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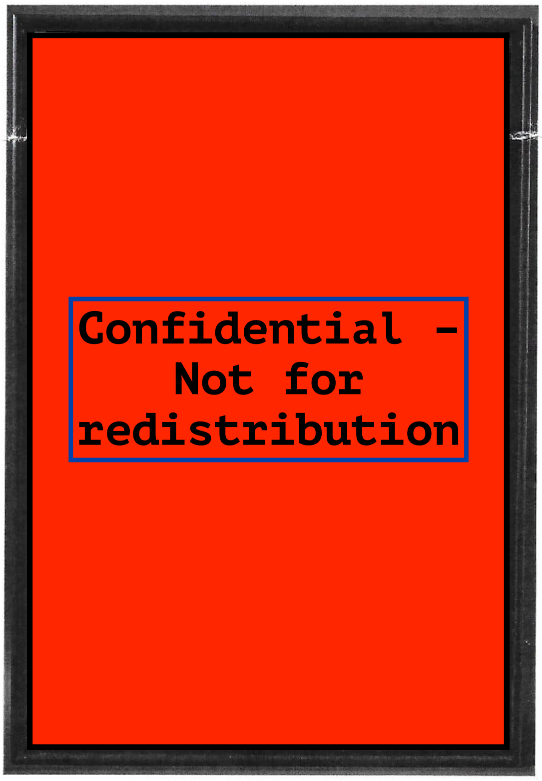
22/07/2013

Radiocarbon dating report



Radiocarbon dating of a painting attributed to Francis Bacon.

A small piece of linen with white paint was taken. The sample was first cleaned with hexane in an ultrasonic bath, then bleached.

The sample was converted into graphite and measured by AMS (MICADAS).

Result:

RICH-20371: 108.48±0.39 PMC

(RICH = labcode; PMC = % modern carbon)

After calibration using http://calib.qub.ac.uk/ this gives a calendar age of:

1956 - 1957 AD at 95% probability.

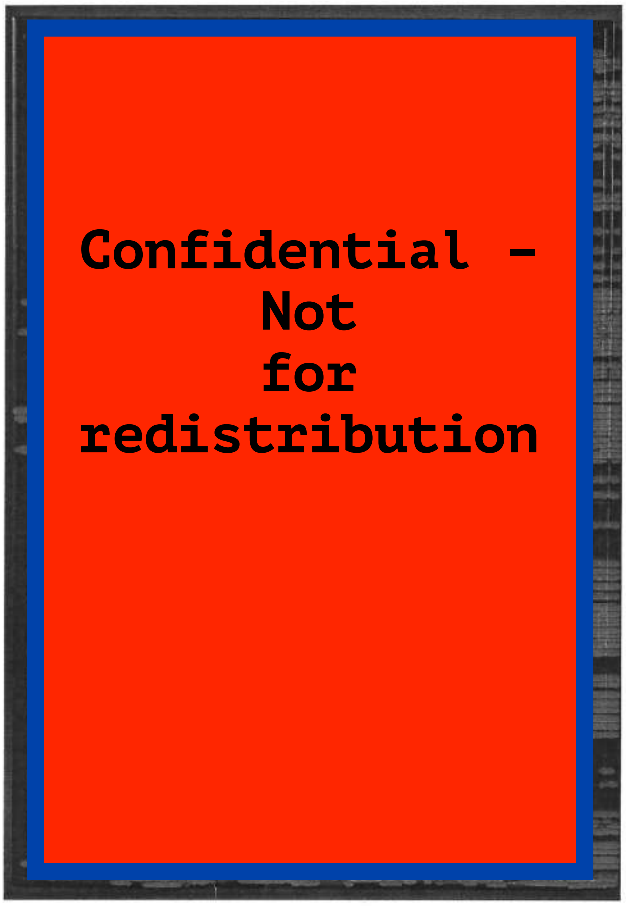
Reference:

Q Hua and M Barbetti,
"Review of Tropospheric Bomb ^{14}C Data for Carbon Cycle Modeling and Age Calibration Purposes", (2004) Radiocarbon 46: 1273-1298.

