International Journal of Sciences

Research Article Volume 12 – July 2023 (07)

The RUSI Mask is an Authentic Replicate of the Original Death Mask of Napoléon

Gérard Lucotte[1]✎, Frans Jullien[2], Thierry Thomasset[3]

[1]Institute of Molecular Anthropology, Paris, France
[2]Museum of Natural History, Paris, France
[3]Laboratory of Physico-Chemistry. UTC, Compiègne, France

Abstract: *Objective*: We report here results obtained concerning the authenticity of the Napoléon's RUSI death mask of Napoléon. *Methods*: mtDNA analyses of three hairs included in the plaster of the inter eyebrowed region of the mask, and SEM-EDX analyses of the plaster, of the pencil lead used for the inscription and of the hairs are realized. *Results*: the plaster of the mask is of "plâtre de Paris" and the pencil lead is of soft graphite. The three hairs studied showed the presence of the 16184T mutation of the mtDNA; that confirms that the RUSI mask is an authentic replicate of the original death mask of Napoléon.

Keywords: mtDNA Sequences, 16184T Mutation, Napoléon RUSI death mask, SEM-EDX Analyses

It is the baron Eugène de Veauce who signalled to the French audience the existence of the RUSI mask [**1**], named at the beginning as the "death mask of Napoléon". That mask contains, at its interior, the inscription "L'Empereur Napoléon Saint Helena". De Veauce had seen this mask (in 1952), at the Royal United Service Museum (in London) and described it as a "mask of very fine plaster, of a striking realism" ; but he denigrated that it was the true death mask of Napoléon.

This mask was acquired by the Royal United Service Museum in August 1939 (The Times, 5 August 1939) ; the corresponding press extract indicated that it was some part of the prestigious collection of Essling ; in fact the mask was – some times ago – a deposit to the museum to Mr and Mrs C.H.L. Alder.

De Veauce investigated about the mask and visited Charles Alder. According to him, he acquired the mask – together with other napoleonian relics – from Mr Louis-Charles de Bourbon, who declared that he had bought it from Victor Masséna, pince of Essling "between 1896 and 1910". In his 1964 article [**2**], de Veauce wrote "André Masséna, son of Victor Masséna, declared that this mask was not in the collections of his father". In his second book [**3**], in 1971, de Veauce indicated that Louis-Charles de Bourbon was in fact "a swindler whose true name was William Reeves". Consequently, de Veauce alerted at that time the Pr Félix Markham (an eminent specialist of the Napoléon period) and the mask was declared as a false and remote from the window where it was laced in the London Museum.

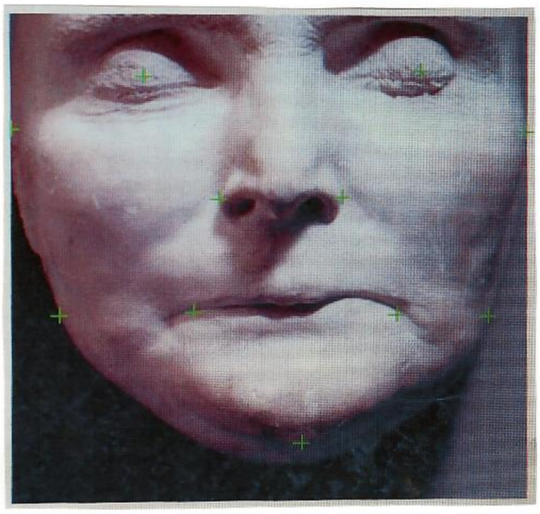
The RUSI mask was finally sold in 1986 to an American surgeon, the Dr Corso, and was sold again in 2004 at New York to a Franco-American, Mr Dimitri Jodidio.

The goal of the present article is to test the authenticity of the RUSI mask. One of us (G.L.) had the opportunity, in February 2014, to see this mask in real ; he photographed it and took on its surface samples of plasters corresponding to some part of the inscriptions containing fibers and hairs. The samples were then loaded on dedicated sticky-tapes, for observations and analyses.

Material and Methods.

Facial photograph of the mask (**Figure 1**) was studied using an improvement of the FaceGen program (http://en-wikipedia.org/wiki/FaceGen). Left profile of the mask was compared to that of a drawing of Napoléon on his death bed (**Figure 2**).

Figure 1 : Photograph of the face of the mask and indications of the places (green cross) of the eleven points used for the FaceGen program.



Published at: http://www.ijsciences.com/pub/issue/2023-07/
DOI: 10.18483/ijSci.2696; Online ISSN: 2305-3925; Print ISSN: 2410-4477

✎ Gérard Lucotte (Correspondence)
☎ 06 98 82 92 61

Figure 2 : The golden frame containing the drawing (by Marchand) of the left profile of Napoléon on his death bed.

Plaster under the r letter of the writing was first photographed in optic, using a confocal binocular microscope.

The two plaster samples (interior and exterior) and all the fibers detected were studied by SEM (Scanning Electron Microscopy) – EDX (Energy Dispersive X-ray analysis). The SEM apparatus used was a Philips XL 30 instrument (an environmental version) ; GSE (Gaseous Secondary Electrons) and BSE (Back Scattered Electrons) procedures are used, the last one to detect heavy elements.

Elemental analysis for each sample were realized by EDX, this SEM microscope being equipped with a Bruker probe AXS-EDX (the system analysis is PGT ; spirit model of Princeton Gamma Technology).

Each elemental analysis is given in the form of a spectrum, with kiloelectrons / Volts (ke/V) on the abscissa and elemental peak heights in ordinates.

DNA extraction from the bulbar follicule (bulbar piece : bp) of hair number **3** was conducted using a standard method (0.5 M EDTA, sarcosyl 20% and proteinase K (NucleoSpin® kit ; Macherey-Nagel, Duren, Germany), in accordance with the manufactured instructions.

The mtDNA (mitochondrial DNA) genomic sequence interval of the HyperVariable Sequence 1 (HVS1) from positions 15,991 to 16,390 was amplified by PCR with primers F15971 and R16410. For each PCR, the DNA extract from bp was amplified in a 12.5 µl reaction mixture (2 mM MgCl2, 50 mM KCl, 10 mM Tris/HCL pH = 9, 1% Triton X-100, 0.2 mM of each DNTPs, 0.1 µm of each primer) and 2.5 U of DNA polymerase (Ampli Taq Gold ; Applied Biosystems, Foster City, CA, USA). The amplification was carried out with an initial denaturation step at 95°C for 6 min., followed by 35 cycles at 95 °C for 1 min and 72°C for 1 min.

PCR products were purified from agarose gel (QIA Quick PCR purification kit, Valencia, Ca, USA). Both strands of us all the amplified mtDNA fragments eluted from agarose gel slices were directly sequenced (Big Dye Terminator Cycle Sequencing kit, Applied Biosystems). The sequences obtained were aligned against the Revised Cambridge Reference Sequence, to identify polymorphic sites. Seqscape software (Applied Biosystems) and Clustal Analysis were used for pairwise alignments.

Results

Results obtained concern : the treatment by FaceGen of the anterior face of the mask, the comparison of the left profile of the mask to that of a drawing taken on his death bed, the examination and analysis of the plaster samples taken at the interior of the mask and in the inter-eyebrowed region, those of fibers and hairs contained in the inter-eyebrowing region, and the DNA analyses of three of these hairs.

