B (**Figure 28**) also identified utilizing seismic refraction (Dobecki & Schoch, 1992; Schoch *in* Schoch & Bauval, 2017: pp. 81-82).

Previously, we have interpreted the bent rod symbol (which we named the “JAW Sign”, commemorating the work and legacy John Anthony West) to be a key to a lock, or perhaps a bolt, securing a door and thus identifying *Mehit* as a monumental, locked facility such as an archive or library (Seyfzadeh et al., 2017). The object depicted by the JAW Sign is ostensibly inserted with one, two, or three (sometimes linked) prongs into the back of the image of *Mehit* depicted on First Dynasty sealings dated to a period between *Horus Narmer* and *Horus Den* and on Old Kingdom tomb reliefs from the mastabas of *Hesry-Re*, *Wepemnefret*, and *Hemiunu*. If Anomaly A is indeed human-made, it could be the elusive archive under the Great Sphinx, the real “Hall of Records”, but without a direct probe definitive proof of it will likely never be obtained and whatever records stored therein, be they written symbols, relics, or some other form of stored communication, could have already been lost to time and decay, especially since

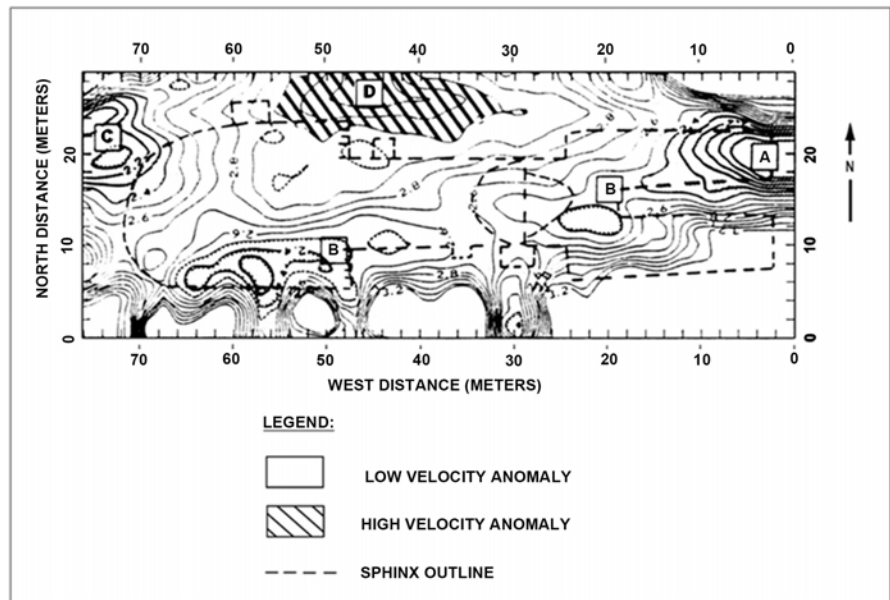


Figure 28. Seismic velocity map beneath the Great Sphinx as determined by refraction tomography (see Dobecki & Schoch, 1992). The outline of the Great Sphinx is shown as a dashed line. Illustration courtesy of Robert Schoch and Catherine Ulissej.



Figure 29. View inside the Sphinx enclosure looking west towards the pyramid of *Khafre* from the east. The northern, left forepaw is visible. The red arrow shows a capped drilling head left by a 2009 probe conducted by Cairo University, Zahi Hawass, and Mark Lehner for the then Supreme Council of Antiquities (now the Ministry of State for Antiquities). This drill went circa 10 meters into the lower member bedrock of the Sphinx ditch at an approximate impact angle of 45° (Video URL: <https://youtu.be/3qGzfZHWbZE>). The approximate northwest corner of Anomaly A is shown in red. It extends east and south of the position of this probe and only barely, if at all, overlaps with it. Photo by M.S., June 2019.

the water table under the Sphinx enclosure has probably reached a level of at least 5 meters below the surface.

Here, however, we would like to report new evidence to support the idea that the bent rod(s) over *Mehit* may have been a key as we have proposed. We previously predicted that there is likely not a single word in the ancient Egyptian language which utilizes the JAW Sign by itself (Seyfzadeh et al., 2017: p. 172). Here, we maintain that this statement is correct, but wish to qualify it. Likely, the northern territory of prehistoric Egypt's Delta before unification spoke and wrote in a pictographic language different from the phonetic script (the earliest written symbols of which are found in Tomb U-j) of the Nile Valley and southern Egypt, the homeland of the *Thinite* kings beginning with *Horus Narmer* (Helck, 1987, chapter 11). This *Buto-Maadi*-native tongue is now a ghost language, since no inscriptions in it have been found to date with the sole possible exception of an early dynastic mud seal imprint (i.e. a sealing) with apparently non-Egyptian symbols discovered south of the Great Sphinx at Giza (Kromer 1972: pp. 27, 33-34). Some of these lost foreign symbols, however, survived in what became the early Egyptian language after unification circa 3000 B.C.E. One such symbol is the bent rod which we previously coined as the JAW Sign.

This sign can be seen painted onto jars from royal tombs in *Abydos* next to a sign resembling Gardiner W8 (Figure 30). W8 is likely also a symbol which was used in the *Buto-Maadi* language zone, where it had the phonetic value of *g3* and was later absorbed into the dynastic state language of hieroglyphic Egyptian where it later assumed a completely different sound value, *skty*. The original meaning of the word *g3* in native-*Buto* is unknown, but the sound of this word resembles *g3* /*g3wt*. In Egyptian, *g3* /*g3wt* possibly meant tribute(s)/tax(es) (Vyus, 2015: p. 2339) or oil (Figure 30), which in the language of predynastic and early dynastic Egyptian from the south were *jpw* and *h3t.t*, respectively (Helck, 1987: pp. 186, 171). Therefore, tributes from the Delta might have been labelled with the native-*Buto* symbol W8, because the Upper Egyptian royal scribes would have read this as tributes, for example in the form of oil shipments, from the conquered zone.

The JAW Sign, written together with W8, probably denoted the origin of the tribute in the Delta as was common practice on oil tags. Oil from the Delta was famously made in *B3st* /*Bubastis*. We therefore suspect that the JAW Sign had a phonetic value of either *Bu-Ba* or *Ba-Bu*, which in Egyptian meant "Seat of the Soul" or "Soul Seat", the same meaning as is given by the commonly known word for the city, *Ba-Set* (Figure 31). Since there are some reasons to suspect that traders who had settled in the Delta had cultural contact with contemporary Sumerians of the *Uruk* Period in Mesopotamia (4000-3100 B.C.E.)²³ and since the native-*Buto* ghost language was evidently distinct from Upper Egyptian, we asked, (contra Ward, 1964: pp. 35-39), if there might indeed be a linguistic link between the former two people.

²³This is based on the Sumerian cultural footprint evident in some Egyptian art and architecture (for a review see for example the discussion by Helck, 1987, ch. 10).



Figure 30. The upper pane shows pottery markings found on jars in the royal tombs of Abydos by Petrie (Petrie, 1901, Plate LVa). The bent-rod JAW Sign which Petrie called a “yoke” sign, is associated with a “winged ring” sign (second row) possibly identical with Gardiner W8 (see bottom pane). Used as a determinate, it appears in three contexts: Granite, family, and oil. Used phonetically, it appears to have two different values, *skty* and *g3*.

The Akkadian/Sumerian dictionary assigns the meaning of opening, doorway, door, or gate (keeper) to the word “babu”, and the meaning of bend to “ga-babu” (Figure 31). We therefore reconstruct the meaning of the JAW Sign in the following way: The object in symbol-form meant “open/doorkeeper” in native-*Buto* (e.g. we suggest Oppenheim, 1998: pp. 14-27; esp. pp. 26-27) and when combined with Gardiner W8 it meant “bend/encircle/curve”. One can reasonably derive the meaning of “bent opener” (e.g. key) from this, if this language was based on a bi-syllabic word design as Helck also suspects (Helck, 1987, chapter 11); however, no sense at all may have been made in the language of native-*Buto* by combining W8 and the JAW Sign. In the language of Upper Egypt, however, the combination of these two symbols sounded like the words *g3wt b3bw* “Oil-Babu”, i.e. oil tribute from *Baset / Bubastis*, which is why they were painted on jars shipped to *Abydos* and marked as highly coveted grave goods for the afterlife. In principle, this phonetic use of words which meant one thing (or even

kapāpu (*kabābu*) v.; 1. **to bend**, to curve, to wrap around, 2. 1/2 to bend, curve (intrans.), 3. *kuppupu* to bend, to curve, 4. *šukpupu* to cause to bend, 5. IV to become bent; from OB on; I *ikpup* — *ikap-pap* — *kapip*, 1/2, II, III, IV; wr. syll. and GILIM, GAM; cf. *kippatu*, *kippu*, *kuppupu*.

[x]-x BULUG = *ka-pa^{ba}-pu* A VI/1:178.
paātu kapātu [...] *ka-pa(1)-pu* (for context see *kapātu* lex. section) CT 31 10 r.(1) iii 15 (ext. comm.); *tu-kap-pap* 5R 45 K.253 viii 48, but *tu-gab-bab* ibid. 34 (gramm.).

Akkadian/Sumerian

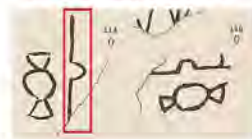
gabābu (to bend) see *kapāpu*.





gabābu (sling) see *kabābu*.

bābu A s.; 1. **opening, doorway, door, gate, entrance** (to a house, a building or a part thereof, to a palace, a temple or part thereof, to a city, to a cosmic locality), 2. city quarter, 3. opening of a canal, of an object, of a part of the body, 4. in *bāb ekalli* umbilical fissure of the liver, 5. opening, beginning (in transferred mngs.), 6. item, section; from Oakk. on; pl. *bābū*, *bābanu* (rare in SB), *bābatu* (passim from OB on); wr. syll. and KÁ (in mng. 4 ME.NI for *bāb ekalli*); cf. *bābanu*, *bābaná*, *bābu* A in *rah bābi*, *bābu* A in *ša bāb ekalli*, *bābu* A in *ša bābi*, *bābu* A in *ša muḫḫi bābi*, *gagū* in *ša bāb gagū*.



Buto?