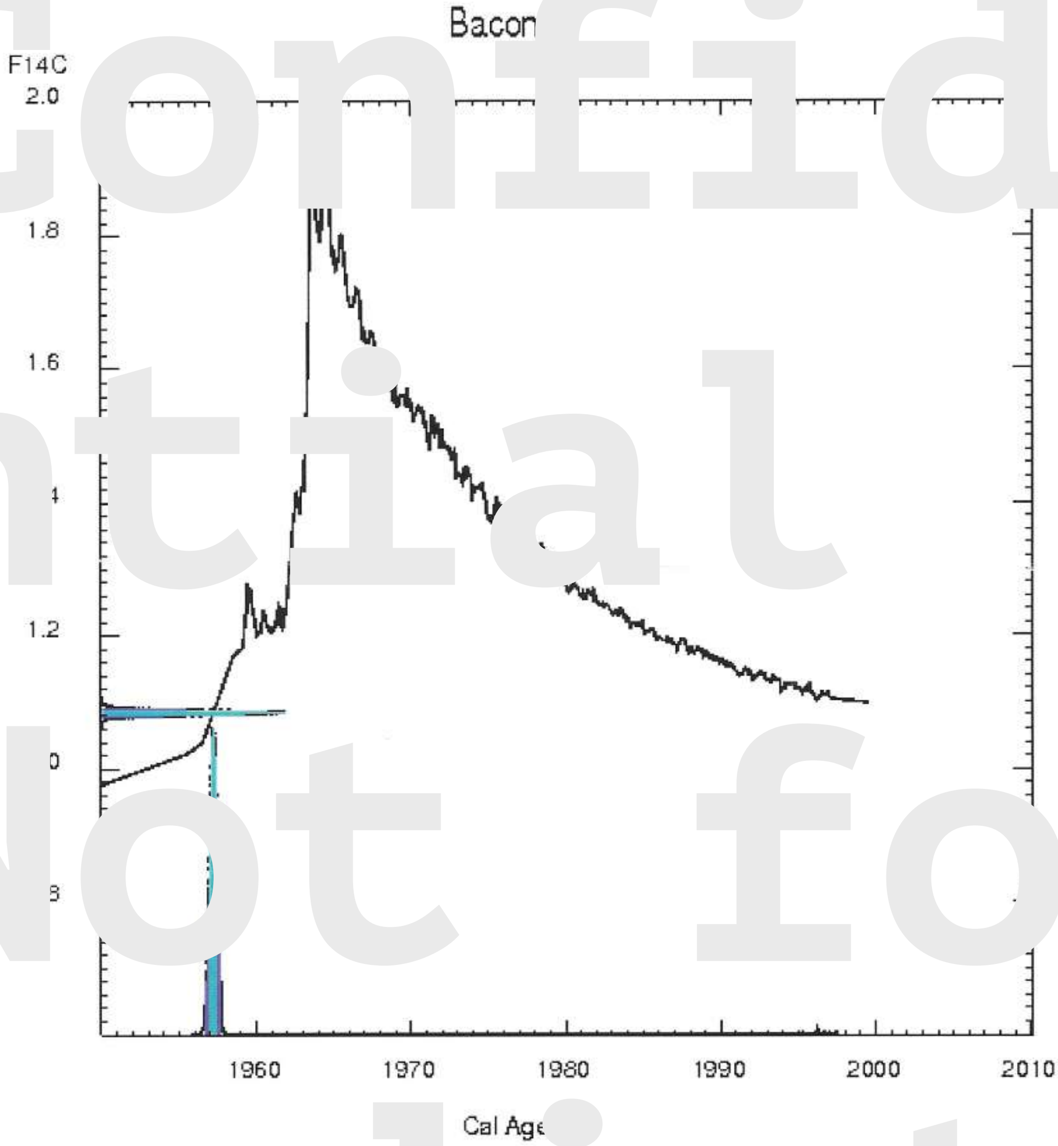
LABORATORY: PAINTINGS

Analysis report

File number:	**2013.11892**
Title:	Self-portrait
Object type:	Painting on canvas
Author:	Attributed to Francis Bacon (1909-1992)
Owner:	Private
Geographical origin:	U.K.
Current location:	Belgium, private collection



Demand		Report	
Date demand:	February 19th, 2013	**Date report:**	May 21st, 2013
Demander:	[redacted]	**Coordinator of the study:**	Steven Saverwyns
		Author of the report:	Steven Saverwyns



Sincerely,

rk Van S ydonck
rk.vanst lonck kir be

Mathi Boudin
Mathieu.bo in@kik .be

1. Aim

Identification of the painting palette of this self-portrait attributed to Francis Bacon (1909-1992). According to the historical information provided the painting must have been made in the late 1960's - early 1970's. Additionally it will be checked if the pigment use is consistent with the creation date of the painting, and with the materials used by Francis Bacon, as recently studied in a PhD thesis[1].

2. Methodology

The pigment composition was determined with two analytical techniques: micro-Raman spectroscopy (MRS) and X-ray fluorescence (XRF). With MRS molecular information is obtained, and both inorganic and organic pigments can be identified. The technique however is in general much slower than XRF. Non-invasive measurements are feasible so sampling of the painting could be avoided, and a large number of different zones could be analysed. A dispersive Raman spectrometer (inVia, Renishaw) equipped with a laser with wavelength at 785 nm (Innovative Photonic Solutions) and a fibre optical probe was used for all measurements. The laser power and measuring times were chosen in order to obtain an acceptable signal-to-noise ratio without burning the sample. Figure 1 shows the MRS instrument with optical probe in action.