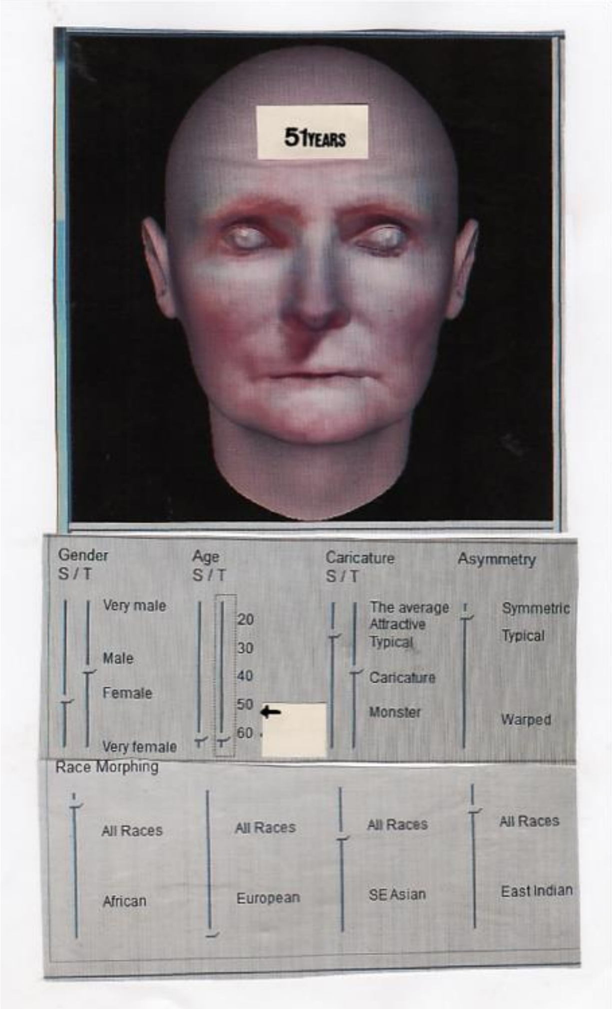
1. Analysis of the face of the mask by FaceGen.

The eleven points taken for the FaceGen analysis are : the two external zygomatics ; the two middle eyelids ; the two external nostrils ; the two corners of the mouth ; the two external points of the face outline at these levels, and the middle point of the chin tip.

Results obtained showed that the face is assymetric (a characteristic of the human face), with an European attractive pattern (both in form and texture).

Results are absurd for age, because of the usual modifications occurring on the face after death (we know that the mask was realized by Burton and Antommarchi at St Helena at least fifty hours after death). So we adjust age (Napoléon is dead at 51 years old) to a value (**Figure 3**) comprised between 50 and 60 years [**4**], and the pattern of the face is so more similar to that of the mask. Aberrant dates concerning gender (in form) can be explained by hypopituitarism Napoléon had at the end of his life.

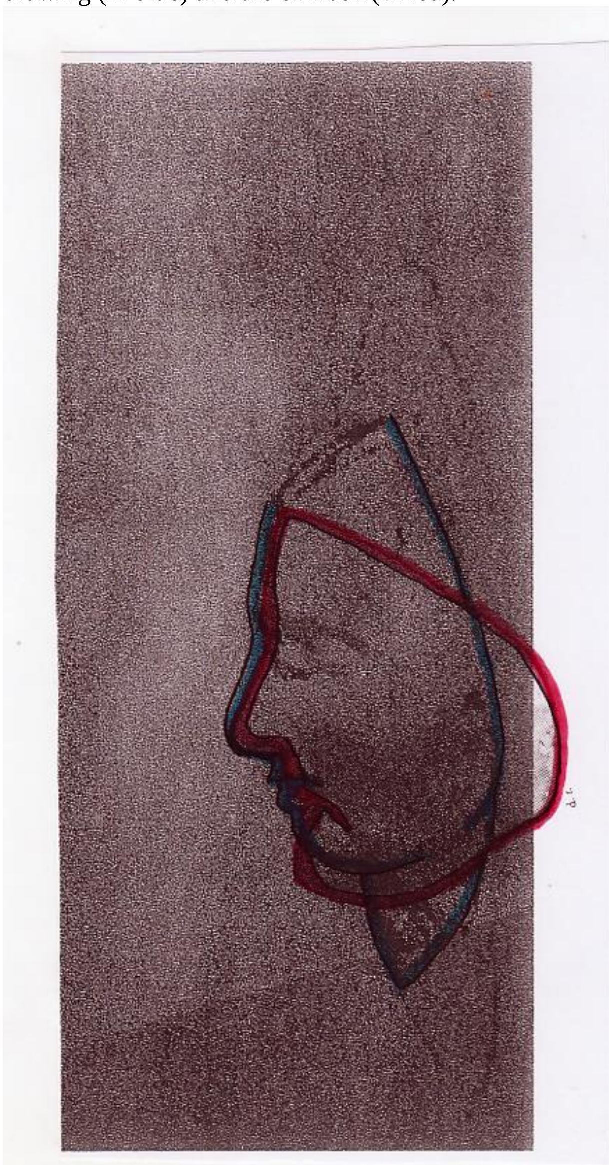
Figure 3 : Reconstructed face for an age comprised between 50 and 60 years. (the 51 years old value are indicated). *Above* : the reconstructed face. *Below* : the datas (S : form ; T : texture).



2. **Comparison between the two left profiles.**

Figure 4 shows superpositions of the left profiles from the drawing and for the mask : these two profiles are identical for the forehead, the nose root, the bone bridge and for the nostrils. The superior lip is more overhung for the drawing than for the mask ; that can be explained by the plaster application of the mask on the face during the process.

Figure 4 : Superpositions of the left profiles of the drawing (in blue) and the of mask (in red).



The mandible is more lowered in the mask than in the drawing, and the chin is more marked : probably all the lower part of the face was remodelled in the mask.

3. **Examinations and analyses at the r letter of the inscription.**

The plaster sample sample containing some part of the r letter of the inscription (the second r letter of the word "Empereur") was taken in the interior face of the mask **Figure 5** with a sterile blade during the Feb. 2014 examination.

Figure 6 is an optical photograph showing intense black traces (1-7) of the pencil lead. **Figure 7** shows SEM photographs of the same plaster piece, where the seven black dots can be seen in enlarged views. **Figure 8** shows the EDX analysis of the seventh dot ; the corresponding spectrum contains more carbon (C) and less oxygen (O) contents than those of the surrounding (corresponding to the plaster). We conclude that the pencil lead is mainly compounded of carbon.

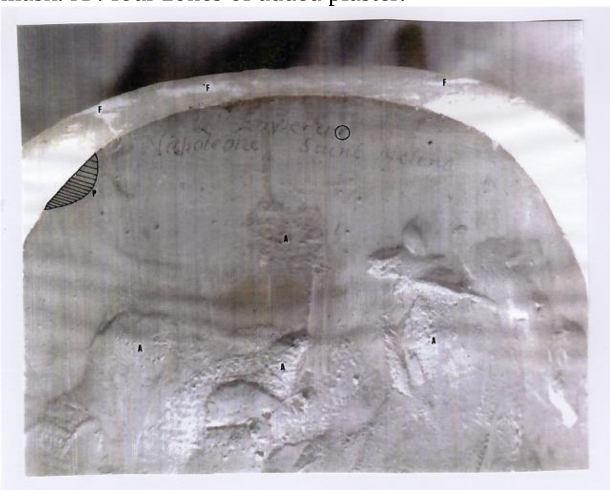


Figure 5 : Photograph of the interior face of the mask showing the inscription and places where the plaster was taken. P : zone of the taken plaster ; ® second r letter of the word Empereur, where the plaster was taken. F : three rubbing zones on the edge of the mask. A : four zones of added plaster.