-  *b3st* *Bubastis* [noun - loc.] W1 - X1 - O49
-  *b3st* *Bubastis* [noun - loc.] G29 - Q1 - X1 - O49
-  *st* *place* [noun] Q1 - X1
-  *bw* *place, thing* [noun] D58 - G43

Egyptian

-  *g3* (unknown) [verb] W11 - G1 - W8
-  *g3* (unknown) [verb] W11 - G1 - W8 - W11 - G1 - X1 - W8
-  *bgt* *an oil (from vines ?)* [noun] D58 - W11 - X1 - W8 - W23
-  *tb* (an oil) [noun] X1 - D58 - W8 - W1 - W9

Figure 31. The bent-rod symbol (JAW Sign) sounded like the word for *Bubastis* in the Upper Egyptian language, but phonetically resembles “babu” = open in Akkadian/Sumerian (Oppenheim, 1998: pp. 14-27), which may have shared a common linguistic root with the native-*Buto* ghost language. When combined with Gardiner W8 *g3*, the two symbols sounded like *g3-babu* Oil/Tribute from *Bubastis* in Upper Egyptian but would have possibly meant “ka-papu/ga-babu” = bend in Akkadian/Sumerian (Oppenheim, 1995: p. 1; Oppenheim, 2008: pp. 175-176) and thus possibly also in the lost language of native-*Buto*.

nothing) in one language to express something different and unrelated in another (or even the same) language became firmly embedded in the later Egyptian language in the form of Group-Writing (Allen, 2014: pp. 260-263) and *hk3* Magic (Seyfzadeh & Schoch, 2018: pp. 109-110).

We therefore observe that the JAW Sign was initially used in at least two foreign (from *Buto*) loaner words in the language of unified Egypt, “ga-babu” = Oil/Tribute from Baset and “babu-urmalw” (Akkadian/Sumerian “ur-maḫ-ḫu”/“ur-ma-lw” = colossal lion; Oppenheim, 2010: p. 232) = Gatekeeper of The Great Lion, i.e. the monumental lioness *Mehit* at Giza in our reconstruction²⁴. We would like to point to the intriguing similarity between Akkadian “ur-maḫ-ḫu” and Egyptian

²⁴Of note, the same words in hieroglyphic Egyptian *wr m3j* “Great Lion” were found painted on pottery shards at the *Wadi al-Jarf, Khufu’s Harbor* (Tallet, 2012: p. 168, left piece).

Mehit-wrt (two words transposed), the Great Flood. However, as far as we can tell the JAW Sign was never used in any native-Egyptian word. If our reconstruction of the native-*Buto* meaning (open/gatekeeper) and sound (“ba-bu”) of the JAW Sign is correct, it further supports our theory that the JAW Sign-over-*Mehit*, an originally native-*Buto* construct (since *Mehit* was at Giza) was concretely meant to depict a key, literally an opener, inserted into a facility in the shape of a monumental lioness, located, as we have argued, at Giza long before *Khafre*. This is also the meaning of the bent-rod lioness dual symbol adopted by the later state language of dynastic Egypt, where it became part of an exclusive title carried by only the highest and most trusted officials at the royal court (Seyfzadeh et al., 2017). We suggest that this locked facility was the true “Hall of Records”, an archive or repository of stored knowledge under the left forepaw of *Mehit*, where an actual man-made void evidently exists, so far seemingly unexplored. Whether this archive was made before or after the creation of *Mehit* is unknown and only its contents, if recoverable, may definitively date it and *Mehit* herself.

Given the above analysis of a Sumerian origin of the JAW Sign, another possibility arises: The northern and southern language zones of Egypt before unification incorporated the imagery of a monumental lioness at Giza split in half by the major fissure in two different, but related ways: Upper Egyptians in the language zone of *Hierakonpolis* and *Abydos* interpreted the major fissure through the lion(ess) monument as something between its front and back, i.e. “intermediate” or “medium” and Lower Egyptians in the language zone of Egypt’s Delta centered on *Buto* interpreted this geological feature as an opening and hence used the JAW Sign to represent a gateway, for example, to the monument’s interior.

4. Conclusion

In this paper, we have presented evidence that a prehistoric monumental lioness at the foot of the Giza Plateau inspired the creation of distinct symbols used in writing and the mythical story of creation based on distinct physical features of the statue, in this case damage possibly caused by a shifting Earth or by a solar strike from the sky. This evidence suggests that a megalithic lion or lioness existed at Giza at least as early as Egypt’s proto-dynastic phase and thus contradicts the conventional Reisner/Hassan/Ricke/Lehner/Hawass model promoted over the last century which proposes that the Great Sphinx was originally carved in its entirety seven centuries later during the Fourth Dynasty. Our findings make two major, testable predictions: First, evidence of a prehistoric culture possibly involved in the creation of the original lion(ess) monument may still exist in the void beneath its left paw. This area has never been probed even though seismic refraction testing suggests one exists there and has correctly identified another void by the northern flank. Second, our reconstruction of the bent rod JAW Sign’s meaning predicts that the language spoken and written by

the Buto-Maadi, and possibly even older cultures in the Delta, is related to Sumerian supporting the idea of cultural contact and influence (e.g. Frankfort, 1924: p. 118). We propose that it may be possible to reconstruct this ghost language in a manner analogous to the method we demonstrate in this paper with the JAW Sign.

In ancient Anatolia, we have proposed that prehistoric bull-like (or Orion-like) pillars adorned with symbol-like carvings at Göbekli Tepe inspired the later Luwian hieroglyphic language. In both cases, the original meanings of the constructions may have been related to the images imagined in the night sky possibly invoking ideas of a higher power and creator. After a great world-wide catastrophe erasing the cultural footprint of these cultures, the only remnants were the megaliths (including the original Sphinx in the form of the lioness *Mehit*). In our model, these megaliths became the seeds of new civilizations, not the advent of surplus food production from domesticated plants and animals as has been the dominant archeological paradigm over the last century.

The civilization-organizing mechanism in our model is congregation and shared belief. People come together when they share a common goal, such as escaping hardship or aspiring to a common ideal, like the belief in a higher power and an afterlife where they hope to reunite with those they lost. Such beliefs also alleviate the fears of untimely death, for example the fear of an unnatural death due to environmental catastrophes, and the permanence of death. The unintended, but beneficial, consequence of prehistoric congregation was agglomeration, enhanced economic productivity due to more efficient communication, basically prehistoric networking. Ideas and implementations for a better life evolved faster from these prehistoric think tanks created when people congregated under the power of symbols.

Symbols, because they can inspire belief, power this people-organizing mechanism. Symbols can invoke fear and hope. Symbols can guide the lost, unite smaller bands of people, and bring together people who would otherwise compete. And so, it is the symbolic power of megaliths left by prior civilizations doomed to obscurity in the annals of history in the aftermath of catastrophe, their awe-inspiring symbolic appearance that is, which ultimately seeded and inspired new civilizations, which themselves arose and fell, nevertheless continuously preserving the central, immortal thread of the divine culture of humanity and our ancestors.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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Erratum

In *The Inventory Stele: More Fact than Fiction* (*Archaeological Discovery*, 2018, Vol. 6, pp. 103-161), in the last paragraph on page 123 and in the caption to **Figure 11** of that paper, we erroneously equated the three-level subterranean chamber system excavated by Selim Hassan collectively called the Osiris Shaft, the lowest level of which is also known as the Water Shaft or the Tomb of Osiris, with Campbell's Tomb excavated by Howard Vyse, whose lay-out and symbolism also invokes an Osirian character. Our interpretation of the text in that part of the paper was meant to implicate the former (the Osiris Shaft) whose age based on surface luminescence testing appears to be much older than the latter (Campbell's Tomb) attributed to the Late Period (Liritzis, I., Vafiadou, A. (2014). Surface luminescence dating of some Egyptian monuments. *Journal of Cultural Heritage*, Vol. 16, No. 2, pp. 134-150, Table 1).

Silver and Gold on the Hairs of Holy Maria-Magdalena, Studied by Scanning Electron Microscopy and Elemental Analysis

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Abstract

We have studied by optical microscopy and by SEM-EDX some metallic particles of silver and gold adhering to the Maria-Magdalena hairs. The presence of silver particles is explained by the contact between hairs and the inner side made of silver of the initial reliquary where Maria-Magdalena remains were kept. Presence of gold particles is also explained by the contact between hairs and the gold of the bust-reliquary where hairs of Maria-Magdalena hairs were kept between 1283 and 1793.

Keywords

Maria-Magdalena's Hair, SEM-EDX Analyses, Silver and Gold Particles, Successive Reliquaries Where Maria-Magdalena's Remains Were Kept, Calcium Phosphate Deposits, Other Metallic Particles

1. Introduction

Holy Maria-Magdalena (3?-63?) is the most abundantly cited woman in the four Gospels. There were some places (notably Palestine) where Maria-Magdalena could be buried, but according to the French "tradition des Saints de Provence" (Trouillet, 2016) she (and her companions) landed to the present French Mediterranean shores (in a region corresponding to the current part of Les-Saintes-Marie-de-la-mer) and attained further the towns of Marseilles and Aix-en-Provence.

Some relics (cranium, bones and hairs) of the presumed Maria-Magdalena were kept in the Saint-Maximin basilica, where a large lock of Maria-Magdalena's hair is kept in a dedicated reliquary. We have obtained some hairs from this lock, for scientific purposes (microscopic examinations and

chemical analyses). We have published these last years the mitochondrial DNA haplogroup found by extracting genomic DNA from the bulb of hair number 10 (Lucotte, 2016), the explanation of the brown-red observed colour of the hairs by scanning electron microscopic characterisation of its melanosomes (Lucotte & Thomasset, 2017a), the description of some fennel rests on or at the vicinity of some of these hairs (Lucotte et al., 2018) and marine micro-remains loaded on the hairs (Lucotte et al., 2019).

In the present study, we describe and analyse silver and gold metallic deposits on some of these hairs, by SEM (Scanning Electron Microscopy) and EDX (Energy Dispersive X-ray spectroscopy) analysis.

2. Material and Methods

The material is ten of the lock of Maria-Magdalena's hairs that were kept in the dedicated reliquary located in the Saint-Maximin basilica. These hairs, numbered 1 to 10, were loaded on a sterile sticky paper for optical microscopy, SEM and EDX analysis.

All the hairs were examined in confocal stereoscopic micrography. The SEM apparatus used for metallic deposits observations is the FEI model Quanta FEG (an environmental electron microscope apparatus). Elemental analysis of deposits was achieved by using EDX, this SEM microscope being equipped with the probe model X-flash 6/30. Both LFD (Large Field Detector) and CBS (Circular Back Scattering) were used, the last one to better detect heavy elements. Each elemental analysis is given in the form of a spectrum, with kiloelectrons/Volts (keV) on the abscissa and elemental peaks heights (cps/eV) in ordinates.