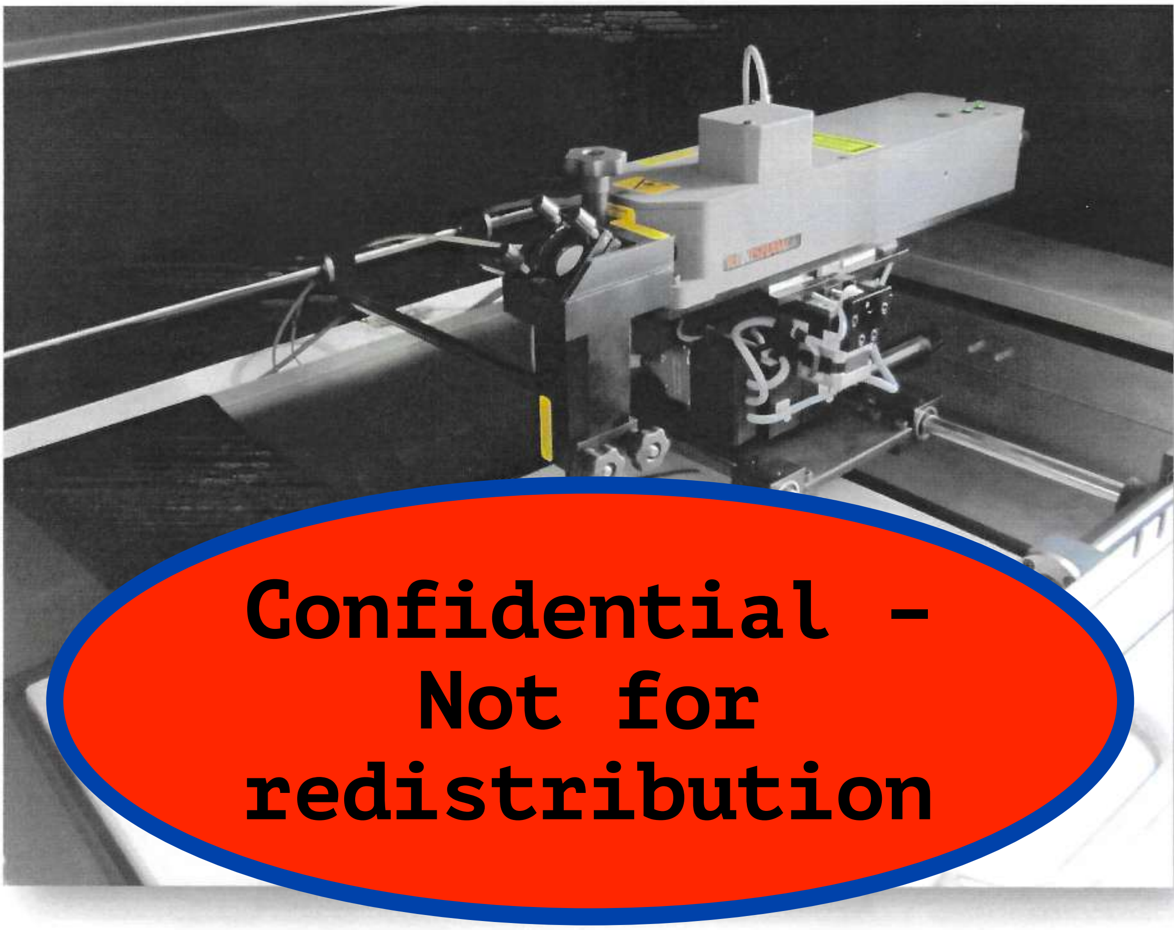


Figure 1. The optical probe of the MRS instrument in action: non-invasive elemental analysis of organic and inorganic pigments.

XRF is a technique for elemental analysis of inorganic pigments. In this technique, a beam of primary X-rays is focused on the sample and the induced X-ray fluorescence, characteristic for each element present, is measured. Due to the high energy of the incident X-rays, the detected signal comes from

[1] Russell J., *A Study of the Materials and Techniques of Francis Bacon (1909-1992)*, PhD thesis, University of Northumbria at Newcastle, September 2010.

the different paint layers present, and not just from the surface layer. Thus, with this technique, the pigments from the preparation layer to the top paint layers are analysed at the same time. With the instrument used qualitative data for elements whose atomic number is equal to or greater than that of potassium (Z = 19) can be obtained. XRF spectra were obtained with an Artax micro-XRF instrument (Bruker AXS, Germany) equipped with a rhodium tube as X-ray source. All measurements were performed using the following experimental parameters: accelerating voltage of 50 kV, a current of 600 µA and a measurement time of 180 seconds without a filter. Figure 2 shows the instrument in use.

Figure 2. The XRF-instrument in action: non-invasive elemental analysis of inorganic pigments.

In order to avoid analysing retouched zones the painting was carefully examined under UV-light. Additionally for some pigments the fluorescence behaviour can help with their identification. The UV picture of the image is given in figure 3, together with the image under white light for comparison reasons.