Figure 6 : Optical in colours photograph (with a binocular microscope, x 75)showing one plaster piece of the mask, on which can be observed little black dots (numbered 1-7) corresponding to pencil lead fragments.

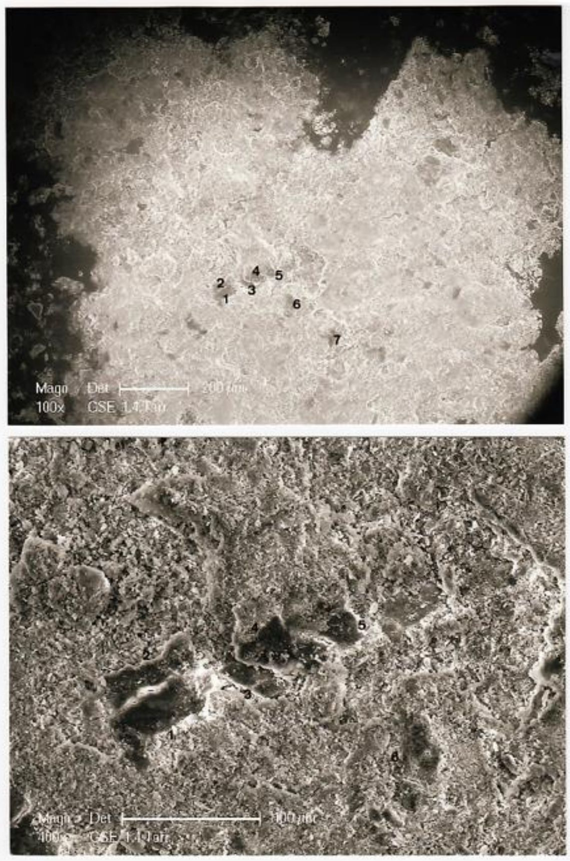
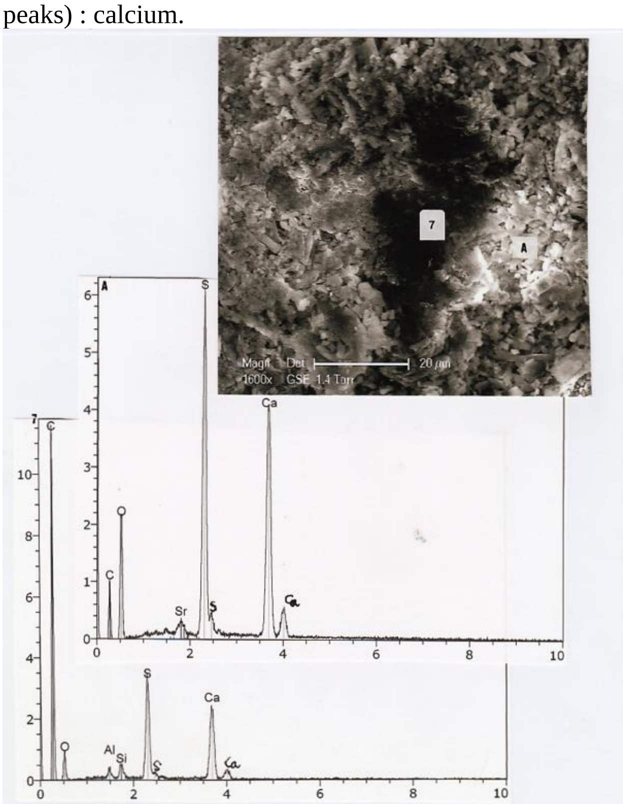


Figure 7 : SEM photographs (in GSE) of the plaster piece showing the black dots. *Above* : x100. *Below* : x 400. Numbers 1-7 correspond to the seven black dots.

Figure 8 : *Above* : SEM photograph (x1600, in GSE) of the seventh (7) dot ; A corresponds to the surrounding plaster. *Below* : spectras at A and 7. C : carbon ; O : oxygen ; Al : aluminium ; Si : silicium ; Sr : strontium ; S (two peaks) : sulphur ; Ca (two peaks) : calcium.



We know that Kaspar Faber constructed in 1760, in Stein (near Nuremberg) a pencil factory using powder of graphite as lead ; but it is his grand son (Lothar von Faber) who improved the process, in 1889, permitting the obtentions of pencil leads of different hardness. The black and fat writing at the back of the mask (favourable to a writing on a plaster material) are certainly written during the first part of the XX Century, so well after Napoléon's death time.

4. Examinations and analysis of the plaster of the back of the mask.

Further examinations give the chemical composition of the plaster of the back of the mask : **Figure 9** shows a SEM photograph of some little pieces of plaster at this level ; the corresponding spectrum shows (in decreasing order of contents) one peak of sulphur (S), one of calcium (Ca), one of oxygen (O) and one of carbon (C). The two S and Ca peaks (each double peaks) correspond to gypsum (a calcium sulphate) ; the relatively low proportion in O corresponds to the plaster (a semi-hydrated calcium sulphate of chemical formula $Ca\ SO_4\ (H_2O)\ ½$). **Figure 10** shows a greatly enhanced (x10 000) MEB photograph of the characteristic plaster spines ; one of them studied has the corresponding plaster chemical composition. **Figure 11** shows a rare particle of the plaster compounded of heavy material ; the corresponding spectrum is that of the strontium sulphate (the Celestine : $SrSO_4$).

Figure 9 : *Above* : SEM photograph (x100, in GSE) of the powder of plaster. *Below* : spectrum of a powder grain.

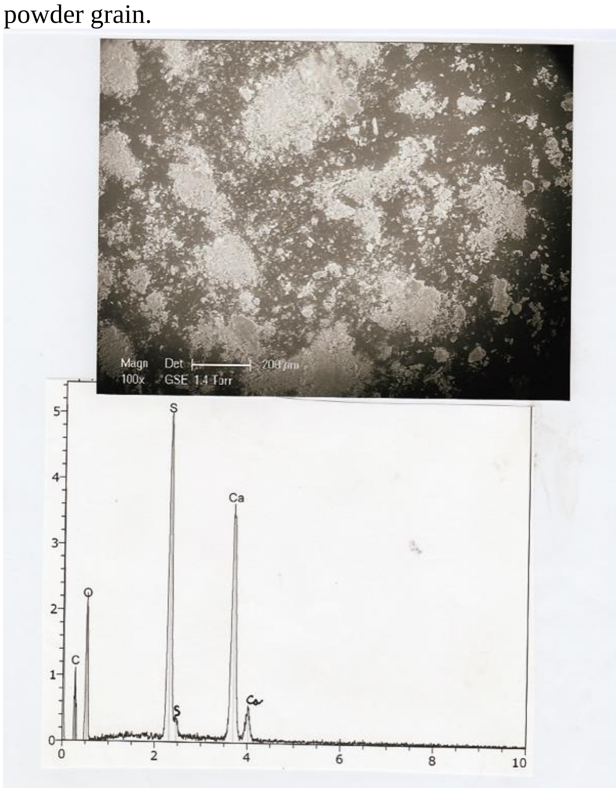


Figure 10 : *Above* : SEM photograph (x10 000, in GSE) of plaster spines. *Below* : spectrum of one (spot) of them.