3. Results and Discussion

There are numerous particles of silver and of gold on the surface of hair numbers 1, 2, 3, 4 and 9. As an example **Figure 1** shows an optical view of some portion of hair number 2 where silver is present under the form of a longitudinal line running along all the hair border, and gold under the form of three local deposits.

3.1. Silver

Figure 2 shows a MEB photograph of some part of the longitudinal line; EDX analysis establishes that it is mainly compounded of silver (of the chloride form, which is the most stable). Two other parts of the line are shown on **Figure 3**, which are of the same elemental composition. In a fourth part of the line (**Figure 4**), the height of the chlorine peak is as elevated as that of the silver main peak.

Figure 5 shows a granulous particle (of about 3 μm of length), located on hair number 1. Elemental analysis of this particle establishes that it is compounded of a mixture of silver chloride and sulphide. **Figure 6** shows another particle, also located on hair number 1 that is of silver sulphide with gold. **Figure 7** shows another particle located on hair number 2 that is a plaque (of more than 5 μm of



Figure 1. Optical view (20×) of a portion of hair number 2. S: silver; G: gold.



Figure 2. One deposit of silver chloride on hair number 2. *Above:* SEM photograph (in CBS, 400×) of the deposit (the black point indicates the location where EDX analysis is realized). *Below:* spectrum at the black point. C: carbon; O: oxygen; S: sulphur; Cl: chlorine; Ag (three peaks): silver; Ca (two peaks): calcium.

length) of silver sulphide with some traces of copper. **Figure 8** a voluminous (of more than 150 μm of length on about 50 μm of width) rectangular plaque, located at the vicinity of some part of hair number 4, that is compounded of many parts of pure silver.



Figure 3. Two other deposits of silver chloride on hair number 2. *Above:* SEM photograph (in CBS, 1500×) of the two deposits. *Below:* spectrum at the black points.

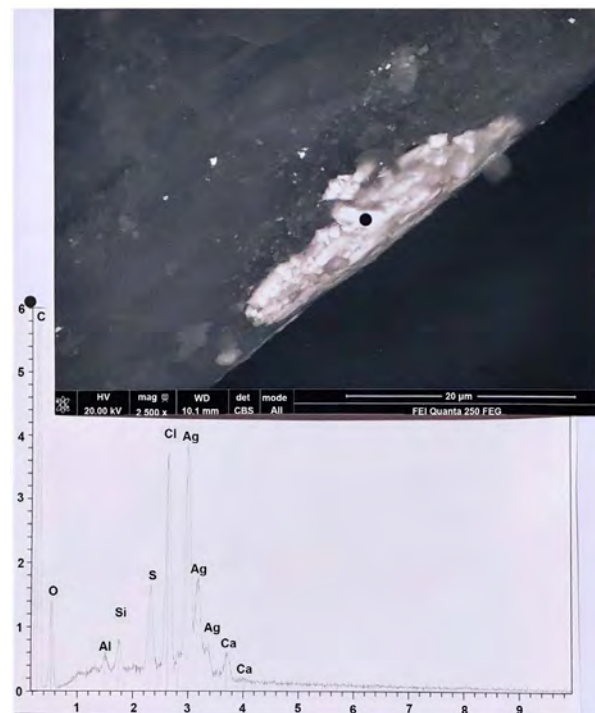


Figure 4. A fourth deposit of silver chloride on hair number 2. *Above:* SEM photograph (in CBS, 2500×) of the deposit. *Below:* spectrum at the black point. C: carbon; O: oxygen; Al: aluminium; Si: silicium; S: sulphur; Cl: chlorine, Ag (three peaks): silver; Ca (two peaks): calcium.

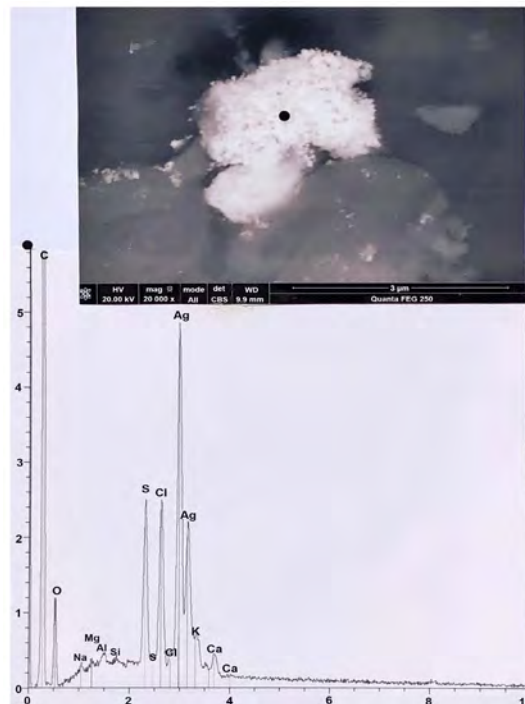


Figure 5. A particle, located on hair number 1 that is a mixture of silver chloride and sulphide. *Above:* SEM photograph (in CBS, 20000 \times) of the particle. *Below:* spectrum at the black point. C: carbon; O: oxygen; Na: sodium; Mg: magnesium; Al: aluminium; Si: silicium; S (two peaks): sulphur; Cl (two peaks): chlorine; Ag (two peaks): silver; K: potassium; Ca (two peaks): calcium.

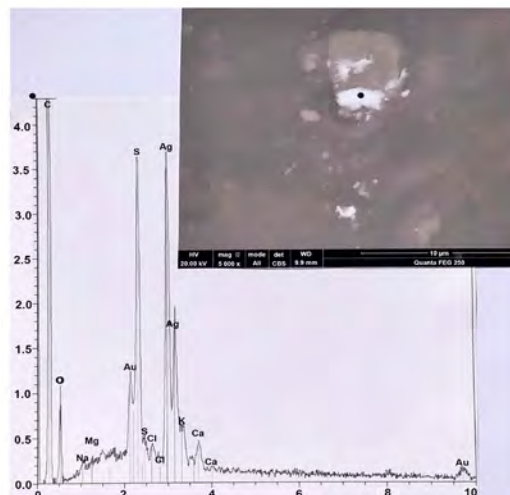


Figure 6. Another particle located on hair number 1 that is of silver sulphide with gold. *Above:* SEM photograph (in CBS, 5000 \times) of the particle. *Below:* spectrum at the black point. C: carbon; O: oxygen; Na: sodium; Mg: magnesium; Au (two peaks): gold; S (two peaks): sulphur; Cl (two peaks): chlorine; Ag (two peaks): silver; K: potassium; Ca (two peaks): calcium.

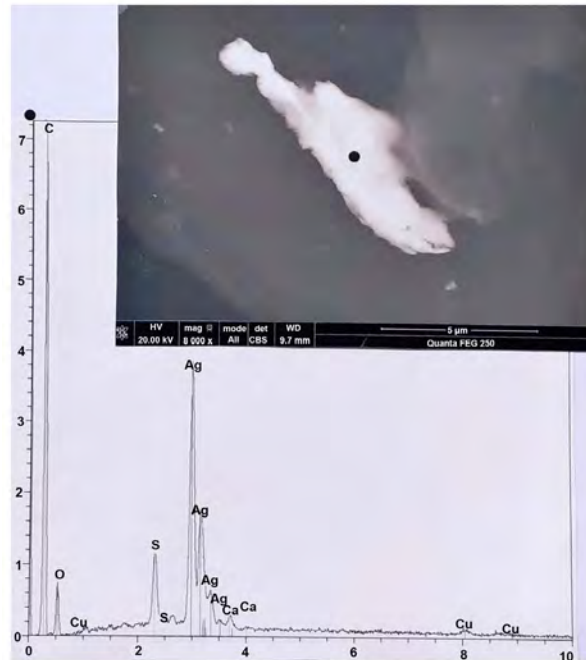


Figure 7. A plaque, located on hair number 1 that is of silver sulphide with copper. *Above:* SEM photograph (in CBS, 8000×) of the plaque. *Below:* spectrum at the black point. C: carbon; O: oxygen; Cu (three little peaks): copper; S (two peaks): sulphur; Ag (four peaks): silver; Ca (two peaks): calcium.

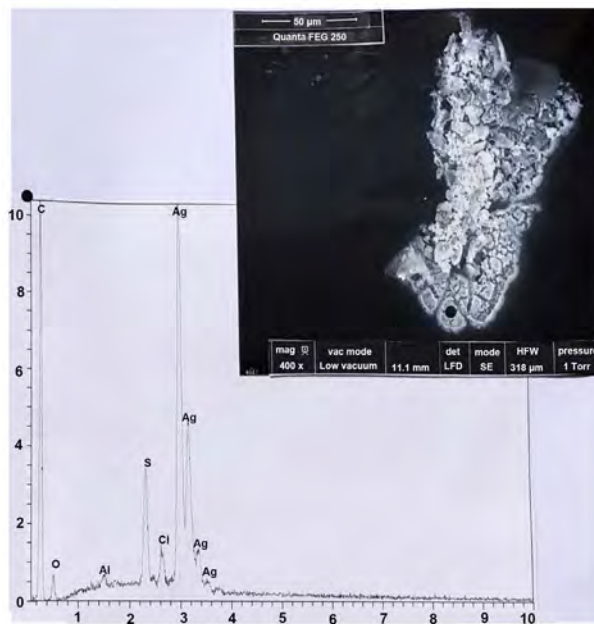


Figure 8. A voluminous plaque of pure silver, that is located at the vicinity of hair number 4. *Above:* SEM photograph (in LFD, 400×) of the plaque. *Below:* spectrum at the black point. C: carbon; O: oxygen; Al: aluminium; S: sulphur; Cl: chlorine; Ag (four peaks): silver.

3.2. Gold

Figure 9 is a SEM photograph of one of the three particles of gold, depicted on **Figure 1**, located on hair number 2; it is a multi-lobed particle of about 1.5 μm of maximal length. Its elemental analysis establishes that it is mainly compounded of gold (in fact an alloy, with 8.5% of silver and 2.2% of copper). The sulphur content in the sample is, as for all of the gold particles studied here, more elevated than that found in ancient hairs (Lucotte & Thomasset, 2017b); it is deduced that this elemental level in sulphur is mainly due to pollution. The composition of the particle located on hair number 3 (**Figure 10**) is also that of an alloy of gold, silver and copper. But in the plaque, also located on hair number 3 (**Figure 11**), the alloy is mainly of gold with traces of copper; it is also the case for a second smaller plaque (**Figure 12**), located on hair number 1, and for a third plaque (**Figure 13**), but with silver, located on hair number 1.

