

Note from the Making and Knowing Project:

This essay was written for “The Art Technological Source,” an 8-week graduate course at the University of Amsterdam offered by Dr. Marjolijn Bol in 2015 and 2016 to students enrolled in an MA program in either Technical Art History or Conservation and Restoration. Students worked on various recipes from BnF Ms. Fr. 640 on the following five topics: 1) tracing and painting on glass, 2) yellow dyes and their applications, 3) dragon’s blood, 4) painters’ varnishes, and 5) sieves.

This is an un-edited student paper that relies on an earlier state of the Making and Knowing Project’s transcription and translation of Ms. Fr. 640. For an updated version of the text, see:

Making and Knowing Project, Pamela H. Smith, Naomi Rosenkranz, Tianna Helena Uchacz, Tillmann Taape, Clément Godbarge, Sophie Pitman, Jenny Boulboulle, Joel Klein, Donna Bilak, Marc Smith, and Terry Catapano, eds., *Secrets of Craft and Nature in Renaissance France. A Digital Critical Edition and English Translation of BnF Ms. Fr. 640* (New York: Making and Knowing Project, 2020), <https://edition640.makingandknowing.org>. DOI: <https://doi.org/10.7916/78yt-2v41>.

Annotation to BnF Ms. Fr. 640

On scales black / *noir d’escaille* for black outlines in reverse glass painting (as described in fol. 39v of manuscript BnF Ms. Fr. 640)

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Relevant transcriptions and translations

BnF Ms. Fr. 640, fol. 31v

Translation [tl_p037v, 4 March 2016]

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<div>
<id>p031v_4</id>
<head>Painting on glass</head>
<ab>For blue, they take some of the roughest <m>azure d'email</m> and grind it on
shale, and mix in two or three rosary beads' worth of <m>lead rock</m> or more,
according to the quantity of work. And having done their drawing with "<m>noir
d'escaille</m>" (which is painted towards the light with the piece of <m>glass</m>
upright), they lay all their pieces down over white <m>paper</m> so that by the
whiteness of the <m>paper</m> they can judge the lighting of their scenes and put
down all colors of the same kind at the same time. Then they reheat.</ab>
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Transcription [tc_p037v, 13 August 2015]

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<head>Paindre daprest </head>
<ab>Pour le <m>bleu</m> ilz prenent de l<m>azur desmail</m> du plus</lb>
gros & le broient sur une escaille & y meslent deulx ou trois</lb>
patenostres de <m>roquaille</m> ou plus selon la qua{n}tite de la besoigne</lb>
Et ayant faict leur desseing de <m>noir descaille</m> (qui se paint</lb>
vers le jour et la piece de <m>verre</m> droicte) Ils couchent toutes</lb>
leurs pieces sur du <m>papier</m> blanc grand pour cognoistre par</lb>
la blancheur du <m>papier</m> le jour de leurs histoires et as y assoir</lb>
les couleurs qui sont dune sorte tout a un coup Puys ilz</lb>
recuisent</ab>
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BnF Ms. Fr. 640, fol. 37_2

Translation [tl_p037v, 4 March 2016]

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<id>p037_2</id>
<head><pro>Glass-maker</pro></head>
<ab>
Some do not lay <m>gris d'escaille</m> on the <m>glass</m> to work on it, but trace
straight on the <m>glass</m> with <m>noir à huile</m>. However, it is important that
the <m>wood</m> be <m>degreased</m>, because if it has even a little
<m>grease</m> [on it], the color will not take at all. And even, if the working <pro>glassmaker</
m> has a stink from his nose or his mouth, and he breathes on the
<m>glass</m>, the color will not take on it. Those who came up with the invention of
working in small works of softened <m>enamels</m> use only <m>azure enamel</m>,
which is blue, and <m>esmail colombin</m>, which is the color of purple, which they
soften with <m>rocks</m> or <m>lead glass</m>. As for yellow, they make it from
<m>silver</m>, red from <m>sanguine</m>, as is said elsewhere, black and gray and
shadows from <m>scale black</m>, either strong or weak, carnation from light
<m>sanguine</m>. Green is made first from yellow, then they overlay <m>azure
enamel</m>, either strong or weak, depending on whether they want to make it bright or
dark.
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</ab>
</div>

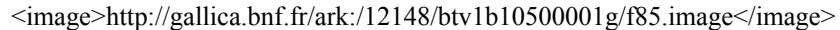
Transcription [tc_p037v, 13 August 2015]

<div>
<id>p037_2</id>
<head><pro>Vitrier</pro></head>
<ab>
Aulcuns ne chargent point de <m>gris d'escaille</m> le <m>verre</m> pour<lb/>
travailler d'aprest, ains trassent sur le <m>verre</m> net avecq<lb/>
du <m>noir à huile</m>. Mays il fault bien que le <m>bois</m> soit<lb/>
<m>desgraissé</m>, car s'il a tant soit peu de <m>graisse</m>, la couleur<lb/>
n'y prendra aucunem{ent}. Et mesme, si le <pro>vitrier</pro> qui travaille<lb/>
a paunteur de nés ou de bouche, & qu'il alene sur le <m>verre</m>, <lb/>
la couleur n'y prandra point. Ceulx qui ont trouvé<lb/>
l'invention de travailler en petite besoigne d'<m>esmaulx</m> att{a}n{dris}<lb/>
n'employent que l'<m>esmail d'azur</m>, qui est le bleu, & l'<m>esmail<lb/>
colombin</m>, qui est couleur de pourpre, lesquels ilz attendrissent<lb/>
avecq de la <m>rocaille</m> ou <m>verre de plomb</m>. Quand au jaulne,<lb/>
ilz le font d'<m>argent</m>, le rouge de <m>sanguine</m> co{mm}e est dict ailleurs,<lb/>
le noir & gris & umbres avecq le <m>noir d'escaille</m> ou fort,<lb/>
ou foible, la carnation avecq la <m>sanguine</m> claire. Le<lb/>
vert se faict premierem{ent} de jaulne, puyss dessus ilz couchent<lb/>
de l'<m>esmail d'azur</m> ou fort ou foible, selon qu'ilz veulent<lb/>
faire gay ou obscur.