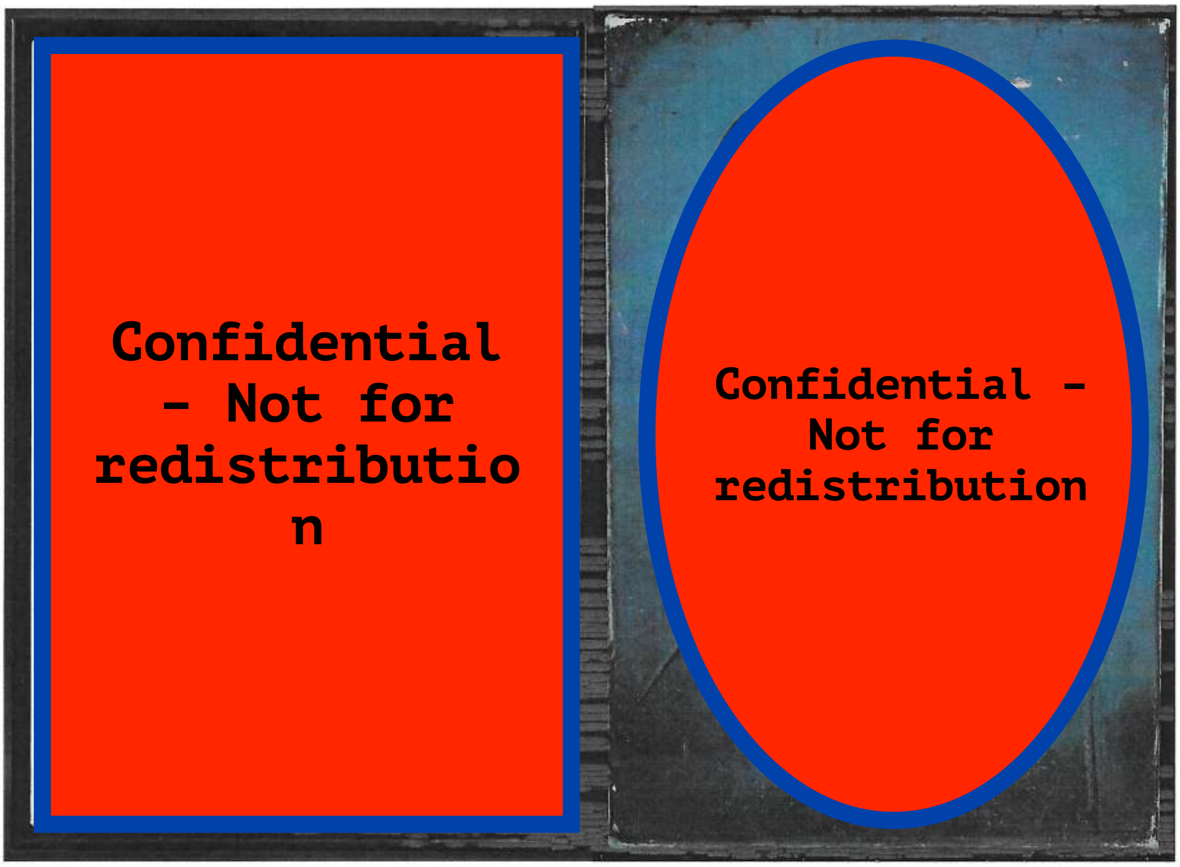


Figure 3. Picture of the painting under white light and UV-light exposure. Especially in the head some intensely fluorescing zones can be seen. Retouching does not seem to be present.

3. MRS and XRF analysis spots

Date:	March 2013 (MRS), April 29th (XRF)
Place:	KIK/IRPA
Responsible person for the current study:	Steven Saverwyns
Analyses by:	Marie-Christine Maquoi (MRS), Steven Saverwyns (XRF)
Number of analysed spots:	19 MRS and 12 XRF measurements
Analyses locations:	See table 1 and figure 4

Figure 4. Indication of the points analysed with MRS and XRF.

4. Analysis results and discussion

Pigment investigations on a selected number of colours using both MRS and XRF allowed determining the painting palette. Results are summarised in table 1.

Table 1. Description of the localisation of the MRS and XRF measurements, together with the results.

N°	Description of the spot analysed	Results (in italic for the XRF results)
MRS1	Intense orange, central in head	- PO13 - Titanium white (anatase) - Lead white
MRS2 **XRF10**	Dark purple, left to the head	- *Lead white* - *Titanium white* (anatase) - *Barium sulphate* - *Zinc white or zinc sulphide* - *Trace of aluminium (indicating ultramarine or substrate for a laked pigment?)*

[illegible]RS3	Pur[illegible] of th[illegible]in	[illegible]m white [illegible]atase) - Barium sulphate [illegible]ent [illegible]ng the pu[illegible] could [illegible] [illegible]tected with M[illegible] see XRF[illegible]3 for t[illegible] purp[illegible] pigment
[illegible]RS[illegible]	Da[illegible] orang[illegible] mouth [illegible]gion	[illegible]PO13 [illegible]um [illegible])
MRS5	White, forehead	- Titanium white (anatase and rutile) - Barium sulphate
MRS6	White, centra[illegible] the head	- Titanium w[illegible] anatase)
[illegible]RS7 **[illegible]RF4**	White, thick pain[illegible] stroke on the [illegible]purple of the bor[illegible] of the he[illegible]	[illegible]nium whi[illegible] anatase and rutile) - *Z[illegible] white or [illegible]c sulphide* *[illegible]m sulph[illegible]* - *S[illegible] quantit[illegible] lead white* *[illegible] (cha[illegible]sum)*
MRS8 **MRS9** **XRF1**	White background	- Titanium white (rutile) - Barium sulphate - *Lead white* - *Zinc white or zinc sulphide* - *Calcium (chalk [illegible]um)*
[illegible]RS10 **[illegible]RS1[illegible]** **[illegible]RS[illegible]** **[illegible]RS[illegible]**	[illegible] bac[illegible] [illegible]er part [illegible] of th[illegible] painting	- Titanium w[illegible] and r[illegible]) - Barium sulp[illegible] - Lead white
[illegible]RS14	[illegible], near th[illegible] region	- Titanium w[illegible]e) - Trace of barium sulphate
MRS15 **XRF7**	White, central in head	- *Zinc white or zinc sulphide* - *Titanium white* (anatase) - *Barium sulphate* *[illegible]race of lead white*
[illegible]RS1[illegible]	Pink [illegible]	[illegible]itanium white (anatase) [illegible] pigment w[illegible]ed e[illegible] pink [illegible]r [illegible]ssibly the [illegible]ncentration is [illegible] low, or the pig[illegible] is [illegible] sensitive [illegible]
MRS17 **XRF11**	Purple of the left side of the head	*[illegible]itanium white* (an[illegible]e) *[illegible]hite* - *Zinc white or zinc sulphide* - *Barium sulphate* - *Calcium (chalk or gypsum)* - Trace of PO13 No pigments were detected that can explain the purple colour, but the t[illegible]al fluorescence could point to the use of madder lake (not detectab[illegible] with MRS nor XRF)
MRS1[illegible]	Pur[illegible] acce[illegible] left s[illegible] of the [illegible]ad	- Ultramarine (?)
[illegible]RS1[illegible] **XRF5** **XRF6**	(Dark) Orange, central in head	[illegible] PO13 *[illegible]um w[illegible]*) - *Lead white* - *Zinc white or zinc sulphide* - *Barium sulphate*