Figure 14 shows an example of grains of gold dust, located on hair number 9. **Figure 15** shows examples of two little particles of gold (of a gold powder), located on hair number 3. **Figure 16** shows an example of a scale of pure gold, of a relatively great size (of more than 2 μm of maximal length), which is located on hair number 9.

3.3. Copper

There is only one piece of pure copper (**Supplementary Figure 1**). It is a little plaque of this metal, located on the surface of hair number 3. Most of the copper-compounded pieces found are particle of brass: **Supplementary Figure 2** shows one of them, also located on hair number 3; there are other plaques of brass, located near hair number 6 and between hairs 9 and 10. Probably they are fragments pulled up to the metal of the reliquary. **Supplementary Figure 3** shows a group of little copper-made particles (calibrated at about 5 μm of length, and of a manufactured form), located on some part of hair number 6. Elemental analyses establish that they are particles of copper sulphate; they are powder members of a classical phytosanitary product. Such groups of copper sulphate particles occur also on two other parts of hair number 6, and on hair number 10.

3.4. Other Metallic Particles

3.4.1. Lead

There is only one piece compounded of lead (**Supplementary Figure 4**), that is located on hair number 9. It is a round (less than 5 μm) particle of composite appearance; elemental analysis establishes that it corresponds to lead phosphate, another phytosanitary product used in the past.

3.4.2. Iron

Supplementary Figure 5 shows a little white-to-electrons particle, located on the hair number 3 border. Elemental analysis establishes that it is a particle of iron oxide, a metallic industrial pollutant commonly found in all samples studied. Such pollutant commonly found in all samples studied. Such pollutant

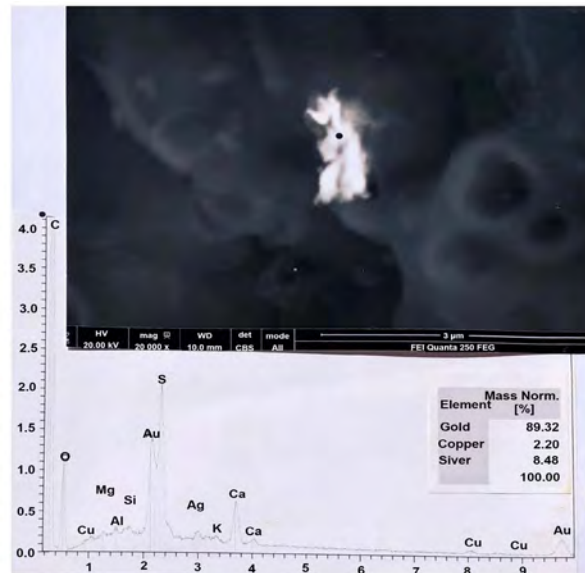


Figure 9. A particle of gold, located on hair number 2. *Above:* SEM photograph (in CBS, 20000×) of the particle. *Below:* spectrum at the black point. C: carbon, O: oxygen; Cu (three peaks): copper; Mg: magnesium; Al: aluminium; Si: silicon; Au (two peaks): gold; S: sulphur; Ag: silver; K: potassium; Ca (two peaks): calcium. Insert: relative percentages of gold, copper and silver in the alloy.

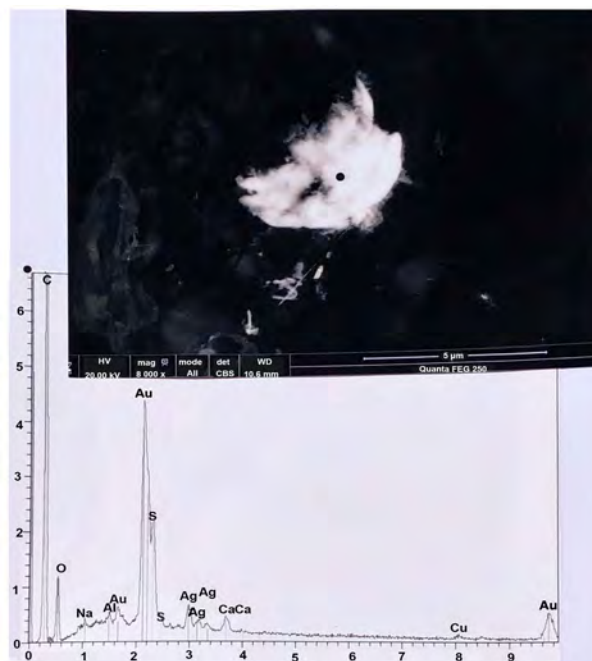


Figure 10. A particle of gold, located on hair number 3. *Above:* SEM photograph (in CBS, 8000×) of the particle. *Below:* spectrum at the black point. C: carbon; O: oxygen; Na: sodium; Al: aluminium; Au (three peaks): gold; S (two peaks): sulphur; Ag (three peaks): silver; Ca (two peaks): calcium; Cu: copper.

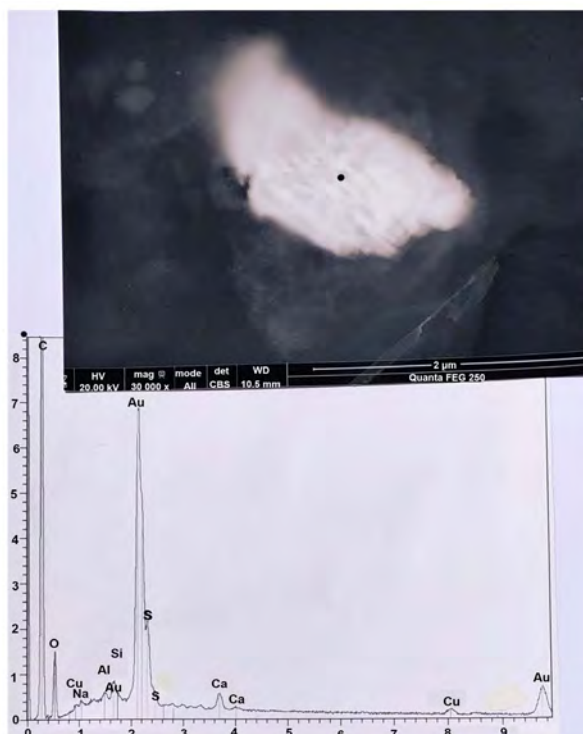


Figure 11. A plaque of gold, located on hair number 3. *Above:* SEM photograph (in CBS, 30000×) of the plaque. *Below:* spectrum at the black point. C: carbon; O: oxygen; Cu (two peaks): copper; Na: sodium; Al: aluminium; Au (three peaks): gold; Si: silicium; S (two peaks): sulphur; Ca (two peaks): calcium.

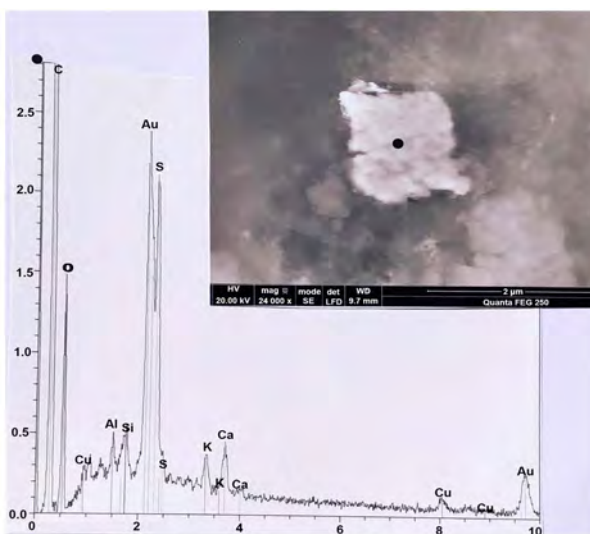


Figure 12. A second plaque of gold, located on hair number 1. *Above:* SEM photograph (in CBS, 24000×) of the plaque. *Below:* spectrum at the black point. C: carbon; O: oxygen; Cu (three peaks): copper; Al: aluminium; Si: silicium; Au (two peaks): gold; S (two peaks): sulphur; K (two peaks): potassium; Ca (two peaks): calcium.

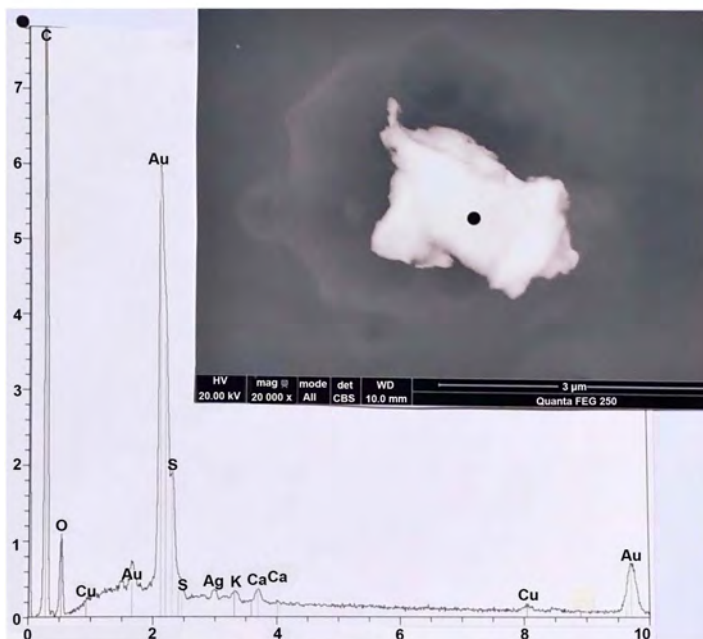


Figure 13. A third plaque of gold, located on hair number 1. Above: SEM photograph (in CBS, 20000×) of the plaque. Below: spectrum at the black point. C: carbon; O: oxygen; Cu (two little peaks): copper; Au (three peaks): gold; Ag: silver; S (two peaks): sulphur; K: potassium; Ca (two peaks): calcium.