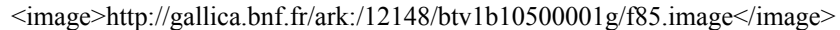
BnF Ms. Fr. 640, fol. 039v, 040r

Translation [tc_p039v_a2, tc_p039v_b2, p039v_a3, p039v_b3a, p040r; 4 March 2016]

<title id="p039v_a2">For laying colors on glass</title>
<ab id="p039v_b2">In order to stop your turpentine colors from running and to make them unified, mix in a little mastic larme together with the turpentine.</ab>
<title id="p039v_a3">Tracing a story on glass</title>
<ab id="p039v_b3a">If you want to trace a story in intaglio on glass, you can do so in different ways. Place your glass pane, as thin as possible, over the printed image, and having cleaned the glass well with lye and ashes so that it is not greasy, trace over the lines visible to you with some oily black or skales black, using a brush, if you want to paint with colors in the manner of glaziers, who spread a wash of skales black all over their glasses and then scratch and uncover the areas where they want to apply colors, leaving whatever is necessary for shadows. But if you want to realize gilt stories on glass with a colored background, imitating the taille-basse of goldsmiths, gild the whole glass with gummy water or garlic juice or fig-tree milk. Then moisten your printed story with two humid linen cloths and lay it down on your gilt glass, then with a pin hafted to a small stick, follow your story lines as if you wished to pounce it, and thus you will roughly draw it on the gilt glass. And next you will uncover the background and what needs to be cleared using a very sharp steel awl, and retrace precisely the lines and complete your work and make faces and skin colors in pounded silver. Then you will fill the background with enamel azure or verdigris or fine turpentine-soaked laque platte, mixed with a little mastic larme if you want the colors to be more unified and not to flow. Next, apply on the underside of the glass and over the colors a white tin sheet. And once dry, you can cover your tin sheet with color to hide your secret. The tin sheet gives light to the colors. Thus you will be able to paint without</ab>
<page>040r</page>

hardly an expert in painting. If your pane is curved as taken from the middle part of a jar, it will show better. When you apply your colors to your panes, first put them on a hot tile and, once they are hot, apply your colors and leave them a while on the tile. Then lay down your tin sheet.

Transcription [tc_p039v_a2, tc_p039v_b2, tc_p039v_a3, tc_p039v_b3a, tc_p040r; 13 August 2015]

Couleurs sur verre
denlumineuse
Affin que tes couleurs a tourmentine ne sespendent pas &
soient unies mesle y avecq la tourmentine un peu de larme de mastic
Trasser sur le verre quelque
histoire
Si tu veulx trasser sur le verre quelque histoire de taille
doulce Tu le peulx faire en plusieurs sortes Pose ta table
de verre sur le plus tanvre que tu pourras sur lhistoire imprimee
& ayant bien nettoye le verre avecq lessive & cendre de sorte quil
ne soit point gras trasse sur les lignes qui te sont apparentes
avecq du noir a huile ou du noir descaille avecq le pinceau si tu
veulx paindre de couleurs en la facon que font les vitriers qui
lavent leur table de verre de noir descaille & puy esgratignent &
descouvrent ce quilz veulent couler de couleur laissant ce qui est
necessaire pour les ombres Mays si tu veulx faire histoires
dorees sur le verre avecq fonds de couleurs qui imitent la taille
basse des orfèvres Dore avecq eau gommee ou suc dail ou laict de
figuier toute ta planche de verre Puy humecte entre deulx linges
mouilles ton histoire imprimee Et lestends sur le verre dore
puy avecq une espingle manchee au bout dun petit baston suys les
lignes de ton histoire comme si tu la voulois poncer & ainsy tu la
trasseras naifvement sur la doreure du verre & apres tu descouvriras
le fonds & ce qui doibt estre vuide avecq une aleine dacier bien
pointue & resuivras nettement les traicts & accompliras ton ouvrage
& feras tes visaiges & carnations dargent moulu Puy rempliras
le fonds dazur desmail ou de verdegris ou de fine laque platte
platte destrempee avecq tourmentine clere meslee dun peu de
larme de mastic si tu veulx que les couleurs soient plus unies & ne
sespendent point Apres couche au dos du verre & sur les couleurs
une foeille destain blanche Et cela sec tu pourras couvrir de couleur
la foeille destain de pour cacher ton secret La foeille destain
donne jour aux couleurs Ainsy tu pourras paindre sans estre
040r
gueres expert en la paincture Si ta planche de verre est emboutie comme prinse du ventre de quelque bocal elle
sen monstrera mieulx **Quand tu couches tes couleurs a**
tourmentine
sur tes planches de verre pose les premierem{ent} sur un quarreau chault
& comme elles seront eschauffees estans tes couleurs & le laisse un peu sur
le quarreau puy pose ta foeille destain

Translation [tl_p041v_1; 4 March 2016]

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<div>
<id>p041v_1</id>
<head><pr>Glassmaker</pr>'s <m>black</m></head>
<ab><m>Filings of iron</m> taken from bars that have been in the fire for a long time,
which are thick, are much better than the common soft ones that fall under the anvil in
the forge, because they imitate <m>niello</m>. To said <m>black</m>, described
elsewhere, some people add a little <m>minium</m>.
</ab>
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Transcription [tc_p041v_1; 13 August 2015]

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<div>
<id>p041v_1</id>
<head><m>Noir</m> des <pr>vitriers</pr></head>
<ab><m>Lescaille de fer</m> qui se prend des barres qui ont long<lb/>
temps este au fœu & qui est espesse est beaucoup meilleure<lb/>
qui celle commune tendre qui tombe sous lenclume en<lb/>
forge pourcequelle imite le <m>nel</m> Audict <m>noir</m> descript ailleurs<lb/>
aucuns y adjoustent <del>d</del>un peu de <m>minium</m>
</ab>
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BnF Ms. Fr. 640, fol. 051v