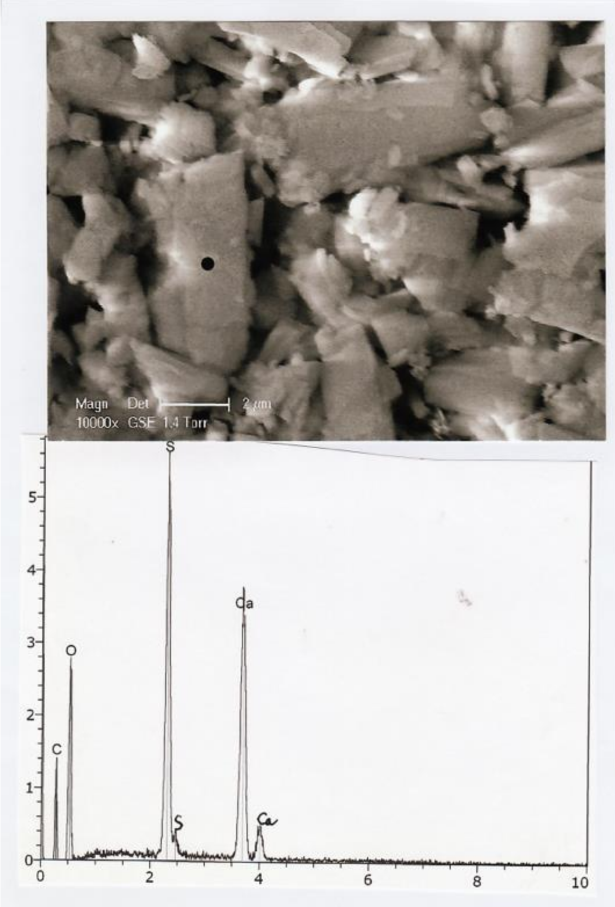
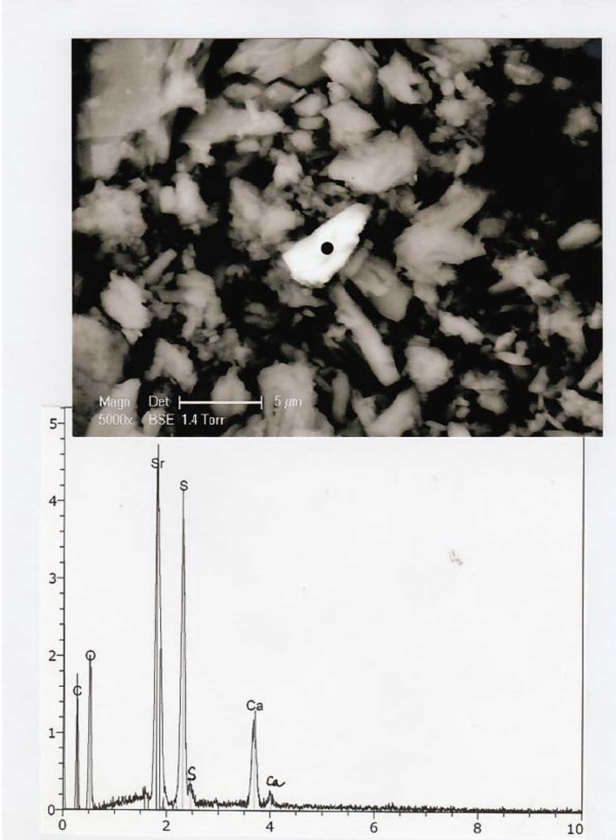


Figure 11 : *Above* : SEM photograph (x5000, in BSE) of a rare particle.
Below : spectrum of this spoted particle.



In summary, this plaster composition (of gypsum only), constituted of uniform and well formed plaster spines and with rare Celestine impurities is that of the “plâtre de Paris”, the favourite material (even now) of sculptors.

5. **Examinations and analyses of the plaster located in the inter-eyebrowed region**.

This plaster sample (containing fibers and hairs) of the inter-eyebrowed region was also taken on the exterior face of the mask with a sterile blade during the Feb. 2014 examination.

MEB examinations and EDX analyses demonstrated that it is also of “plâtre de Paris” (with spines of gypsum and strontium sulphate impurity) ; but the majority of gypsum spines are long and fine sticks (of less than 1 mm of thickness), lumped in small packets (**Figure 12**). These peculiarities confer to the corresponding plaster the quality of a “fine plaster”, of a structure that is favourable to reproduce detailed forms.

Figure 12 : SEM photograph (x2500, in BSE) of a small packet of long and fine sticks of gypsum (thickness measurements are in nm).

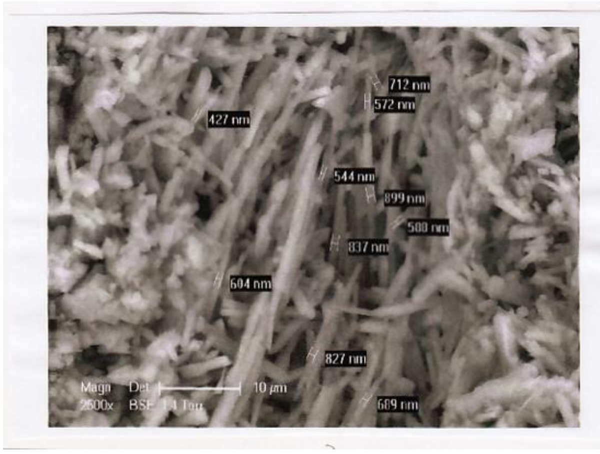


Table 1 summarizes (in decreasing order) the abundances of rare particles detected in BSE at the time of the study of particles of the plaster of the intereyebrowed region. The most abundant of them (48%) are those of strontium sulphate.

Table 1 : Numbers, percentages and compositions of the 50 first particles studied in BSE.

Numbers (%)	Compositions	Remarks
24 (48)	strontium sulphate	impurity characteristic of the "plâtre de Paris"
7 (14)	barium sulphate	a white colouring
6 (12)	iron oxyde	a rosy colouring
4 (8)	calcite	a white colouring
3 (6)	chromed iron	artefact
2 (4)	red earth	a rosy colouring
1 (2)	titane dioxide	a white colouring
1 (2)	tri-sulphates	of calcium, strontium and barium
1 (2)	potassium	pollutant
1 (2)	rare earth	

These are evidence of particles of "white colourings" ; seven particles of barium sulphate and four particles of calcite (**Figure 13**) ; that establishes that the plaster was blenched at various times of its story (since 1810 for the barium sulphate). If it is an artefact, the only one titane dioxide particle detected can indicate a very recent (since 1916) bleaching of the mask.

There are also evidence of particles of pink colourings : six particles of iron oxide and two particles of a red earth (**Figure 14**). These two rosy colourings are responsible of the mask carnation.

We founded one particle of tri-sulfates (of calcium, strontium and barium), one particle of rare earth (with lantana, cerium and neodyne) and one particle of potassium (a pollutant). The three particles of chrome-plated iron detected (**Figure 15**) are probably artefacts concerning blade micro fragments of the blade used to take the plaster piece.

Figure 13 : Examples of spectras of calcite and of barium sulphate. *Above* : spectrum of a calcite particle. *Below* : spectrum of a barium sulphate particle. C : carbon ; O : oxygen ; S : sulphur ; Ca (two peaks) : calcium ; Ba (four peaks) : barium.