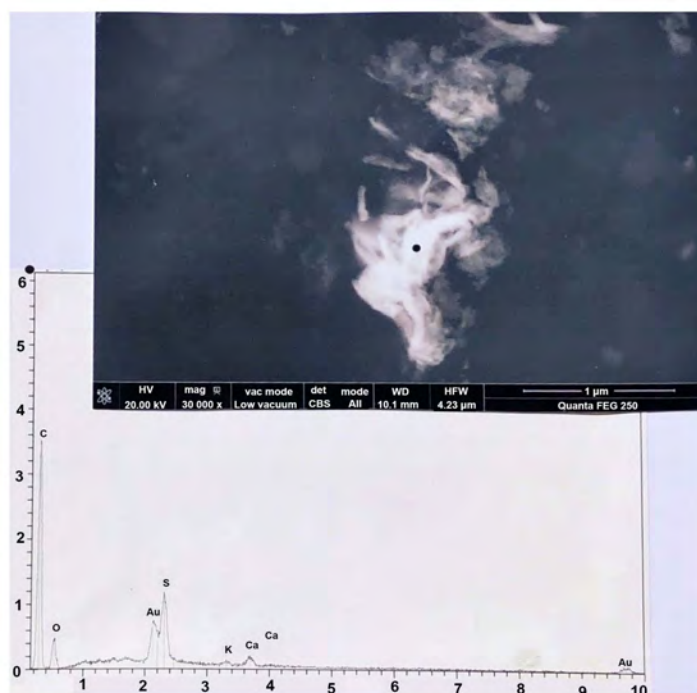


Figure 14. Grains of gold dust, on hair number 9. Above: SEM photography (in CBS, 30000×) of the dust. Below: spectrum at the black point. C: carbon; O: oxygen; Au (two peaks): gold; S: sulphur; K: potassium; Ca (two peaks): calcium.

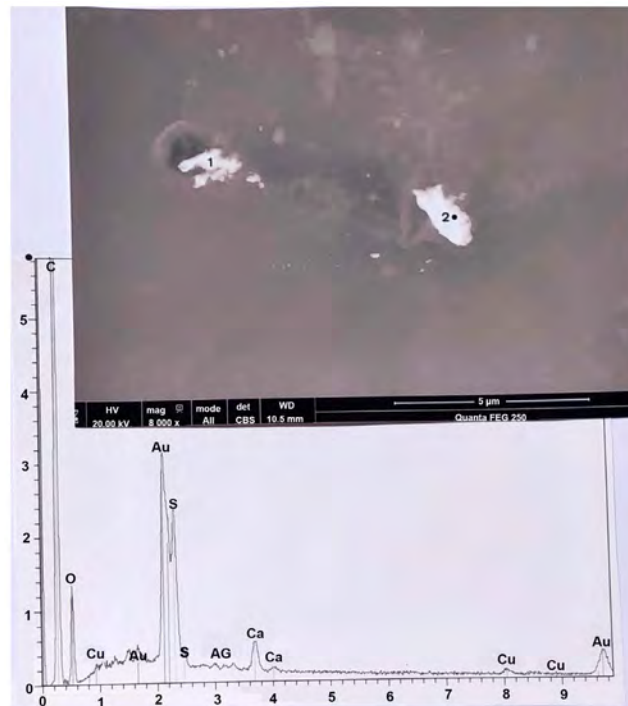


Figure 15. Two little particles of gold, on hair number 3. *Above:* SEM photograph (in CBS, 8000×) of the particles 1 and 2. *Below:* spectrum at the black point of 2. C: carbon; O: oxygen; Cu (three peaks): copper; Au (three peaks): gold; S (two peaks): sulphur; Ag: silver; Ca (two peaks): calcium.

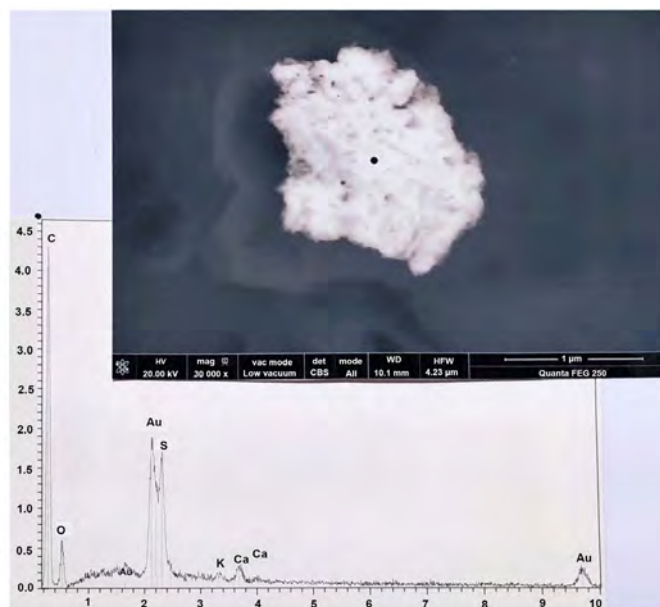


Figure 16. A scale of pure gold, located on hair number 9. *Above:* SEM photograph (in CBS, 30000×) of the scale. *Below:* spectrum at the black point. C: carbon; O: oxygen; Au (two peaks): gold; S: sulphur; K: potassium; Ca (two peaks): calcium.

particles are present in number on hairs numbers 1, 2 and 6. **Supplementary Figure 6** shows a white-to-electrons particle, located on the hair number 6 border near a transversal alteration of that hair. It is complex in form, compounded of little spherical (showing that it corresponds to some material in fusion) sub-particles. Elemental analysis establishes that it is mainly of pure iron. Such spherical sub-particles, isolated or lumped together, were found on the surfaces of hairs numbers 1, 2 and 3. There are also numerous little particles (of pure or of oxidized iron), of various forms, on all hair surfaces; they correspond to common industrial modern pollutants. **Supplementary Figure 7** shows a very little (of about 1 μm) particle, located on hair number 1. It is compounded of iron sulphate, a third common phytosanitary product. Such particles, in isolated form or in groups, are found on hair number 2, 3, 5, 9 and 10.

3.4.3. Titanium

Supplementary Figure 8 shows a rod of titanium, located on some part of hair number 3. It is compounded of titanium dioxide (TiO_2), the most common metallic pollutant after iron. Two other samples of such a rod are found on other parts of hair number 3. **Supplementary Figure 9** shows a micro-ball of titanium, located on hair number 10 (elemental analysis establishes that titanium is the metallic component of this micro-ball). This unique observation corresponds probably to a droplet of modern white colorant (of titanium), loaded on a bed of calcium carbonate.

3.4.4. Aluminium

Supplementary Figure 10 shows three micro-fragments of aluminium, located at the border of hair number 1; they caused here a local alteration of the hair surface. Elemental analysis establishes that the aluminium is of the oxidized form (it corresponds so to a modern aluminium scrop).

3.4.5. Mercury

Supplementary Figure 11 and **Supplementary Figure 12** show two micro-drops of mercury, located on hair number 1. Elemental analysis of these micro-drops shows that they are compounded of cinnabar (HgS), a red colorant used since the Middle Age to imitate blood spots (Lucotte et al., 2016). A third micro-drop of cinnabar, located on hair number 3, is shown on **Supplementary Figure 13**.

3.5. Calcium Phosphate Particles

All of the ten hairs studied have deposits of calcium phosphate on their surfaces. That is important to consider, because hydroxyapatite remains the mineral component found in ancient bones (Lucotte & Thomasset, 2017c).

In some cases the calcium phosphate deposit is very thin (**Figure 17**); but often this thin deposit is arranged in longitudinal line running along the hair surface (**Figure 18**). Locally the calcium phosphate deposit can also be thick (with more mineral matter contained in its), constituting a bone scale with acute borders (**Figure 19**).



Figure 17. An example of a thin deposit of calcium phosphate, located in some part of hair number 3. *Above:* SEM photograph (in CBS, 1000 \times) of the deposit (1-3: calcite particles). *Below:* spectrum at the black points. C: carbon; O: oxygen; Na: sodium; P: phosphorous; S (two peaks): sulphur; K: potassium; Ca (two peaks): calcium.

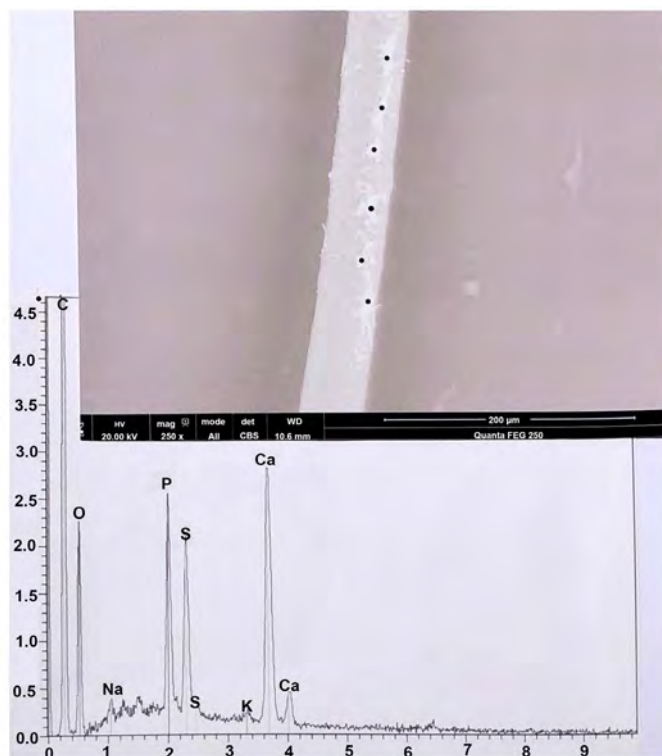


Figure 18. Longitudinal line of six calcium phosphate deposits in another part of hair 3. *Above:* SEM photograph (in CBS, 250 \times) of the line. *Below:* spectrum at the black points. C: carbon; O: oxygen; Na: sodium; P: phosphorous; S (two peaks): sulphur; K: potassium; Ca (two peaks): calcium.



Figure 19. Example of a bone scale (in another part of hair 3). *Above:* SEM photograph (in CBS, 2400×) of the bone scale. *Below:* spectrum at the black point. C: carbon; O: oxygen; Na: sodium; Mg: magnesium; Al: aluminium; Si: silicium; P: phosphorous; S (two peaks): sulphur; K: potassium; Ca (two peaks): calcium.

In other cases the bone scales appear clearly as loaded on the hair surface (**Figure 20**). The most extreme situation of osseous scale loading is represented on **Figure 21**: a voluminous (of more than 50 µm of maximal length) scale of calcium phosphate, very thick and longitudinally fragmented.

In summary, I found on the hairs numerous particles of silver and gold, but also some metallic particles of copper, lead, iron, titanium, aluminium and mercury. All the hairs have deposits of calcium phosphate on their surfaces.