XRF2 [illegible]3	Purple line head	*- Manganese violet* *- Lead white* *- Zi[illegible] or zinc [illegible]hide* *- [illegible]e of titanium w[illegible]e* *[illegible]bariu[illegible]ate*
XI[illegible]3	White [illegible]resc[illegible]t unde[illegible]V	*- L[illegible]d white* *- [illegible] white or zinc [illegible]hide* *- [illegible]nium white* *[illegible]lph[illegible]* *- Calcium (chalk or gypsum)*
XRF9	White, non-fluorescent under UV	*- Lead white* *- Titanium white* *- Barium sulphate* *- Zinc white or z[illegible]lphide* *- Calcium (chalk o[illegible]ypsum)*
X[illegible]2	Preparatic[illegible]	*- Lead [illegible]ite* *- Trac[illegible] barium [illegible]te or titanium white*

A s[illegible]nary p[illegible]our[illegible] tabl[illegible] with th[illegible]uction date of the pigment, if applicable.

Table 2. Summary of results, together with the introduction date of the pigments found (if applicable).

Colour	Pigments	Introduction date
[illegible]e	- Lead white - [illegible]whit[illegible]se [illegible] rutile[illegible] [illegible]inc whi[illegible] [illegible]arium [illegible]hate [illegible]tender [illegible] pigmen[illegible] - Lithopone (?) (co-precipitate of barium sulphate and zinc sulphide) - Chalk or gypsum	- Antiquity - Mass-produc[illegible]6, in ar[illegible]int sir[illegible] (anatase) and pos[illegible]945 (rutile[illegible] - Ca. 1840 - Early 19th centur[illegible] - Discovered around 1850, first large-scale production in 1874 - Mineral
Orange	- PO13 (Pigment Orang[illegible]	- [illegible]zopyrazolone pigment, discovered in 1910, co[illegible]mercially available since the [illegible]30's
Violet	- M[illegible]e violet [illegible]e ([illegible]ltramarine ([illegible]	- [illegible]mercially i[illegible] ar[illegible]st m[illegible] 18[illegible] - N[illegible]ural compo[illegible] - N[illegible]ural and synthetic [illegible]e ca. [illegible]8

From these results it can be concluded that all pigments identified were known by the earlier 1970's, the date when the painting is supposed to have been made (according to the statement of Rolf af Sandeberg the painting was acquired in 1974, and hence must date from before 1974). The pigment [illegible]st com[illegible]ially introduced found was titanium white in the ru[illegible] form, introduced in Europe after [illegible]945. All [illegible]r pigments found were known b[illegible]re that date.

[illegible]itanium w[illegible] as [illegible]gme[illegible] exists [illegible]two di[illegible]ent forms, anata[illegible] and rutile[illegible] disc[illegible] in [illegible]821 titan[illegible] white [illegible]as [illegible] mass [illegible]oduced [illegible]efore 1916 and [illegible] availab[illegible] in artis[illegible] pain[illegible] since [illegible]921 in th[illegible] anatase [illegible]m. [illegible] rutile [illegible]rm wa[illegible] troduced in Euro[illegible] after 19[illegible][3].

[2] Perego F., *Dictionnaire des matériaux du peintre*, Editions Belin, 2005, p.100.
[3] Laver M., *Titanium Dioxide Whites*, in *Artists' Pigments. A Handbook of Their History and Characteristics, Vol. 3*, West Fitzhugh E. (Ed.), National Gallery of Art – Washington/Oxford University Press, 1997, p.295-355.