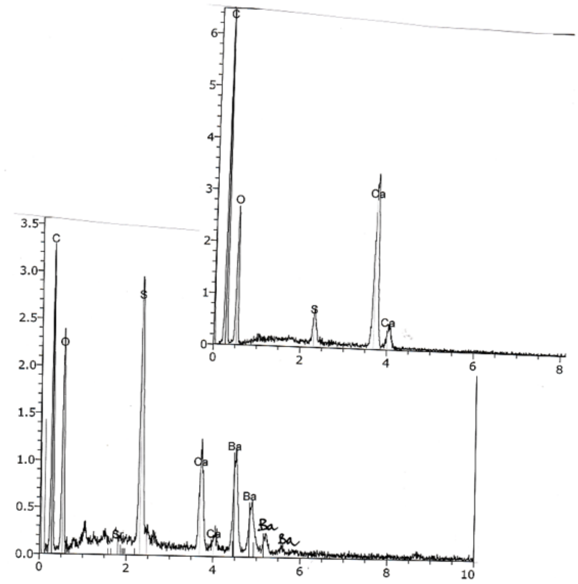


Figure 14 : Examples of spectras of iron oxide and of a red earth. *Above* : spectrum of a particle of red earth. *Below* : spectrum of a particle of iron oxyde. C : carbon ; O : oxygen ; Fe (three peaks) : iron ; Na : sodium ; Mg : magnesium ; Al : aluminium ; Si : silicium ; S : sulphur ; Ca (two peaks) : calcium.

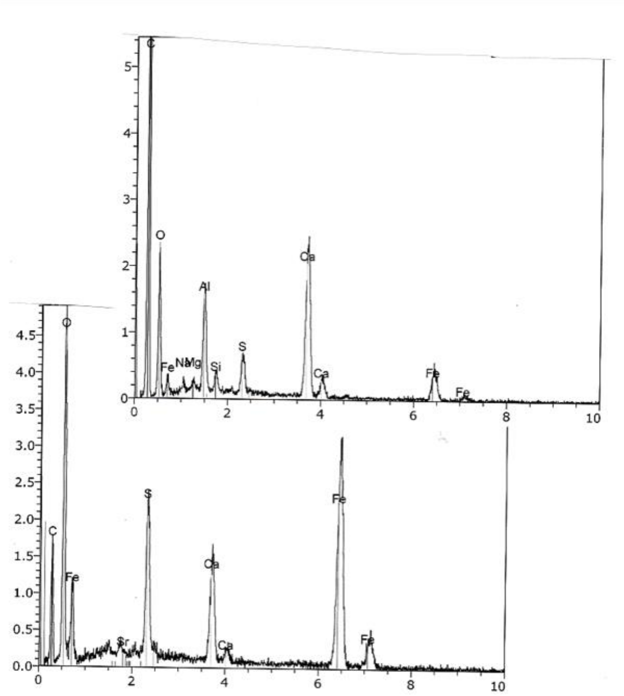
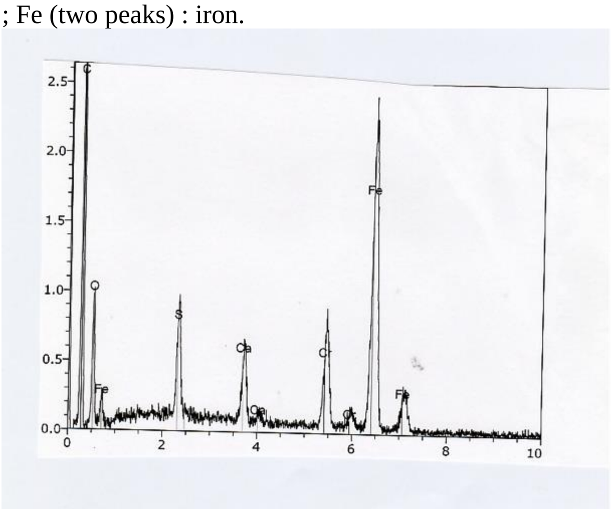


Figure 15 : An example of the spectrum of a chrome-plated particle. C : carbon ; O : oxygen ; S : sulphur ; Ca (two peaks) : calcium ; Cr (two peaks) : chromium ; Fe (two peaks) : iron.



6. Examinations and analyses of fibers and hairs. This plaster piece contains also fibrous material. **Table 2** summarizes (by successive order of their observations) the characterizations of the ten fibers observed : fibers numbers **5** and **8** are very twisted and one of the same vegetal species (probably of cotton) : the fiber number **6**, flattened, with little in relief borders and periodic twists along its length, is a modern cotton fiber (see figure 25). Fibers numbers **5**, **6** and **8** are dissociated fibers of the cotton tissue that was used during the plaster mask manufacturing process.

Table 2. Numbers and characterizations of the ten fibrous materials observed

Numbers	**Characterizations**
1	synthetic fiber
2	synthetic fiber
3	1st hair
4	2nd hair
5	vegetal fiber
6	vegetal fiber (cotton)
7	3th hair
8	vegetal fiber
9	4th hair
10	5th hair

Fibers numbers **1** and **2**, of cylindric forms and with very little diameters, has a chemical composition of carbon and oxygen only ; so, they are artificial synthetic fibers (a common modern pollutant of all samples).

Fibers numbers **3**, **4** , **7** , **9** and **10** are hairs. They are hairs because they present regular alignments of scales at their surfaces and because its spectras contain sulphur (of keratin) ; there are human hairs because the distances between successive scales alignments are of the order of 5-10 µm.

The photograph of **Figure 16** shows the hair number **1** ; it is an hair fragment, of 250 µm of length. The two paragraphs of **Figure 17** show the both cut extremities and that hair fragment. Scales are visible in the middle part of hair (**Figure 18**), where thickness is about 11 µm. Spectrum of the hair at that level contains mainly organic elements (carbon and oxygen), and a sulphur peak (corresponding to the disulfure bridges of the keratine) ; there are little peaks of nitrogen (an organic element of the hair), of chlorine and sodium (the sweat), of magnesium and of calcium.

The photograph of **Figure 19** shows a portion of hair number **2**, that emerge from the right border of the sticky-tape. Scales are well visible in the middle part of this hair (**Figure 20**), where the thickness is about 16 µm ; spectrum at that level contains the organic material (carbon, nitrogen and oxygen), the sulphur peak, and the chlorine and sodium little peaks. **Figure 21** shows the cut end of the hair. The estimate level length of hair number **2** is 3.9 mm (it is the longest of the five hairs found).

The photograph of **Figure 22** shows the left part of hair number **3**. The left end of this hair is bulged, indicating a capilar bulb at that extremity. As shown on the photograph of **Figure 23,** thickness at the bulb is of 38.5 µm while that of the adjacent hair tube is of the order of 28 µm. The corresponding spectras at these two levels are characteristics to that of an hair. Photographs of **Figure 24** show the hair middle part (where scales are well visible) and the hair natural end (which is split).

The estimate total length of the hair number **3** is 2.58 µm. Because it has a bulb, it was chosen at first for DNA extraction experiments.

The photographs of **Figure 25** shows the hair number **4** and its split end. It is an hair fragment of the form of an hook ; its length is of about 400 µm. Scales are visible in the middle part of the hair (**Figure 26**), where the thickness is of about 11 µm. The corresponding spectrum is characteristic to that of an hair. There are several manufactured mineral particles of potassium component (**Figure 27**) – probably of a soap –trapped at the hook extremity.

The photograph of **Figure 28** shows an hair number **5** ; it is an hair fragment which has also the form of one hook – of 180 µm of length. Photographs of **Figure 29** shows its two cut extremities. In its middle part (**Figure 30**) scales are not very well visible ; its thickness at that level is of 15 µm. The corresponding spectrum is characteristic to that of an hair. **Table 3** summarizes the main characteristics of the five hairs found. All had scales, and their spectras are characteristic of hairs.

Figure 16 : SEM photograph (x500, in GSE) of the hair number **1**.

Figure 17 : SEM photographs (x 4000, in GSE) of the both extremities (*above* : terminal ; *below* : basal) of the hair.