Translation [tl_p051r_b2b; 4 March 2016]

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<ab id=p051r_b2b">
<ab id=p051r_b2b">which is different from the printers' one, you have to boil for a long
time some walnut oil or, even better, some linseed oil, and after boiling for a long time,
you will add garlic cloves and bread crusts to skim them and leave again to boil on big
fire, then eventually you will add a measure of lampblack that you would have ground
with some oil previously on the marble. And lastly you will mix everything and until you
see that the plate prints well. And when you will have spread the ink, dry the plate with a
white sheet of paper and do that until the paper looks clean and then print. If you dry the
plates with a cloth, it would remove the ink off. Linseed oil gets thicker while boiling
and becomes similar to a varnish and risks catching fire as soon as you boil it, so make
sure that when you boil it, it is in an open space or where the flame cannot damage
anything. Some burn some scale until it turns black and grind it with some non-boiled
linseed oil or walnut oil that some consider to be better. This black is beautiful but the
lamp smoke one is blacker. When you want to print, take with your finger's end and
reasonably spread some of the said black all over the plate previously cleaned with
some detergent as said, then, rub it with a white sheet of paper until the paper is
completely white and do not touch it with your bare hand but with a paper applied on it.
And after cleaning the plate perfectly, rub again the sides and edges with a folded sheet
of paper. Then, have [available] a small even table and on it a piece of felt, then a few
sheets of paper and eventually the one you want to print on, moistened between two
humid napkins. And on this sheet of paper, put your sheet then some more paper, and
at least another piece of felt. Then put it through the rollers and you can print a dozen
pieces consecutively while always charging the plate with ink and cleaning it as you did.
But if you stop printing, the rest of the ink will dry out in the plate's lines and so you will
have to let it boil in detergent or urine, as said, to clean it. The rollers must not be too
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loose.</ab>

Transcription [tc_p051r_b2b; 13 August 2015]

<ab id=p051r_b2b>qui est different de celuy des imprimeurs Il fault faire long<lb/>
temps bouillir de lhuile de noix ou pour mieulx de lhuile de<lb/>
lin & ayant long temps bouilly Tu y mettras des aulx &<lb/>
des croustes de pain pour les desgraisser & laisseras encores<lb/>
fort bouillir puis en fin y mettras une partye du noir<lb/>
de lampe que tu auras broye avecq de lhuile auparavant<lb/>
sur le marbre Et en fin le mesleras tout & jusques a ce<lb/>
que tu voyes que la planche imprime bien laquelle Et<lb/>
co{mm}e tu y auras couche lancre essuye bien les planches avecq<lb/>
la superficie dune foeille de papier blanc & fais ainsy<lb/>
jusques a ce que le papier se monstre net puis imprime<lb/>
Si tu essayois les planches avecq un linge il osteroit lancre<lb/>
Lhuile de lin sespessist en bouillant & vient co{mm}e un vernis & est<lb/>
dangereulx de senflammer partant quand tu le feras bouillir fais<lb/>
que ce soit en lieu decouvert ou en lieu ou la flamme ne puisse<lb/>
porter domage Aulcuns font brusler du tartre jusques a ce<lb/>
quil soit noir & le broient avecq de lhuile de lin non bouilly<lb/>
ou huile de noix que daultres trouvent meilleur Ce noir est<lb/>
beau Mays celuy de fumee de lampe est plus noir Quand<lb/>
tu veulx imprimer fr prens avecq le bout du doigt dudict noir<lb/>
mediocrem{ent} espes toute la planche premierem{ent} nettoeye en lessive<lb/>
co{mm}e dict puis avecq la superficie dun papier blanc frotte la<lb/>
jusques a ce que le papier demeure blanc et ne la touches pas<lb/>
de la main nue pourceq mays un papier applique par dessus<lb/>
& ayant nettoye parfaitem{ent} la planche frotte encores dun papier<lb/>
redouble les bords & costes Apres ayes une petite table unye<lb/>
& sur icelle une piece de feultre puis quelques foeilles de papier<lb/>
& en fin celle que tu veulx imprimer qui soit humectee entre deulx<lb/>
servietes mouillees Et sur ceste foeille mets ta planche puis<lb/>
daultre papier & enfin ung aultre foeultre Puis passe entre<lb/>
les rouleaulx Et tu peulx imprimer une douzaine de pieces<lb/>
de suite en chargeant tousjours la planche dancre & la nettoya{n}t<lb/>
co{mm}e tu as fait Mays si tu desistes dimprimer Le reste de<lb/>
lancre se sechera dans les traicts de la planche Ainsy il te<lb/>
la faudra faire bouillir en lessive ou urine co{mm}e est ja dict<lb/>
pour la nettoyer Les rouleaux ne doibvent pas estre trop lasches</ab>

BnF Ms. Fr. 640, fol. 058v

Translation [tl_p058v_1; 4 March 2016]

<div>

<id>p058v_1</id>

<head>Blacks</head>

<ab>Coal black, ordinary black lead black, burnt ivory black, peaches stones black,
black smoke, black light, burnt oxes' feet bones black</ab></div>

Transcription [tc_p058v_1; 13 August 2015]

<div>

<id>p058v_1</id>

<head>Noirs</head>

<ab>Le <m>noir de charbon de mine</m> De <m>charbon commun</m><lb/>
D<m>ivoyre</m> brusle De <m>noyaux de pesches</m> de fumee<lb/>
de lampe Dos de <m>pied de boeufs</m> brusles</ab></div>

BnF Ms. Fr. 640, fol. 065r

Translation [tl_p065r_1; 4 March 2016]