Table 1 summarizes all the observations on calcium phosphate deposits on each hair studied. That suggests a previous close and prolonged contact between these hairs and some bone. We have a representation (**Figure 22**) of the ancient (since 1283 to 1793) bust-reliquary of Maria-Magdalena: that is a bust of gold, where her cranium was loaded; the cranium, with adhering hairs, was surmounted by a crown of gold (that of Charles 1^{er} d'Anjou). In this 1283 reliquary, hairs framed the cranium. It is probable that calcium phosphate deposits observed result from narrow contact (during about fifty centuries) of hairs adhering to the cranium.

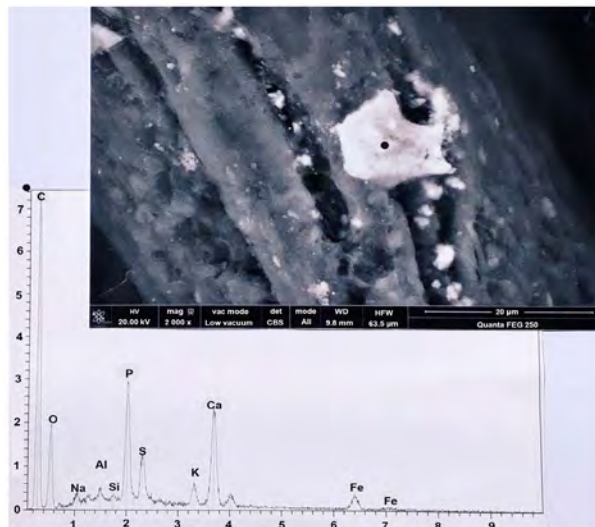


Figure 20. A bone scale, located on hair number 6. *Above:* SEM photograph (in CBS, 2000×) of the scale. *Below:* spectrum at the black point. C: carbon; O: oxygen; Na: sodium; Al: aluminium; Si: silicium; P: phosphorous; S: sulphur; K: potassium; Ca (two peaks): calcium; Fe (two peaks): iron.

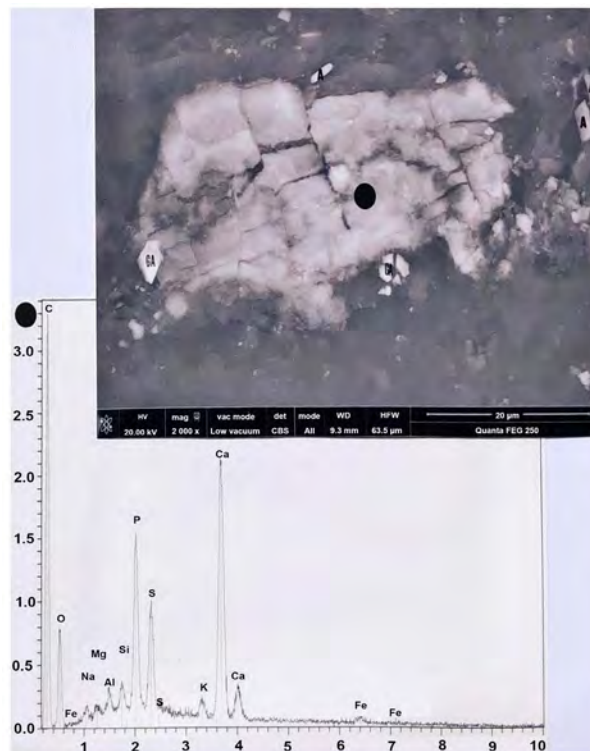


Figure 21. A thick plaque of bone, located on hair number 9. *Above:* SEM photograph (in CBS, 2000×) of the plaque. A: aragonite particles; CA: calcite particles. *Below:* spectrum at the black point. C: carbon; O: oxygen; Fe (three little peaks): iron; Na: sodium; Mg: magnesium; Al: aluminium; Si: silicium; P: phosphorous; S (two peaks): sulphur; K: potassium; Ca (two peaks): calcium.



Figure 22. The ancient (since 1283) bust-reliquary of Maria-Magdalena. N: golden mask; L: crown of gold; R: bust-reliquary of gold (source: collection Lallemand de Betz; Bibliothèque Nationale de France, Paris).

Table 1. Calcium phosphate deposits found on hairs.

Hair number	Different sorts	Corresponding figures
1	<ul style="list-style-type: none"> • a thin deposit • a thick deposit 	
2	<ul style="list-style-type: none"> • a thick deposit 	
3	<ul style="list-style-type: none"> • a thin deposit • four thin deposits arranged longitudinally • a thin deposit • four thick deposits arranged longitudinally • two thin deposits • Four thin deposits • six thin deposits arranged longitudinally • a trail of thin deposits • a thin deposit • a bone scale 	<p>Figure 17 Figure 18 Figure 19</p>
6	<ul style="list-style-type: none"> • a thin bone scale • a thick bone scale 	Figure 20
7	<ul style="list-style-type: none"> • three thick deposits arranged longitudinally 	
9	<ul style="list-style-type: none"> • two thin deposits • a thick plaque 	Figure 21

Table 2 summarizes all the observations of gold particles on hairs. Probably most of them (particularly those that are of pure gold) are due to close contact between hairs and the gold of the bust-reliquary and that of the crown.

Silver particles (**Table 3**) are more difficult to explain. But we know (Franzoni, 2016) that Maria-Magdalena's remains were initially (since 1281) kept in a

Table 2. Gold deposits found on hairs.

Hair number	Different sorts	Corresponding figures
1	<ul style="list-style-type: none"> • a plaque of gold alloy (Au/Ag) • Four little particles of a gold powder • two little particles of a gold powder • two little particles of a gold alloy (Au/Ag/Cu) powder • a second plaque of gold alloy (Au/Ag/Cu) 	<p>Figure 12 Figure 13</p>
2	<ul style="list-style-type: none"> • three little particles of a gold alloy (Au/Ag/Cu) powder • a little poly-lobed particle of a gold alloy (Au/Ag/Cu) • six little particles of a gold powder 	Figure 9
3	<ul style="list-style-type: none"> • a particle of gold alloy (Au/Ag/Cu) • a plaque of gold alloy (Au/Cu) • two particles of gold alloy (Au/Ag/Cu) • three particles of a gold alloy (Au/Ag/Cu) of a powder 	<p>Figure 10 Figure 11 Figure 15</p>
9	<ul style="list-style-type: none"> • a little plaque of pure gold • grains of pure gold dust • a particle of pure gold 	<p>Figure 14 Figure 16</p>

Table 3. Silver deposits found on hairs.

Hair number	Different sorts	Corresponding figures
1	<ul style="list-style-type: none"> • a particle that is a mixture of silver sulphide and chloride • a particle of silver sulphide and gold • a plaque of silver with copper • a granulous particle of silver sulphide • a little particle of silver sulphide 	<p>Figure 5 Figure 6 Figure 7</p>
2	<ul style="list-style-type: none"> • a little particle of silver sulphide • about fifteen particles of silver sulphide arranged among the longitudinal axis of the hair • one plaque of silver chloride on the border of the hair • two plaques of silver chloride on the border of the hair • one plaque of silver chloride on the border of the hair 	<p>Figure 2 Figure 3 Figure 4</p>
3	<ul style="list-style-type: none"> • a little plaque of silver sulphide • a particle of silver sulphide/chloride • many little plaques of silver sulphide (with copper traces), arranged longitudinally • two little plaques of silver sulphide • eight little plaques of silver sulphide arranged longitudinally • a turmoiled little particle of silver sulphide 	
4	<ul style="list-style-type: none"> • a large plaque of pure silver 	Figure 8
9	<ul style="list-style-type: none"> • two little plaques of silver sulphide • one little pile of particles of silver sulphide, with copper 	

silver reliquary; possibly some of the silver particles observed on hairs were due to initial contact with the inner side of the reliquary.

4. Conclusion

We observed on all hairs studied many deposits of calcium phosphate. Their

forms differ: sometimes it is a very thin layer of calcium phosphate loaded on the surface of the hairs; but it can be a thicker deposit, with visible borders. Sometimes they consist of plaques of calcium phosphate that mimic a true osseous structure. The trails of calcium observed are often arranged in longitudinal lines along the hair corpus.

Such observations indicate a previous close contact between hairs and some bone. We know that hairs covered cranium in the historical (between 1283 and 1793) bust-reliquary (see **Figure 22**) where Maria-Magdalena remains were kept. It is during this long time period that the hydroxyapatite of the cranium loaded on hairs.

Because the bust-reliquary was of gold (and also the crown that covered hairs), some of the gold plaques observed on some hairs (particularly those that are of pure gold, like that of **Figure 16**) can be detached among time from the gold of the bust-reliquary to the hair surface. Generally, gold particles deposited on hairs are made of an alloy of gold with little amounts of silver and copper.

The numerous plaques or silver sulphide (or/and chloride) observed at the surface of some hairs are more difficult to explain; often these plaques are also orientated in longitudinal lines along the hair surface. Because we know that the initial (since 1281) reliquary where the Maria-Magdalena remains were kept was of silver, we suppose that some of the silver plaques observed (particularly those that are of pure silver, like that of **Figure 8**) were also detached among time from the silver of the inner side of this reliquary.

Other metallic particles observed at the hair surfaces are in fact explained as residues of deposits from the current reliquary, or as traces of phytosanitary products or colorants, or as modern industrial metallic pollutants.

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We thank F. Racine, the priest of Saint-Maximin-la-Sainte-Baume, who furnished Maria-Magdalena's hairs. Thank you also to T. Thomasset (UTC of Compiègne) for his assistance on the SEM. The present article is a development of some part of the conference I have pronounced at the Saint-Maximin-basilica on the 23rd of July 2016.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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Supplementary Figures



Figure S1. A plaque of copper, located on hair number 3. *Above:* SEM photograph (in CBS, 8000×) of the plaque. *Below:* spectrum at the black point. C: carbon, O: oxygen; Cu (three peaks): copper; Al: aluminium; S (two peaks): sulphur; Cl: chlorine; Ca (two peaks): calcium.



Figure S2. A plaque of brass, located on hair number 3. *Above:* SEM photograph (in CBS, 4000×) of the plaque. *Below:* spectrum at the black point. C: carbon; O: oxygen; Cu (three peaks): copper; Zn (three peaks): zinc; Na: sodium; Al: aluminium; Si: silicon; S (two peaks): sulphur; Ca (two peaks): calcium.