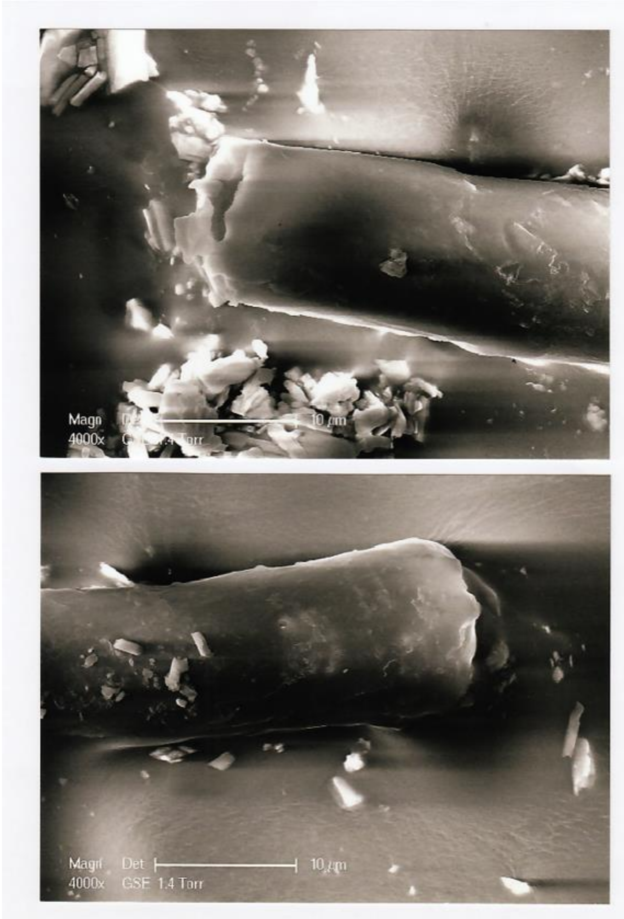


Figure 18 : *Above* : SEM photographs (x4000 in GSE) of the middle part of the hair. *Below* : the corresponding spectrum. C : carbon ; N : nitrogen ; O : oxygen ; Na : sodium ; Mg : magnesium ; S : sulphur ; Cl : chlorine ; Ca : calcium.

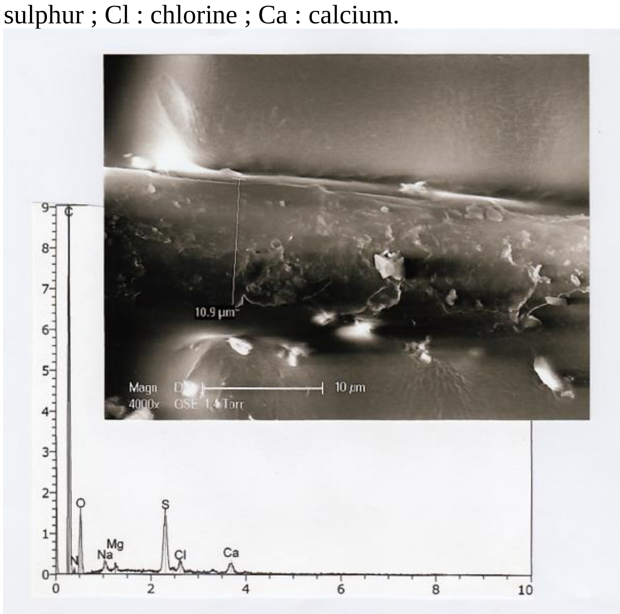


Figure 19 : SEM photograph (x100, in GSE) of the hair number **2** , emerging from the right part (P) of the sticky-tape.

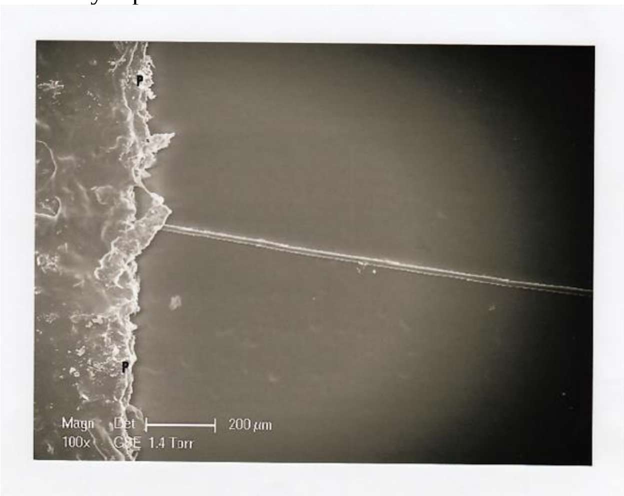


Figure 20 : *Above* : SEM photograph (x3200, in GSE) of the middle part of the hair. *Below* : the corresponding spectrum.

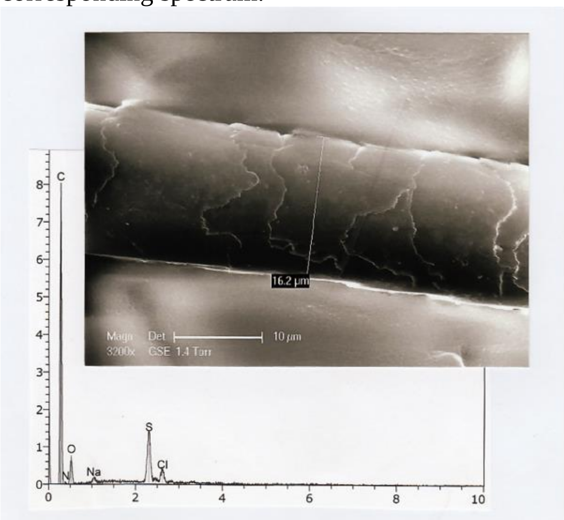


Figure 21 : SEM photograph (x1600, in GSE) of the terminal end of the hair.

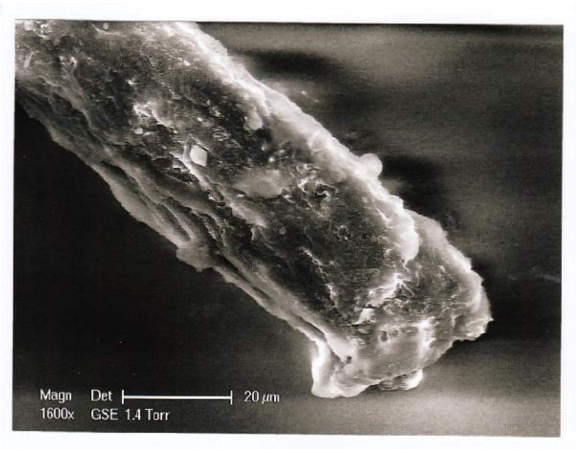


Figure 22 : SEM photograph (x125, in GSE) of the hair number **3**.

Figure 23 : SEM photograph (x1000, in GSE) of the left extremity of the hair, showing the bulb (B). T : adjacent tube of the hair . *Below* : spectras at the B and T levels.