<div>
<id>p065r_1</id>
<head>Shadows</head>
<ab> Because blacks produce various colors, some reddish black, others bluish, and others greenish, choose those verging on yellow in order to obtain beautiful shadows in <m>oil</m>, for men's shadows are similarly yellowish, and for this effect use very strongly crushed <m>[...]</m>, which you mix with a bit of <m>yellow ochre</m> and <m>white lead</m>, that is after you have crushed your <m>white lead</m> and gathered with the <figure/> crushed with the <m>[...]</m>. This way it ^{the black} will be more desiccative, and on its own producing a yellowish black, when mixed with a bit of white it will be perfect for men's shadows. Blacks which produce a greenish black are appropriate for women's shadows. Take then some black of <figure/>, a little <m>sap green</m> and some <m>bistre</m>, and you will have a perfect woman's shadow in distemper.</ab>

Transcription [tc_p065r_1; 13 August 2015]

<div>
<id>p065r_1</id>
<head>Umbres</head>
<ab>Pourceque les noirs font diverses couleurs les uns un noir rouges {tre}<lb/>
les aultres tirant sur le bleu aultres sur le vert Choisis ceulx<lb/>
qui retirent sur le jaulne pour faire beaulx umbres a <m>huile</m> Car<lb/>
lumbre mesmem {ent} des hommes est jaulnastre Et pour cet effect use<lb/>
de la <m>geiete</m> broyee bien fort laquelle tu mesleras dun peu d<m>ocre
<add>jaulne</add></m> & de<lb/>
<m>blanc de plomb</m>. Ou bien apres que tu as broye ton <m>blanc de
plomb</m><lb/>
bro et nettoye p ramasse avecq la <figure/> broyes y la
<m>geiette</m> Ainsy il<lb/>
sera plus desiccatif & faisant de soy mesme un noir jaulnastre<lb/>
le peu de blanc mesle le rendra parfaict pour umbre dhomme<lb/>

1. Introduction

The manuscript BnF Ms. Fr. 640 holds several terms that do not manifest themselves immediately to the modern reader. This annotation shall explore a pigment that was available to the author-practitioner in order to create the black outline in reverse glass painting, which is called “noir d’escaille” / “scales black”. The reconstructed recipe entitled “For laying colors on glass” / “Couleurs sur verre denlumineure” can be found on fol. 39 *verso* continuing on fol. 40 *recto* of the manuscript. It is made use of a binding substance that holds the pigments to the glass rather than fusing them onto the glass by a process of firing. From this it may be inferred that this recipe describes a case of *cold painting on glass* also referred to as *reverse glass painting*.¹ The recipe 39 *verso* describes in three parts all relevant steps that are required to paint on glass. It starts out with the most remarkable characteristic of glass, its transparency, which perfectly allows copying from something such as a “story in intaglio”. The latter is a reference to an engraving on paper, which was commonly entailed and laid underneath the glass used.² According to the recipe, the contour lines in black are to be painted first. These will also remain visible in the end, since a reverse glass painting is looked at from the side that is reverse to the one painted on.³ At this point, the reconstruction was focused on the first part of the recipe “How to trace a story on glass” / “Trasser sur le verre quelque histoire”. The material and manner necessary to transfer the outlines of a print onto a glass in black colour were investigated.⁴ With regard to black paint, the general term “noir huil” / “oily blacks” and, in addition to that, the term “noir d’escaille” / “scales black” are indicated in the recipe. The reconstruction work was thus confronted with the issue to consider what kind(s) of black pigments the author-practitioner may have actually had available and whether both options indicated were eventually to be seen as contrasting each other. What are possible reasons for the author-practitioner to mention “noir d’escaille” distinctively for the black outline in reverse glass painting?

¹ Ward, Gerald. *The grove encyclopedia of material and techniques in art*. New York: Oxford U.P., 2008, 252.

² See examples of reverse glass painting from the time of BnF Ms. Fr. 640 and their templates in: Steiner, Wolfgang. *Hinterglas und Kupferstich. 100 bisher unveröffentlichte Hinterglasgemälde und ihre Vorlagen aus drei Jahrhunderten (1550-1850)*. München: Hirmer, 2004.

³ Ward, Gerald. *The grove encyclopedia of material and techniques in art*, 252.

⁴ On recipes also substantially dealing with aspects of reverse glass painting, please refer to the research of fellow colleagues: Ilse Steeman, Roy van der Wielen, Caitlin Soughwick, Corinna de Regt and Rosa Hoogenboom.

In this context, BnF Ms. Fr. 640 and a number of other treatises were consulted to understand the characteristics of “scales black” in comparison to other black pigments. Due to scant information on the specific topic a relatively large time period was considered from the 13th century (Heraclius) till 19th century (Gessert). The main focus is on publications of reverse glass painting, but to get a broader understanding also references to pigments that are used in other fields were included such as panel painting and stained glass.⁵ Recent analytical investigations on the black outlines in reverse glass painting by Hahn and Bretz (2009) were also taken into consideration. Complementary to the literature survey personal attempts were made to reconstruct paint on the basis of different black pigments with special regard to “scales black”.

2. The term “Noir d’escaille” / “scales black”

Considering the composite character of the manuscript in which recipes or notes often refer to each other on very different locations or in different contexts, fol. 58 *verso* was consulted in which the author-practitioner made a list of six black pigments.⁶ The neighbouring recipes refer clearly to painterly issues, such as painting shadows. Interestingly, this list of blacks lacks a mention of “noir d’escaille” which may indicate that “noir d’escaille” originates from a different context than the other six pigments. Yet, at another location, at fol. 41 *verso*, an entry is entitled with “noir des vitriers” / “glass maker’s black”. Here the author-practitioner writes about “lescaille de fer” as a black originating from scales falling from hot iron bars. The use of *escaille* in connection with iron is confirmed in Rande Cotgrave’s dictionary from 1611 in which he included an entry on “escaille” directing to “escaille de fer” also described as “the skales that fly from [Steele] when they are hammered”.⁷

⁵ See for example Cennini on black pigments in chapter 37. Cennini, Cennino. *Il libro dell’arte, o trattato della pittura*. Firenze: Felice le Monnier, 1859: p. 24-25. See also notes of Ernst Berger on common black colours for oil painting in: Fels, Donald. *Lost secrets of Flemish painting. Including the first complete English translation of the De Mayerne manuscript, B.M. Sloane 2052*. Floyd: Alchemist, 2004, 149.