Lead white has been for centuries one of the most used white pigments until it became gradually replaced by alternatives that were introduced in the 19th and 20th centuries, such as zinc white and [illegible]ium white. Because of toxicity reasons it i[illegible]rbidden [illegible] a pigment in in[illegible]al (households) p[illegible]ts, but it can still be found in artistic pai[illegible]

Zinc wh[illegible] was i[illegible]duce[illegible] round [illegible]40 as a[illegible]lternative to le[illegible] white[4]. [illegible] sulp[illegible]e, to[illegible]er wi[illegible] barium [illegible]phate, [illegible]ns t[illegible] white [illegible]ment li[illegible]pone[5]. Since n[illegible]er with [illegible]F nor [illegible]S th[illegible] b[illegible]wee[illegible] zinc wh[illegible] (Zn[illegible] and z[illegible] sulphi[illegible] (ZnS) can eas[illegible] be mad[illegible] and c[illegible]inly [illegible]t in the [illegible]ence[illegible] sulp[illegible]e), it [illegible]ot [illegible] inc [illegible]rese[illegible]ite [illegible] sulphide. The strong fluorescence in the white parts observed under UV-light seems, according to the XRF-measurements, to be related with a higher concentration of zinc in the fluorescent zones. As zinc white is known to exhibit a strong fluorescence under UV-light it is believed that the zinc detected with XRF is present as zinc white rather than as zinc sulphide, at least in the stronger fluorescent parts, thus mainly the head.

Barium s[illegible]ate has been produced since the early 19th cent[illegible] and is used as cheap extender rather [illegible]n as [illegible]. As sa[illegible]re, it migh[illegible] present a[illegible]thopone.

T[illegible] purp[illegible] pigment used to [illegible]nt the co[illegible] the head [illegible]uld not be identified with MRS, as no [illegible]surab[illegible] Raman signal wa[illegible] obtained. [illegible] however showe[illegible] high concentration of manganese; to a lesser ext[illegible] pho[illegible] less [illegible] was dete[illegible] rom this result it was concluded that manganese violet, a manganese ammonium phosphate compound, was used as purple pigment. It was discovered in 1868 and has been produced commercially from around 1890[7]. The purple zone under the ear seems to be made with a different pigment, since no manganese was detected in this zone. Ultramarine might be present, but the rather weak signal might indicate that another pigment, [illegible]erhaps colorant, is present in this zone as well. With the [illegible]es used however this could not [illegible] confirmed, only by ta[illegible]g a sample more information [illegible] the pigments of this zone might be [illegible]ained [illegible]ently [illegible] were taken. Since th[illegible]ot dam[illegible]mpli[illegible] [illegible]bler[illegible]. Ultr[illegible]arine [illegible]und in nature in the mineral l[illegible]rite) has [illegible]en syn[illegible]sized [illegible] ca [illegible]8[8]. [illegible]xt to th[illegible]ar, u[illegible]r UV-illumination a faint pinkish [illegible]orescenc[illegible] noted. [illegible]is can [illegible]int to [illegible]use [illegible] madde[illegible]r ma[illegible]r lake) a natural colorant derive[illegible] rom the r[illegible] of the [illegible]mmon [illegible]adder [illegible]t *Ru[illegible]um*[9]. It i[illegible]pared by precipitatio[illegible]rant [illegible]nd t[illegible] of a weak aluminium signal in the dark purple zone under the ear strengthens this hypothesis. But, as said before, only sampling can confirm (or reject) this hypothesis.

The orange pigment finally is the only synthetic organic pigment found in the painting, all other pigments are inorganic in natu[illegible] (with the ex[illegible]ption of madder lake, but that pigment has a natural origin), meaning that they have [illegible]metal ato[illegible] their structure, opposed [illegible] the organic compounds that are de[illegible] from petro[illegible]rivatives. The orange pi[illegible] was ide[illegible]ied with MRS as PO13, [illegible]ngin[illegible] th[illegible]lass [illegible] the [illegible]azopyra[illegible]e pigme[illegible] discovered [illegible] and co[illegible] availab[illegible]ince th[illegible]930[illegible].

From th[illegible]mbine[illegible] XR[illegible] MR[illegible]asurem[illegible] in the w[illegible] zon[illegible] some i[illegible]stin[illegible] results [illegible]ld be deduced. [illegible] lead white [illegible] in [illegible] measurements [illegible] than likely originated from the preparation layer. Spot XRF 12 was measured in a zone in the head where no white paint could be

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[4] Eastaugh N., Walsh V., Chaplin T., Siddall R., *Pigment Compendium: A Dictionary and Optical Microscopy of Histo[illegible]ments*, Oxford, **2008**, 412.
[5] Eastau[illegible]N., Walsh V., Chaplin T., Siddall R., *[illegible]ment Compendium[illegible] Dictionary and Optical Microscopy of Historic [illegible]*, Oxford, **[illegible]8**, 24[illegible]
[6] Eastau[illegible], [illegible]in T., [illegible]dall R., *[illegible] Dictionary [illegible] Historic [illegible]ments*, [illegible]rd, **[illegible]8**, 44[illegible]
[7] Interne[illegible]eference [illegible]tp:/[illegible]w.gol[illegible]paints.[illegible]/justpaint/jp6artic[illegible]php, last [illegible]essed Ma[illegible]h 20[illegible]
[8] Eastau[illegible]N., Wa[illegible]., Cl[illegible]in T., [illegible]dall R., *[illegible]ment C[illegible]mpendium[illegible] Dictionar[illegible] Optic[illegible]icros[illegible]y of [illegible]oric [illegible]*, [illegible]xford, **2[illegible]**
[9] Eastaugh N., Walsh V., Chaplin T., Siddall R., *Pigment Compendium: A Dictionary and Optical Microscopy of Historic Pigments*, Oxford, **2008**, 250, 251.
[10] Herbst W. and Hunger K., *Industrial Organic Pigments. Production, Properties, Applications*, 3rd edition, VCH, 2004, 264.