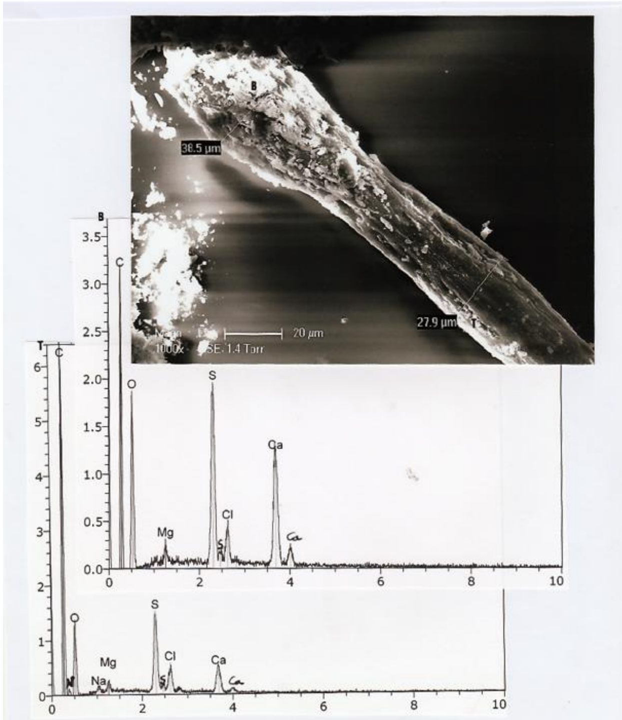


Figure 24 : *Above* : SEM photograph (x3000, in GSE) of the middle part of the hair. *Below* : SEM photograph (x3000, in GSE) of the natural end of the hair.

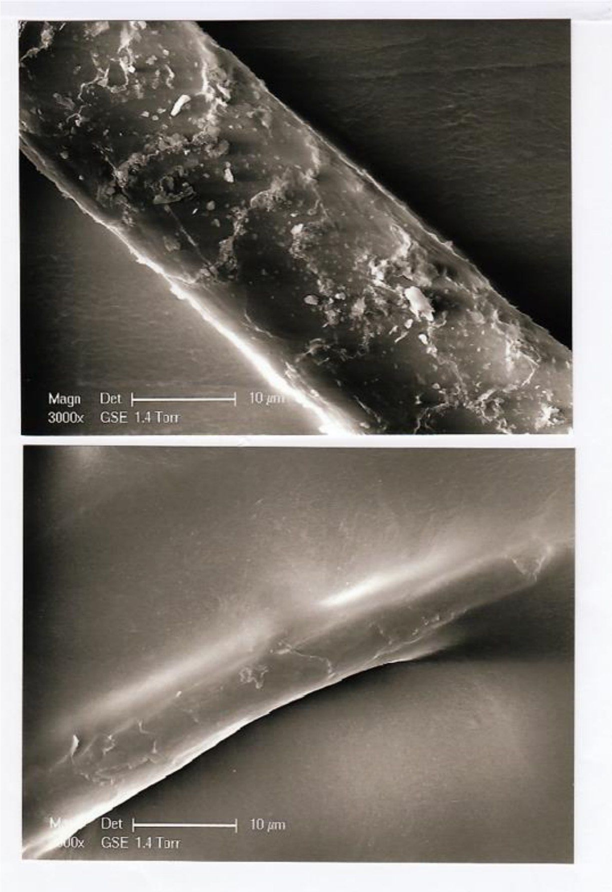


Figure 25 : *Above* : SEM photograph (x250, in GSE) of the hair number **4** (F : the cotton fiber). *Below* : SEM photograph (x2000, in GSE) of the splitted end of the hair.

Figure 26 : *Above* : SEM photograph (x4000, in GSE) of the middle part of the hair. *Below* : the corresponding spectrum.

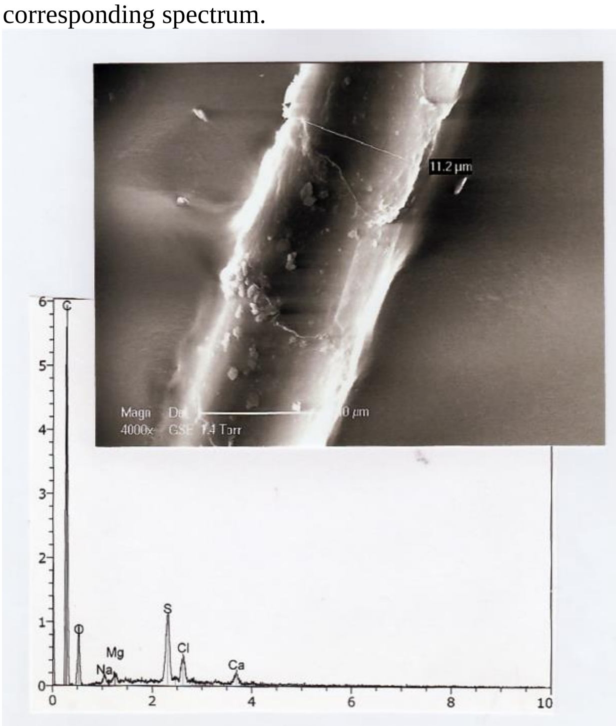


Figure 27 : *Above* : SEM photograph (x2000, in GSE) of the hooked end of the hair, showing seven (1-7) trapped particles. *Below* : spectrum of particle number 2. C : carbon ; O : oxygen ; S : sulphur ; K : (two peaks) : potassium.

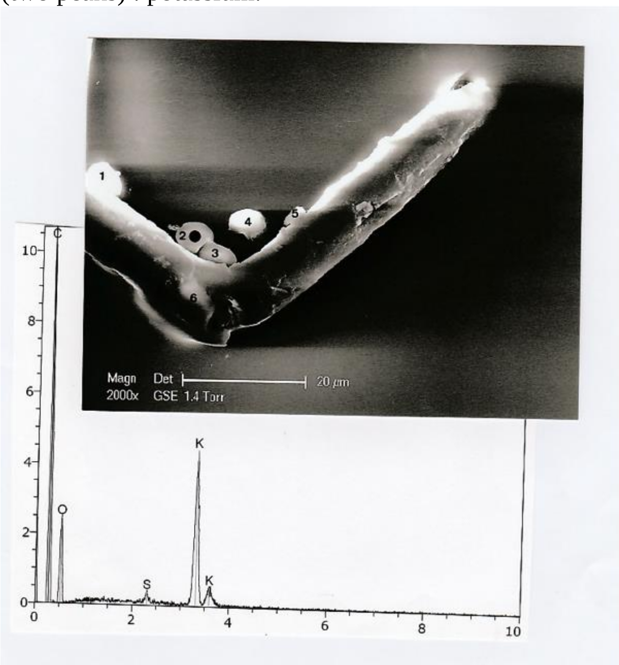


Figure 28 : SEM photograph (x1000, in GSE) of the hair number **5**.

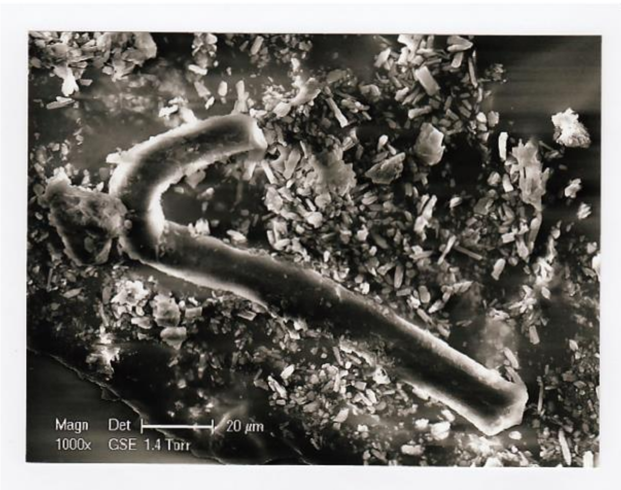


Figure 29 : *Above* : SEM photograph (x3000, in GSE) of the Terminal cut end of the hair fragment. *Below* : SEM photograph (x4000, in GSE) of the basal cut end of the hair fragment.