⁶ „Le noir de charbon de mine, De charbon commun, D’ivoire brusle, De noyaux de pesches, De fumee de lampe, Dos de pied de boeufs brusles.” / “Coal black, ordinary coal black, burnt ivory black, peaches stones black, smoke of a lamp (lamp black), burnt oxes’ feet bones black“. BnF Ms. Fr. 640, tl_p58v_1.

⁷ Cotgrave, Rande. *A dictionarie of the french and english tongues*. 1611. Hildesheim: Georg Olms, 1970.

Mary Merrieffield, a 19th century historian of the techniques of painting, lists several black pigments in her book on medieval and renaissance treatises of painting.⁸ She also mentions “nero di schiuma di ferro”, which literally translates to “black of iron-foam” and appears to be the Italian equivalent of “noir d’escaille”. Merrifield refers here to three persons among which also Fillippo Baldinucci, who wrote a technical dictionary in 1681. He mentions the Italian term “scaglia di ferro” literally meaning “scales of iron”.⁹ In the current translation of the manuscript Ms. Fr. 640, 39v, “noir d’escaille” is referred to as “skales black”, which, for reasons of consistency is followed in this annotation.¹⁰ This is done despite the fact that the English term “hammerscale” taken from a pigment glossary of a recent publication would better denote the pigment’s identity and is more frequently used.¹¹ Christophe Zindel, the writer of a recent overview of ancient manuals, refers in his German glossary to it as “Eisenhammerschlag” adding the mention “Eisenoxidschwarz”.¹² The latter refers to the pigment’s chemical composition, which is iron oxide. From the above it is concluded that within the context of BnF Ms. Fr. 640 “noir d’escaille” is the same as “glass maker’s black” and can safely be identified as a black pigment made of the scales of iron.

3. The making of “scales black” and its visual character as described in BnF Ms. Fr. 640

Whereas no account could be found in BnF Ms. Fr. 640 on the making of the six black pigments listed in fol. 58 *verso*, the reader is indeed given a short indication on the quality of iron scales on fol. 41 *verso*. The author-practitioner states there that thicker scales are regarded to be of higher quality and obtained from iron that had been relatively longer in the fire. In order to

⁸ Merrifield, Mary. *Medieval and renaissance treatises on the arts of painting. Original texts with English translations*. New york: Dover, 1967, CCXXV-CCXXViii.

⁹ „Scaglia di ferro. Una certa superficie del ferro, che insieme con una ruggine, la quale, si trova alle cave di esso ferro, serve per far colore da velare le finestre o vetriate di vetri colorati.“ Baldinucci, Filippo. *Vocabolario toscano dell’arte del disegno nel quale si esplicano i propri termini e voci, non solo della pittura, scultura, & architettura; ma ancora di altre arti a quelle subordinate, e che abbiano per fondamento il disegno*. 1681: 142.

¹⁰ Though the spelling of „skales“ as written by Cotgrave has been adapted to the modern spelling „scales“. The terminology is inconsistent here in BnF MS. FR. 640, since the modern spelling of „scales“ is used throughout the manuscript.

¹¹ Kirby, Jo, Susie Nash and Joanna Cannon (eds.). *Trade in Artists’ Materials. Markets and Commerce in Europe to 1700*. London: Archetype publications, 452.

¹² Zindel, Christophe. *Göldene Kunst-Pforte. Quellen zur Kunsttechnologie*. Bern: Hochschule der Künste Bern, 2010, 644.

correctly interpret this remark, a reference is due to the process of iron forging. Firstly, iron is exposed to high temperature and due to ambient air oxidation occurs on the outside of the iron, which is visible in the form of a black oxide layer. From a chemical point of view, multiple layer-scales grow during this oxidation process consisting of FeO, Fe₃O₄ and Fe₂O₃, their composition depending on temperature.¹³ It has been experimentally verified that the oxide layer increases in thickness with higher temperature and longer duration of the heating as is stated in the recipe.¹⁴ Ultimately, the oxide scales come off due to the impact of the hammer or due to abrupt cooling. Although the author-practitioner does not go into details on grinding, it is obvious from the size of the scales that grinding the pigment is a prerequisite [Fig. 1].



Fig. 1. Scales of iron as a side product from blacksmith work.

[AnnotationSpring2016_MagdalenaPilko_39v_fig1]

Photo: Michael Fuller¹⁵

In the same passage of the manuscript, a comparison is drawn between the colour of iron scale and *niello*.¹⁶ *Niello* is a black alloy generally used in silver- and goldware composed of a mixture of metallic sulphides. The black colour of *niello* may be described as a strong black or dark-grey which is relevant in an otherwise light colour set.¹⁷ From this passage it may be deduced that the intended effect of “scales black” is to mimic the strong black of *niello* (“...pourcequelle imite le nel”). [Fig. 2]

¹³ Birke, Neil, Gerald Meier. *Introduction to the high temperature oxidation of metals*. Cambridge: 2009, 83.

¹⁴ Dungworth, David, Roger Wilkes. *An investigation of hammerscale*. *Technology report*. Research department report series no 26. English heritage: 2007, 32-33.

¹⁵ <<http://users.stlcc.edu/mfuller/pennsic2008forge.html>> accessed March 21, 2016.

¹⁶ “Scales of iron taken from the bars that have been in the fire for a long time, which are thick, are much better than the common soft ones that fall under the anvil in the forge, because they imitate niello.” BnF Ms. Fr. 640, tl_p041v_1; Translation 4 March 2016.

¹⁷ Maryon, Herbert. *Metalwork and Enamelling. A practical treatise on gold and silversmiths' work and their allied crafts*. New York: Dover, 1971, 161.