XRF2 **[illegible]RF3**	Purple line head	- *Manganese violet* - *Lead white* - *[illegible]ite or zi[illegible]ulphide* *[illegible]race of titanium white* *[illegible]of ba[illegible]lphate*
[illegible]RF[illegible]	Wh[illegible]fluo[illegible]ent u[illegible] UV	*[illegible]ead white* *[illegible]inc white or zi[illegible]ulphide* *[illegible]itanium white* *[illegible]sul[illegible]* - *Calcium (chalk or gypsum)*
XRF9	White, non-fluorescent under UV	- *Lead white* - *Titanium white* - *Barium sulphate* - *Zinc white [illegible] sulphide* - *Calcium (chal[illegible] gypsum)*
[illegible]RF12	Prepara[illegible]n	- *L[illegible] white* - *Tr[illegible] of bariu[illegible] white or titanium white*

[illegible]mmar[illegible] [illegible]r f[illegible] in t[illegible] [illegible]er with[illegible] [illegible]roduction date of the pigment, if applicable.

Table 2. Summary of results, together with the introduction date of the pigments found (if applicable).

Colour	Pigments	Introduction date
[illegible]hite	- Lead white [illegible]m w[illegible]atase [illegible]nd ru[illegible] - Zinc w[illegible] - Bariu[illegible]ulpha[illegible] extender [illegible]n pigm[illegible] - Lithopone (?) (co-precipitate of barium sulphate and zinc sulphide) - Chalk or gypsum	- Antiquity - Mass-prod[illegible]916, i[illegible] paint [illegible] (anatase) and [illegible] 1945 (ru[illegible] - Ca. 1840 - Early 19th cen[illegible] - Discovered around 1850, first large-scale production in 1874 - Mineral
Orange	- PO13 (Pigment Ora[illegible]3)	[illegible]isazopyrazolone pigment, discovered in 1910, [illegible]mmercially available since t[illegible]1930's
Viole[illegible]	[illegible]nese vi[illegible] [illegible]ak[illegible]) - Ultramarine	[illegible]ommercial[illegible]ced [illegible] first [illegible] in [illegible]58 [illegible]atural co[illegible] [illegible]atural and synthe[illegible]ince c[illegible]828

From these results it can be concluded that all pigments identified were known by the earlier 1970's, the date when the painting is supposed to have been made (according to the statement of Rolf af Sandeberg the painting was acquired in 1974, and hence must date from before 1974). The pigment last commercially introduced found was titanium white in the rutile form, introduced in Europe after 1945. [illegible]her pigments found were know[illegible]efore that date.

Titaniu[illegible] pig[illegible]t ex[illegible]n tw[illegible]orms, [illegible]e and ru[illegible] [illegible]h d[illegible] 1821 ti[illegible]um wh[illegible] wa[illegible]ot ma[illegible]rodu[illegible] before 1916 an[illegible]nly avai[illegible]e in a[illegible]' pa[illegible]s sinc[illegible] 1921 in [illegible] anata[illegible]orm[illegible]he ru[illegible] form [illegible] introduced in Eu[illegible]e after [illegible]5[2,3].

[2] Perego F., *Dictionnaire des matériaux du peintre*, Editions Belin, 2005, p.100.
[3] Laver M., *Titanium Dioxide Whites*, in *Artists' Pigments. A Handbook of Their History and Characteristics, Vol. 3*, West Fitzhugh E. (Ed.), National Gallery of Art – Washington/Oxford University Press, 1997, p.295-355.

noticed, only the preparation layer seemed to be present. Also under UV-light the fluorescence deviates from the other zones of the head. The lead signal at that spot was relatively high, and almost [illegible] zinc, titanium or barium was detected. S[illegible]7 on th[illegible]her hand was [illegible]ured in a zone w[illegible]re the white paint was relatively thickly [illegible]plied. The XRF signal was high in [illegible], titanium and barium, [illegible]

Compa[illegible] XRF-m[illegible]ure[illegible]nts 7 [illegible] 8, resp[illegible]tively measure[illegible] the flu[illegible]scent [illegible] zo[illegible] th[illegible]ear, [illegible]d the[illegible]n-flu[illegible]scent [illegible]ite zo[illegible] more to the le[illegible] of the [illegible] show[illegible] a qu[illegible] similar [illegible]positi[illegible]oth sp[illegible] but [illegible]h d[illegible] rel[illegible]ratio[illegible] be[illegible] fluorescent zones were much richer in zinc (white). MRS measurements showed that the titanium white used within the contours of the head was mainly present as anatase (detected in every white spot of the head measured, while only once anatase and rutile were found), while outside the head, the titanium white (mixed with zinc white/sulfide and barium sulphate) used to paint the background is rather a mixture of anatase [illegible]d rutile.