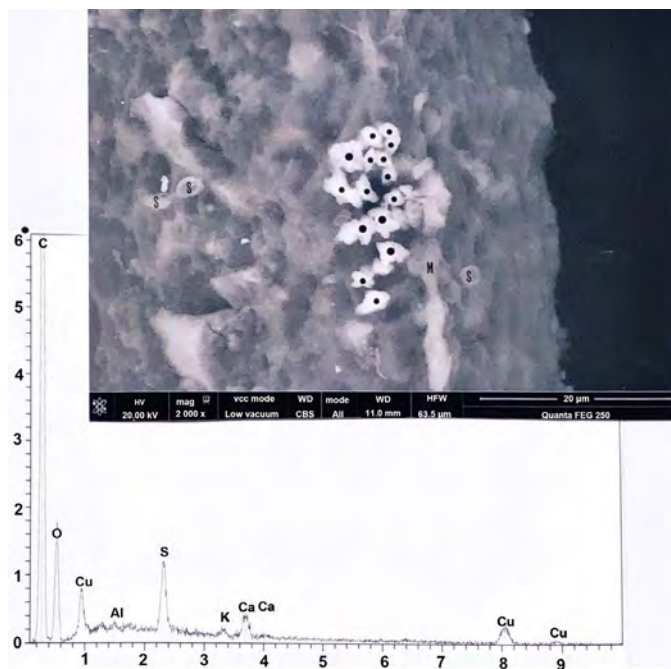


Figure S3. Particles of copper sulphate, located in one part of hair number 6. *Above:* SEM photograph (in CBS, 2000×) of the group of particles (m: mycelium; s: spores). *Below:* spectrum at the black points. C: carbon; O: oxygen; Cu (three peaks): copper; Al: aluminium; S: sulphur; K: potassium; Ca (two peaks): calcium.

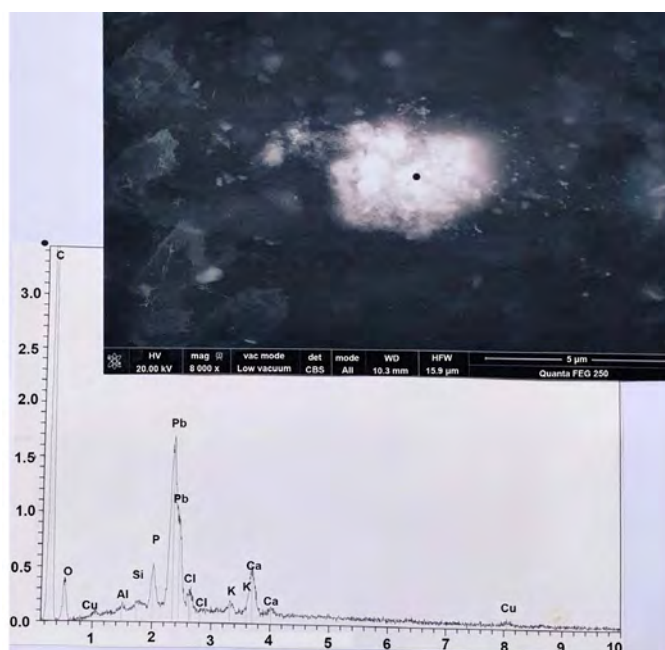


Figure S4. A particle of lead phosphate, located on hair number 9. *Above:* SEM photograph (in CBS, 8000×) of the particle. *Below:* spectrum at the black point. C: carbon; O: oxygen; Cu (two peaks): copper; Al: aluminium; Si: silicium; P: phosphorous; Pb (two peaks): lead; Cl (two peaks): chlorine; K (two peaks): potassium; Ca (two peaks): calcium.

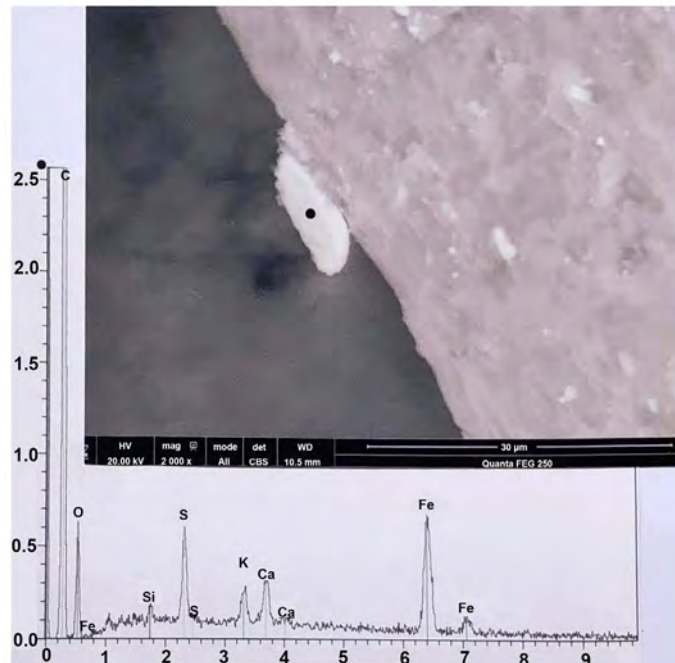


Figure S5. A particle of iron oxide, located on the border of hair number 3. *Above:* SEM photograph (in CBS, 2000×) of the particle. *Below:* spectrum at the black point. C: carbon; O: oxygen; Fe (three peaks): iron; Si: silicium; S (two peaks): sulphur; K: potassium; Ca (two peaks): calcium.

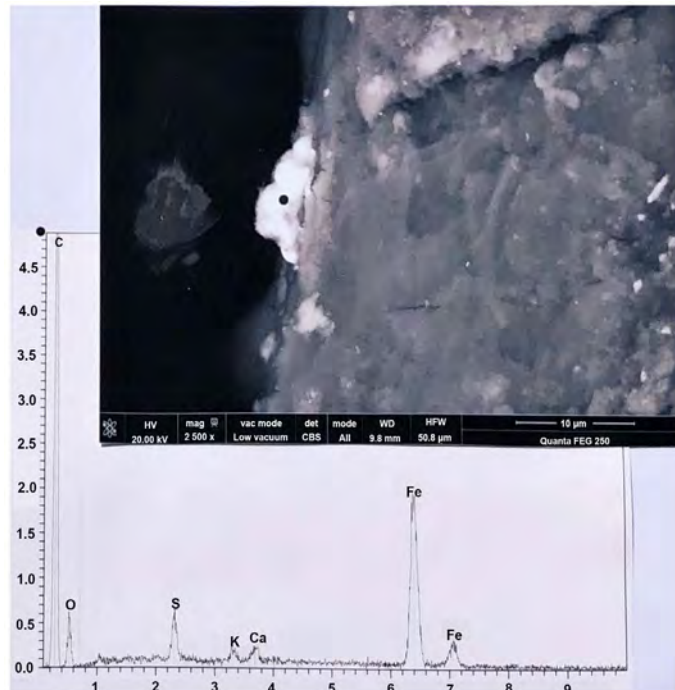


Figure S6. Particles of iron, located at the border of hair number 6. *Above:* SEM photograph (in CBS, 2500×) of the group of particles. *Below:* spectrum at the black point. C: carbon; O: oxygen; S: sulphur; K: potassium; Ca: calcium; Fe (two peaks): iron.

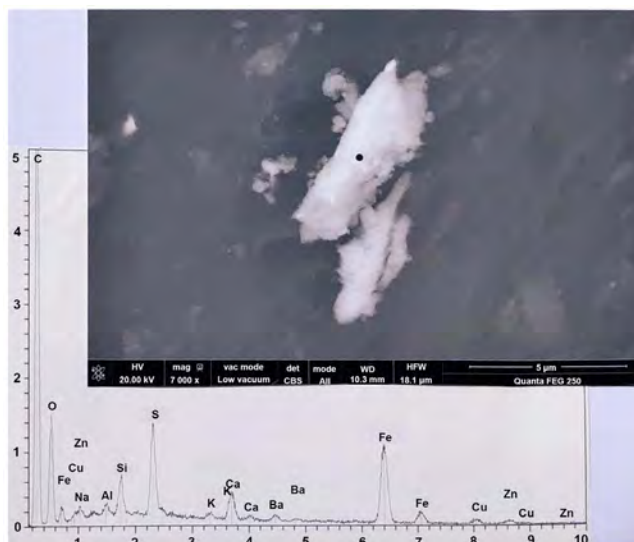


Figure S7. A particle of iron sulphate, located on hair number 1. *Above:* SEM photograph (in CBS, 5000×) of the particles (**4**: particle of iron sulphate; **3**: particle of copper sulphate; **5**: two particles of calcite). *Upper spectrum* (that of particle **4**). C: carbon; O: oxygen; Fe (three peaks): iron; Na: sodium; Mg: magnesium; Al: aluminium; Si: silicium; S (two peaks): sulphur; K: potassium; Ca (two peaks): calcium. *Lower spectrum* (that of particle **3**). C: carbon; O: oxygen; Cu (three peaks): copper; Na: sodium; Mg: magnesium; Al: aluminium; S (two peaks): sulphur; K: potassium; Ca (two peaks): calcium; that spectrum corresponds to a particle of copper sulphate.

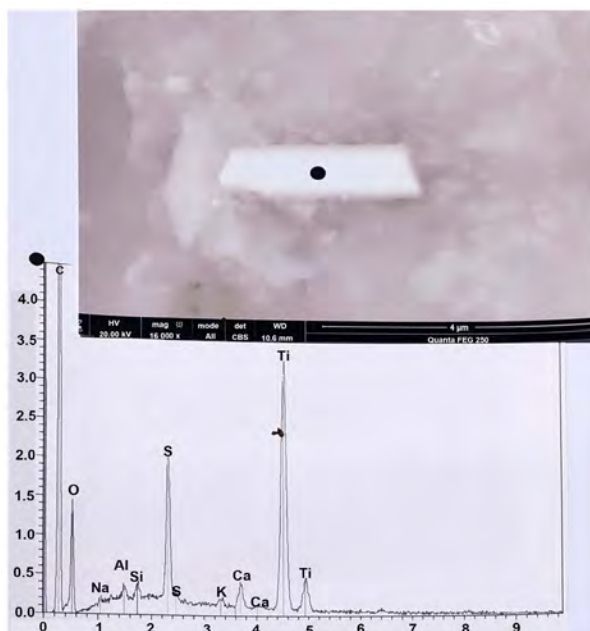


Figure S8. A rod of titanium, located on hair number 3. *Above:* SEM photograph (in CBS, 16000×) of the rod. *Below:* spectrum at the black point. C: carbon; O: oxygen; Na: sodium; Al: aluminium; Si: silicium; S (two peaks): sulphur; K: potassium; Ca (two peaks): calcium; Ti (two peaks): Titanium.