Fig. 2. Note the black of the niello. Devotional diptych with the nativity and the adoration (detail). French, ca. 1500, silver, niello, gilt copper alloy, Metropolitan museum of art (2000.152). Photo: Metropolitan museum of art¹⁸

Also on fol. 37 *verso* the topic of tracing on glass is addressed mentioning “gris d’escaille”. The author-practitioner refers to this as a weak (“foible”) form of scales black, most likely to be understood as a diluted form resulting in a grey colour. In any case, this passage confirms the procedure as explained on fol. 39 *verso* for reverse glass painting. In both recipes it is suggested to use scales black/grey first, before applying oil paints.

5. Other sources

Despite an extensive search in literature, only one other source was retrieved that mentions scales black in reverse glass painting. In 1679, the German glassmaker Johann Kunckel writes in his treatise on the art of glass extensively about reverse glass painting. With him we learn about “allerhand andere Farben zu mahlen_die nicht in das Feuer kommen” / ”painting with some other colours_that are not put in fire”. With regard to scales black, he specifies the following: “Nimm Hammerschag_reibe es unter Leinöl_und mahle damit auff Glas_und lasse es an der Sonnen

¹⁸ Museum of Modern Art. Accessed March 20, 2016, <http://www.metmuseum.org/art/collection/search/472608>.

trocken werden.” / ”Take hammer scale_grind it with linseed oil_and paint with it on glass_and let it dry in sun”.¹⁹

Other sources name black paint containing iron scales in the context of glass-work that requires firing, for example, the so-called Heraclius manuscript from the 13th century²⁰ or Georgio Vasari, who wrote about the practice of the stained glass painter Guglielmo de Marcillat in 1515.²¹ Also, the Italian so-called Marciana manuscript²² of the 16th century mentions it and yet another manuscript from a French painter in 1635.²³ End of the 17th century the Frenchman Blancourt refers in his book “The art of glass”²⁴ to iron scales and also the German Johann Cröker²⁵ (1729) describes it. A later reference was found in “Die Kunst auf Glas zu malen” by M. Gessert (1842).²⁶ All these sources use iron scales in combination with lead glass, which is added to lower the temperature of melting.

From the above, it may be inferred that throughout history the use of iron scales to achieve black on glass was well known in stained glass. It appears likely that scales black was introduced from here to reverse glass painting, since no references were found that led to other disciplines such as panel painting or book illumination. From the above it appears likely also that scales black was never used on a large scale in reverse glass painting.

In the course of the research carried out, it turned out to be difficult to distinguish whether a recipe that concerned the use of iron scales involved a process of firing or whether *cold* painting was described. This is also true for BnF Ms. Fr. 640, because it is not specified therein whether “scales black” requires firing. As fol. 39 *verso* mentions oil paints it was initially presumed that this recipe requires no process of firing, considering that oil paints cannot

¹⁹ Kunckel, Johann. *Ars vitraria experimentalis. Oder vollkommene Glasmacher-Kunst*. Frankfurt (Main): 1679: 23 LIX.

²⁰ Ilg, Albert. *Heraclius. Von den Farben und den Künsten der Römer*. Wien: Wilhelm Braumüller, 1873: 85.

²¹ Merrifield, Mary. *Medieval and renaissance treatises on the arts of painting. Original texts with English translations*, lxxxv

²² Merrifield, Mary. *Medieval and renaissance treatises on the arts of painting. Original texts with English translations*, 614.

²³ Merrifield, Mary. *Medieval and renaissance treatises on the arts of painting. Original texts with English translations*, 792-793.

²⁴ Blancourt, Haudicquer. *The art of glass shewing how to make all sorts of glass, crystal and enamel. Likewise the making of pearls, precious stones, china and looking-glasses. To which is added, the method of painting on glass and enameling*. Translated into English. London: 1699, 179.

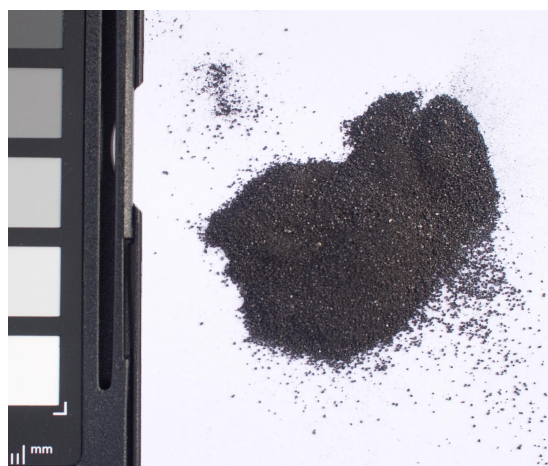
²⁵ Cröker, Johann. *Der wohl anführende Mahler welcher curiöse Liebhaber lehret, wie man sich zur Mahlern zubereiten, mit Oel-Farben umgehen, Gründe, Fürnisse und andere darzu nöthige Sachen verfertigen, die Gemähldte geschickt auszieren, vergülden, versilbern, accurat lacquiren, und saubere Kupfferstiche ausarbeiten solle*. Jena: 1736, 405-406.