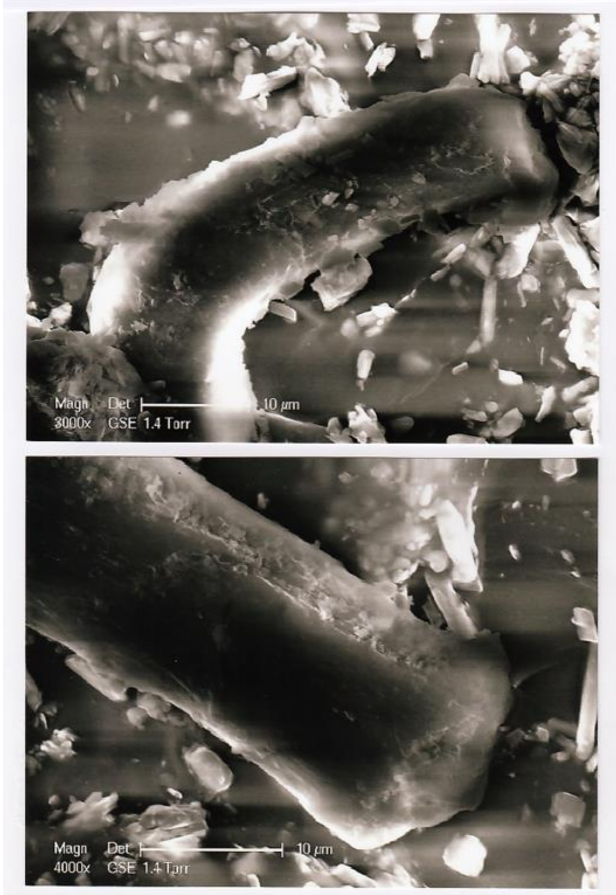


Figure 30 : *Above* : SEM photograph (x3000, in GSE) of the middle part of the hair fragment. *Below* : the corresponding spectrum.

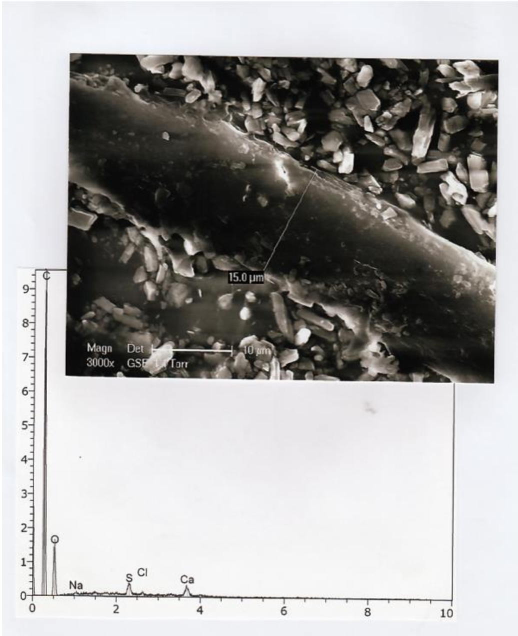


Table 3. A summary of the information concerning the five hairs.

Hair numbers	**1**	**2**	**3**	**4**	**5**
Scales	+	+	+	+	(+)
Spectrum characteristic	+	+	+	+	+
Bulb	_	_	+	_	_
Approximate lengths	250 µm	4mm	2.6 mm	400 µm	180 µm
Points	_	_	bifid	multifid	_
Cut extremities	2	1	0	1	2
Thickness (in µm)	10.9	16.2	22.2	11.2	15

Hair number **3**, which has a length of 2.6 mm is the only one that is complete, with a bulb and a natural (bifid) point. Others are hair fragments : hair fragment **2**, the longest (4mm), has two cut extremities ; hair fragment number **4** has a multifid natural point (the other extremity being cut) ; hair fragment **1** and **5** have both cut extremities at their ends.

Mean thickness of the hairs is 15.1 µm, with border values of 10.9 µm for hair number **1** and of 22.2 µm for hair number **3** ; so, they are extremely thin. Napoléon' hairs are thin [**5**]. The hairs studied here, located in the inter-eyebrowed region of the mask, can be eyebrows ; we know that, in men, eyebrows are thinner (except for white eyebrows, which are thicker) than hairs. Likely hairs described here are inter-eyebrowed downs.

7. MtDNA analyses of the hairs.

The bp piece of hair number **3** was first used for mtDNA sequencing. We found only one mutation in the HVS1 corresponding sequence : in position 16184, the cytosine is replaced by a thymine ; this transversion 16184 >T, named 16184 T, is the HVS1 mtDNA mutation characteristic of Napoléon [**6**].

Identical results were obtained for hair numbers **2** and **1**.

Discussion and conclusions.

Authenticity of the RUSI mask is proven here because its plaster contains in its inter-eyebrowed region downs whose mitochondrial DNA analyses demonstrate that they are Napoléon's hairs.

Down presences in that region is explained by the retentions on the plaster surface at the time of the successive replications of the mask. A similar process was also involved for the eyebrows contained in the plaster of the Antommarchi death mask [**7**].

That was suggested by the marked similarities observed in the contours of the left profile (mainly for the front, for the root of the nose and for the nose bridge) of the RUSI mask compared to that of the drawing realized at the death bed of Napoléon.

When studied by a program of facial recognition, the mask does not show the characteristics of Napoléon's face ; that is so because of the post mortem modification of the soft parts of the moulded face. When the correct age of death is loaded on the program, the reconstructed face is more similar to the mask facial appearance; all its other main characteristics can also be found : asymmetry(that proves that the mask was moulded from a face), gender (male, but with a little feminine component) and ethnicity (a European origin). The reconstructed face at 51 years old shows blue eyes and a pale skin [**5**].

Study on aspect and chemical composition of the mask plaster shows that it is of "plâtre de Paris", on high quality plaster. It does not contain calcium phosphate or other mineral particles characteristic of the soil of Ste Helena island [**8**] ; so the RUSI mask is not the original one, but a more modern replicate processed in a country where the "plâtre de Paris" was available.

The pencil lead used for the inscription is a soft graphite, that was only manufactured since the beginning of the XXth Century ; so the inscription was drawn a long time after the mask was made.

In conclusion, the RUSI mask studied here is a plaster replication of the Burton original [**7**] death mask of Napoléon.

Acknowldgements

We acknowledge Mr P. d'Harvile for the communication of the left profile drawing of Marchand, and Mr D. Jodidio (and Mrs M. Arazabal) for their permissions to examine and remove the RUSI mask. Dr Jodidio participated for financial support of the present work.

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

References

1. De Veauce, E. (1957). L'affaire du masque mortuaire de Napoléon Imp. Bose, Lyon.
2. De Veauce, E. (1964). *Le Ruban Rouge*, **21**.
3. De Veauce, E. (1971). Les masques mortuaires de Napoléon. La Pensée Universelle, Paris.
4. Gibson, S (2012). Computed-assisted age progression. Craniofacial identification, Cambridge University Press.
5. Lucotte, G. , Macé, J., Thomasset, T. (2021). Napoléon the First, a Corsican with pale skin and red hair : DNA evidence for these phenotypic traits. *International Journal of Sciences*, **10**, 1-5.
6. Lucotte, G. (2010). A rare variant of mtDNA HVS1 sequence in the hairs of Napoléon's family. *Investigative Genetics*, **1** : 1-5.
7. Lucotte, G., Thomasset, T., Pougetoux, A. (2018). The Napoléon mutation 16184 T is that found in the HVS1 sequence of the mtDNA extracted from an eyebrown included in the plaster of the Antommarchi death mask of Napoléon. *International Journal of Sciences*, **5**, 104-133.
8. Lucotte, G. (2017). Etude minéralogique et chimique du masque mortuaire Antommarchi de Napoléon 1er. *Revue de l'Institut Napoléon*, **214**, 27-76.