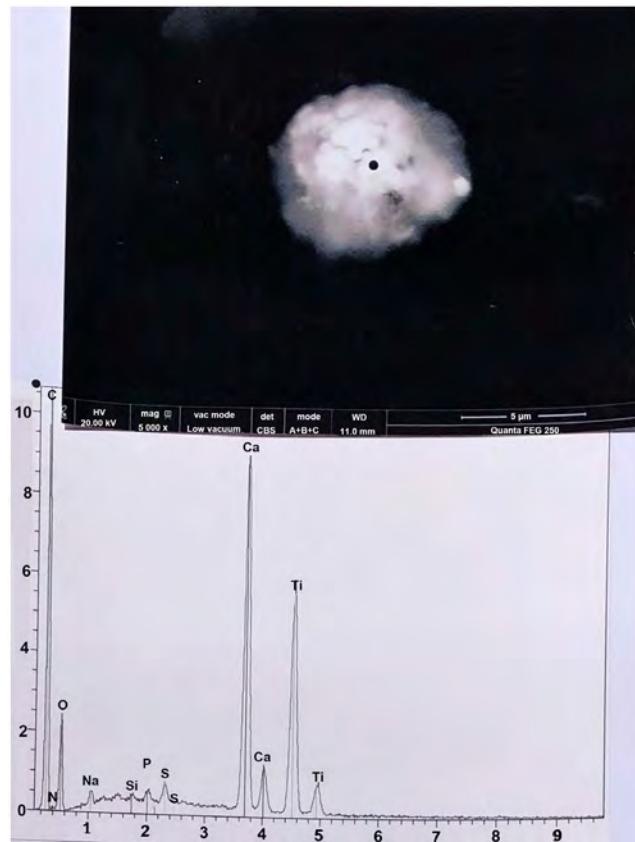


Figure S9. A micro-ball of titanium, located on hair number 10. *Above:* SEM photograph (in CBS, 5000×) of the micro-ball. *Below:* spectrum at the black point. C: carbon; N: nitrogen; O: oxygen; Na: sodium; Si: silicium; P: phosphorous; S (two peaks): sulphur; Ca (two peaks): calcium; Ti (two peaks): titanium.

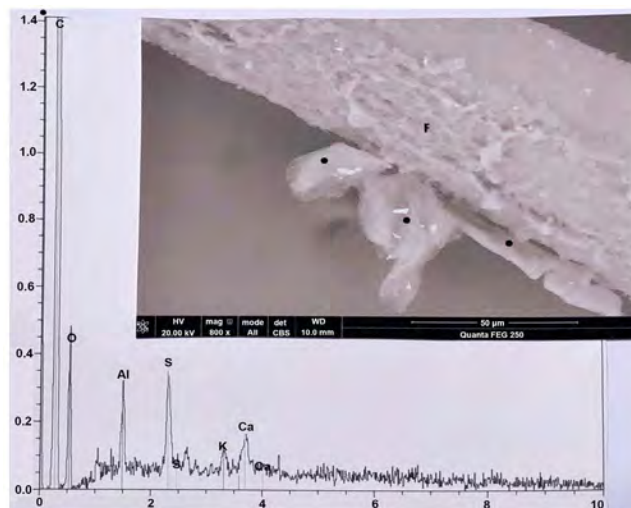


Figure S10. Micro-fragments of aluminium, located at the border of hair number 1. *Above:* SEM photograph (in CBS, 800×) of the three micro-fragments (F: weakened zone of the hair). *Below:* spectrum of the micro-fragments. C: carbon; O: oxygen; Al: aluminium; S (two peaks): sulphur; K: potassium; Ca (two peaks): calcium.

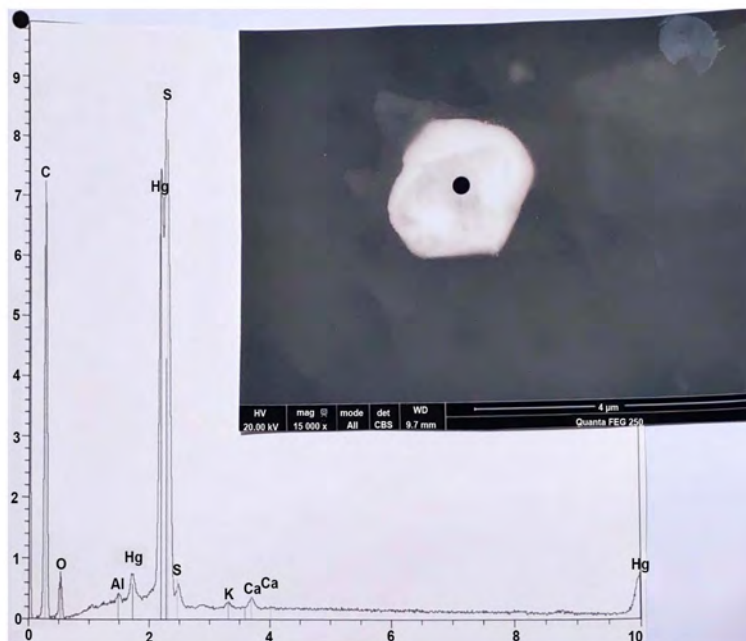


Figure S11. A first micro-drop of mercury, located on hair number 1. *Above:* SEM photograph (in CBS, 15000×) of the micro-drop. *Below:* spectrum at the black point. C: carbon; O: oxygen; Al: aluminium; Hg (three peaks): mercury; S (two peaks): sulphur; K: potassium; Ca (two peaks): calcium.

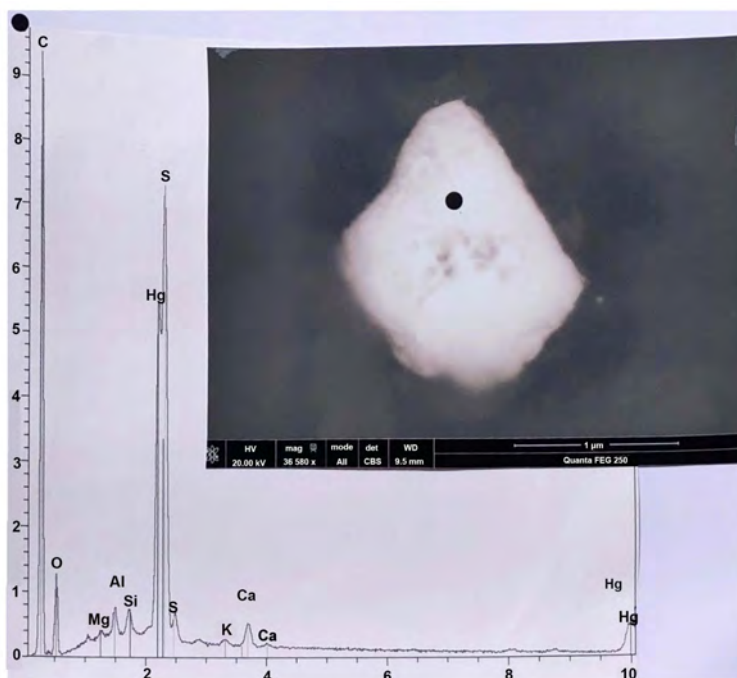


Figure S12. A second micro-drop of mercury, located on hair number 1. *Above:* SEM photograph (in CBS, 36580×) of the microdrop. *Below:* spectrum at the black point. C: carbon; O: oxygen; Mg: magnesium; Al: aluminium; Si: silicon; Hg (two peaks): mercury; S (two peaks): sulphur; K: potassium; Ca (two peaks): calcium.

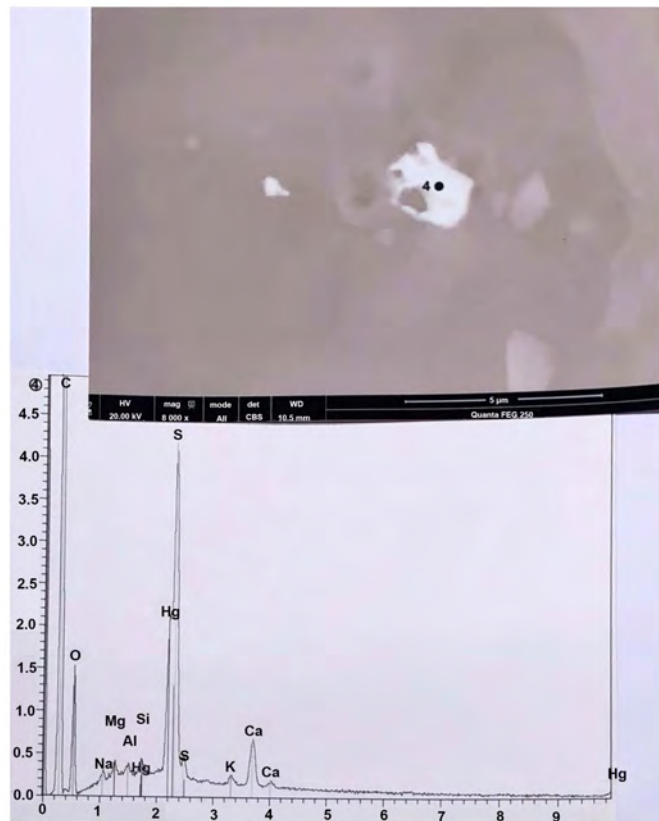
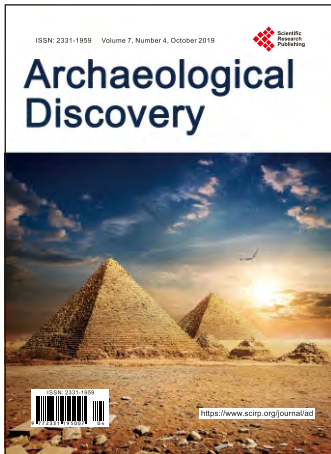


Figure S13. A third micro-drop of mercury, located on hair number 3. *Above:* SEM photograph (in CBS, 8000×) of the micro-drop (4: the micro-drop). *Below:* spectrum of 4. C: carbon; O: oxygen; Na: sodium; Mg: magnesium; Al: aluminium; Hg (three peaks): mercury; Si: silicon; S (two peaks): sulphur; K: potassium; Ca (two peaks): calcium.



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