²⁶ Gessert, M. *Die Kunst auf Glas zu malen und die hiezu nöthigen Pigmente und Flußmittel zu bereiten*. Stuttgart: Ebner und Seubert, 1842, .

withstand the high temperatures and would melt away. Yet, another recipe for painting on glass on fol. 32 *verso*, entitled “Paindre daprest” / “Painting on glass” mentions “scales black” and suggests the possibility of firing by ending the recipe with “Puys ilz recuisent” / “Then they reheat”. Also the remark on the addition of Minium, “To said black, some people add a little minium”, at the end of fol. 41 *verso* appears to go in the same direction. Minium denotes lead of a red colour which could be added to lower the melting temperature or to add colour. Further research would be required.²⁷

6. Reconstruction experiments

The author-practitioner knew about at least six different black pigments including lamp black that may be self-made and does not require grinding.²⁸ Taking this into account the question arises what reason the author-practitioner could have possibly had to mention scales black at all. To win further insight, “scales black” was reconstructed. The pigment is commercially available under the name “Hammerschlagpulver” or “Blacksmith powder”. As purchased it was in fact already refined [Fig. 3].²⁹



[Fig. 3] Refined iron scale purchased as “blacksmith powder”, before grinding. Photo: author

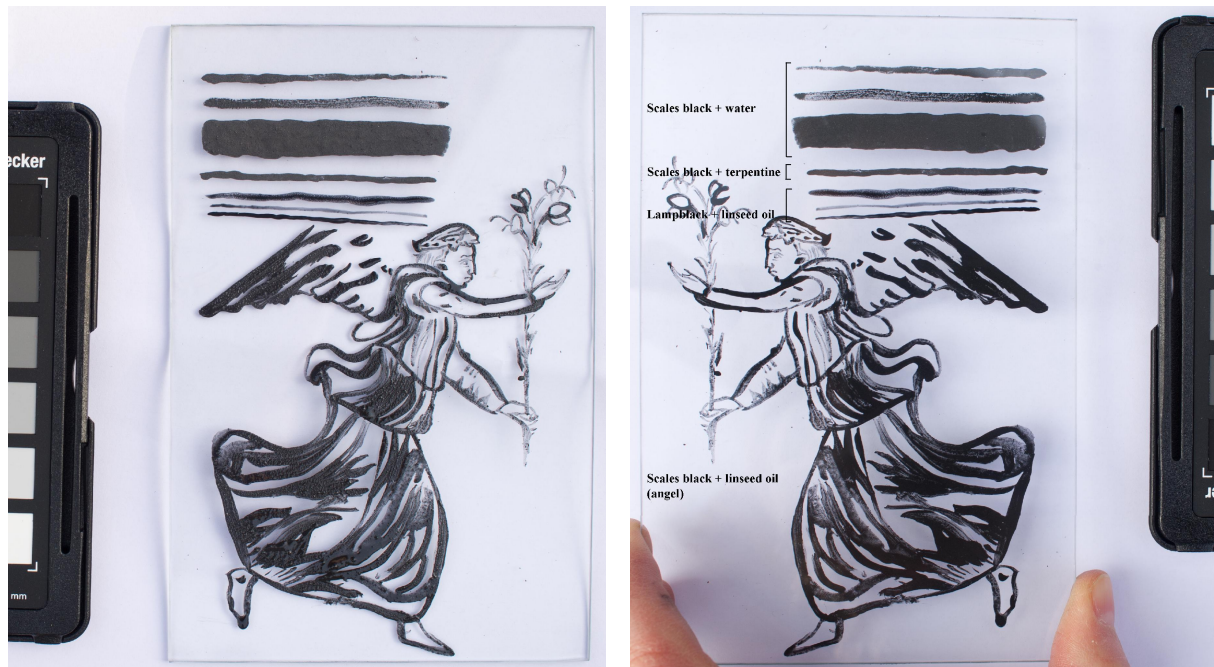
²⁷ Eastaugh, Nicholas, *et al.* *Pigment Compendium. A dictionary of historical Pigments*. Oxford: Elsevier, 2008, p. 270.

²⁸ Cennini, Cennino, *Il libro dell'arte, o trattato della pittura*, 25.

²⁹ Purchased from the German company Kremer pigments.

The powder of iron scales could be ground finely in an hour.³⁰ It was respectively applied with linseed oil, water and turpentine on a glass plate that had previously been cleaned according to the description in fol. 39 *verso*. Compared to lamp black, the attained paint was more pasty, but in accordance with the recipe, black opaque contour lines could be realized on the glass when applied with a brush in linseed oil. It was also possible to engrave a design in a paint layer applied as is suggested as a possibility in fol. 39 *verso*.

The colour tones respectively achieved may be described as follows: dark black with linseed oil; it was found confirmed not to be as dark black as lamp black. A grey was achieved with water, but also when applied with turpentine [Fig. 4], [Fig. 5].



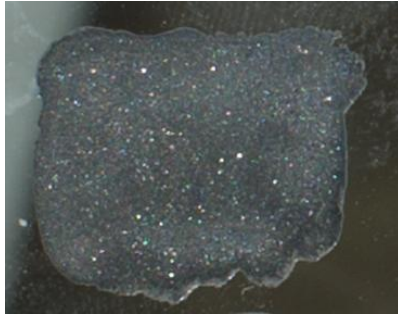
[Fig. 4], [Fig. 5] Reconstruction. Reverse glass painting with “scales black” in different binding media and lamp black in linseed oil, recto (left), verso (right).³¹

The reconstructed paint is rather paste-like compared to lamp black [Fig. 4]. It is remarkable that “scales black” revealed a slight sparkle when seen in reflecting light, which was unique amongst

³⁰ It appeared during painting that prolonging the process of grinding could still have an effect on the paint. The fineness of the pigment and its influence on the application of the paint requires further research.

³¹ The template for the angel was a reverse glass painting from the second half of 16th century from Tyrol. See: Steiner, Wolfgang. *Reverse painting on glass. 100 previously unpublished reverse paintings on glass and the engravings on which they were based, from 1550 to 1850*. München: Hirmer, 2004, 36.

the pigments tested including lamp black, charcoal black, burnt ivory black and peaches stone black [Fig. 6], [Fig. 7].



[Fig. 6] Reconstruction. Different tonalities of black pigments in comparison: lamp black, charcoal black, burnt ivory black and peaches stone black mixed with linseed oil or turpentine. Note that the pigments were not ground.



[Fig. 7] Reconstruction. “Scales black” applied with turpentine on glass in direct sun light (recto). Note the grey tone and the sparkle. A dark black was achieved with linseed oil resulting also in less sparkling.