[illegible]w d[illegible]'s co[illegible]ith the pai[illegible]lette of F[illegible]cis Bacon? Normally it is quite difficult [illegible]ompa[illegible]esults of a speci[illegible]painting with the [illegible]ette of a[illegible]rtist, as quite often this information is j[illegible] not a[illegible]lable. In 2010 a[illegible]D thesis wa[illegible]er publi[illegible]d focussing on the materia[illegible] F[illegible]cis B[illegible]n, investigating [illegible]tings sp[illegible]ing a[illegible]he perio[illegible]om c. 1945 to c. 1990, and including t[illegible]results [illegible]aly[illegible]ple[illegible] 17 ab[illegible] canvases[1]. Although within this PhD study of course not all pigments used by Francis Bacon were covered, it gives a good impression of the more common materials he applied (besides pigments, also binders are discussed). According to the author of the thesis the artist was moreover quite conservative in materials use.

For long time lead white formed the main white pigment in Bacon's paintings. Only since the mid-1[illegible]0's it is more and more [illegible]placed by titanium white, althou[illegible]ly as the 1950's titanium white c[illegible] sporadically be found [illegible] paintings by Francis Bacon. In t[illegible]e cases the titanium white was often f[illegible]d a[illegible]ent [illegible]ls paints, where the [illegible]um w[illegible]d of [illegible] c[illegible]rre[illegible]ooner [illegible]ause [illegible] toxicity issues related to lead [illegible]te pigme[illegible] and th[illegible]arger [illegible]mes [illegible]dec[illegible]

[illegible] white [illegible]hopone w[illegible] found in some of the[illegible], not [illegible] datir[illegible] 1950's.

For the oranges he mainly used cadmium orange, synthetic organic pigments in general, or more specific in orange zones, were only found in a limited number of cases. The author of the thesis states: "The majority of synthe[illegible]ganic pig[illegible]nts detected were found in household paints, where they offer a cheap means of obta[illegible]ng bright yellows and oranges. Because [illegible]con tended to use the [illegible]ter qu[illegible]ts oil [illegible]her [illegible] cheaper [illegible]ther[illegible]ely f[illegible] p[illegible]ent[illegible] his [illegible]k". [illegible]y ph[illegible]locyanine [illegible]een PG7 [illegible] frequently [illegible]; PO13 found [illegible] painting [illegible]pc[illegible]d in o[illegible] of the p[illegible]tings stud[illegible] PhD th[illegible] however als[illegible] states "Organ[illegible]igments wer[illegible]ound i[illegible]everal tin[illegible] orange househo[illegible]aints [illegible]he studio. On[illegible] the [illegible]ne o[illegible]s w[illegible] th[illegible]d c[illegible] from [illegible] so[illegible] backgrounds, even in later works, appear to still use cadmium orange...". According to the thesis this orange is a mixture of synthetic organic red and yellow pigments. In his studio after his death the most common orange oil paint was Winsor orange containing the pigment PO43.

As a purple pigment, Francis Bacon seems almost in all cases to use cobalt violet. Only in one painti[illegible] moreover only in one sample, a[illegible]ain of mangane[illegible]iolet was found, in contrary to our results [illegible]ere manganese violet is the m[illegible] purple pigment. Pink in the faces was, based on the fluoresc[illegible]ed, [illegible]tifie[illegible]rose[illegible] although [illegible] crimson [illegible]

5. Conclusion

All pigments identified in this "Self-portrait" supposed to have been painted in the early 1970's by Francis Bacon, did exist at the supposed creation date. Lead white was found in the preparation layer(s), while the white paint consisted of a mixture of titanium white (both in the anatase and rutile form), zinc white (or sulphide) and barium sulphate, in varying pigment ratios. The orange pigment was identified as the synthetic organic pigment PO13, while the purple in the work was ascribed to manganese violet. The presence of madder is suspected, but could not be proven without sampling.

Results of the pigment analyses were also compared with the painting palette of Francis Bacon as described in a recent PhD thesis, in which a selection of paintings by Francis Bacon created between c.1945 and c. 1990 were studied. A few differences between the "Self-portrait" and the works studied in the PhD thesis could be noticed. Zinc white (and/or lithopone) was only found in some early works, not in paintings from the 1970's. Titanium white found in the "Self-portrait" was only sporadically used before the mid-1970's after which it gradually replaced lead white. The presence of high amounts of titanium white is hence rather exceptional (but not impossible) in a Bacon painting supposed to date from before 1974. Finally synthetic organic pigments were only limitedly present in the paintings studied (with the exception of PG7), and related to the use of household paints. PO13, the orange pigment found in the "Self-portrait", was not found in the works studied in the PhD thesis.

Based on these results it seems that, if Francis Bacon made the painting, he used household paints to create the "Self-portrait", rather than artists' paints. It needs to be stressed that the discrepancy between the materials' use described in the thesis and the ones found in the "Self-portrait" does not rule out the attribution of the painting to Francis Bacon, since the PhD thesis does off course not cover all works attributed to Francis Bacon and hence does not necessarily provide information on the complete painting palette. A stylistic study is recommended, complimentary to this study of the painting palette.

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