7. Discussion

In fol. 65 *recto* the author-practitioner remarks the following: “blacks produce various colors, some reddish black, others bluish, and others greenish, choose those verging on yellow in order to obtain...”. From this statement we learn that the author-practitioner was well aware of differences in appearance obtained by different black pigments. Hence, a possible reason for the author-practitioner to mention “scales black” in fol. 39 *verso* could be its very visual character

with regard to its tonality and slight glittering effect. On the other hand, the difficult working properties of “scales black” may speak against that (long grinding time; long drying time; paste-like paint application): a black similar to *niello* was only achieved with linseed oil, not with turpentine. As seen in the reconstruction, the black outline made with linseed oil required a drying time of several days in order to prevent smearing of the outline. On the contrary, a short drying time may have been a relevant quality due to the complex painting styles in several procedural steps. Recent analytic research has proven that the black outline in several reverse glass paintings was made by the use of black enamels that were applied without firing. Black enamels consist of lead glass and colouring iron oxides, thus iron scales for example.³² The function of lead glass in combination with oil paint is apparently that of a drying agent. In fact, the author-practitioner indeed recommends the use of “azure enamel” that is a blue “which they soften with rocks or lead glass” (fol. 37 *verso*) for reverse glass painting. However, also in fol. 37 *verso*, the use of enamels is specified for blue enamels only, whereas “scales black” is designated separately.

Ultimately, it cannot be excluded that the work with “scales black” involves an intermediate step of firing, of which recipe 39 *verso* lacks a description. In fact this appears indeed likely referring to Cennini. He describes a similar case with finely ground copper oxide (“limmatura di rame ben macinato”) functioning in the same manner as iron oxide.³³ According to him, the painter first applies the glassmaker’s black for the outline. Next, the glassmaker fuses it on the glass in the furnace. Finally, the painter applies oil paint and lets it dry in the air.

8. Conclusion

Fol. 39 *verso* lists materials used for reverse glass painting including specifically iron scales (iron oxide) as a pigment for making black paint. In this context, its intended use is to make black outlines of a painting. The author-practitioner in BnF Ms. Fr. 640 refers to this paint as

³² Hahn, Oliver, et al. Pigments, dyes, and black enamel-the colorants of reverse paintings on glass. *Archaeological and Anthropological Sciences*. 1 Volume, 2009: p. 263-271, accessed 2 March 2016 <<http://link.springer.com/article/10.1007%2Fs12520-009-0021-4>>.

³³ Cennini, Cennino, *Il libro dell'arte, o trattato della pittura*, chapter CLXXI, 122-123.

“scales black” and “glassmakers black”. However, as was shown, terminology may vary considerably also beyond the relevant timeframe and the language of Ms. Fr. 640.

Despite the fact that “scales black” has found relatively little mention in literature on reverse glass painting, reconstruction experiments indicate that black paint for reverse glass painting can be made out of iron scales when applied without a process of firing (having special visual characteristics). However, whether the recipe in fol. 39 *verso* was meant to involve a process of firing or not remains uncertain. Two options are likely: The recipe of Kunckel which coincides with the results of the reconstruction experiments can be regarded as proof that a process of firing was not involved and the recipe concerns cold painting only.

On the other hand, the difficult working properties (long grinding time; paste-like paint application, long drying time) might rather suggest that, despite his respective silence, the author-practitioner indeed associated “scales black” with a process of firing. In this case, as described by Cennini, warm and cold painting would have been used together in consecutive procedural steps. Further analytical research on surviving objects is required in order to understand the application of “scales black” in practice among examples of cold painted reverse glass paintings.

Moreover, it also became obvious that the materials used for recipe on 39 *verso* originate from different disciplines, such as oil paint from panel painting and “scales black” from stained glass painting.

10. Literature

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11. List of illustrations

Fig. 1.

[AnnotationWinter2016_MagdalenaPilkoIlseSteeman_39v_a3_IronScales]

Scales of iron as a side product from blacksmith work.

Michael Fuller. Louis Community College. 21 March 2016

<<http://users.stlcc.edu/mfuller/pennsic2008forge.html>>.

Fig. 2

[AnnotationWinter2016_MagdalenaPilkoIlseSteeman_39v_a3_Niello]

Note the black of the niello. Devotional diptych with the nativity and the adoration (detail). French, ca. 1500, silver, niello, gilt copper alloy, Metropolitan museum of art (inventory number 2000.152).

Metropolitan museum of art. Accessed 20 March 2016

<<http://www.metmuseum.org/art/collection/search/472608>>.

Fig. 3

[AnnotationWinter2016_MagdalenaPilkoIlseSteeman_39v_a3_BlacksmithPowder]

Refined iron scale purchased as “blacksmith powder”, before grinding.

Photo: author

Fig. 4

[AnnotationWinter2016_MagdalenaPilkoIlseSteeman_39v_a3_ScalesBlackInLinseedOilVerso1]
Reconstruction. Reverse glass painting with “scales black” in different binding media and lamp black in linseed oil, verso (left).

Photo: author

Fig. 5

[AnnotationWinter2016_MagdalenaPilkoIlseSteeman_39v_a3_ScalesBlackInLinseedOilRecto1]
Reconstruction. Reverse glass painting with “scales black” in different binding media and lamp black in linseed oil, recto (right).

Photo: author

Fig. 6

[AnnotationWinter2016_MagdalenaPilkoIlseSteeman_39v_a3_scalesBlackInDirectSunlight]
Reconstruction. “Scales black” applied with turpentine on glass in direct sun light (recto). Note the grey tone and the sparkle. A dark black was achieved with linseed oil resulting also in less sparkling.

Photo: author

Fig. 7

[AnnotationWinter2016_MagdalenaPilkoIlseSteeman_39v_a3_DifferentBlackPigments]
Reconstruction. Different tonalities of black pigments in comparison: lamp black, charcoal black, burnt ivory black and peaches stone black mixed with two different binding media (linseed oil and turpentine). Note that the pigments were not ground and still exhibit various tonalities.

Photo: author