

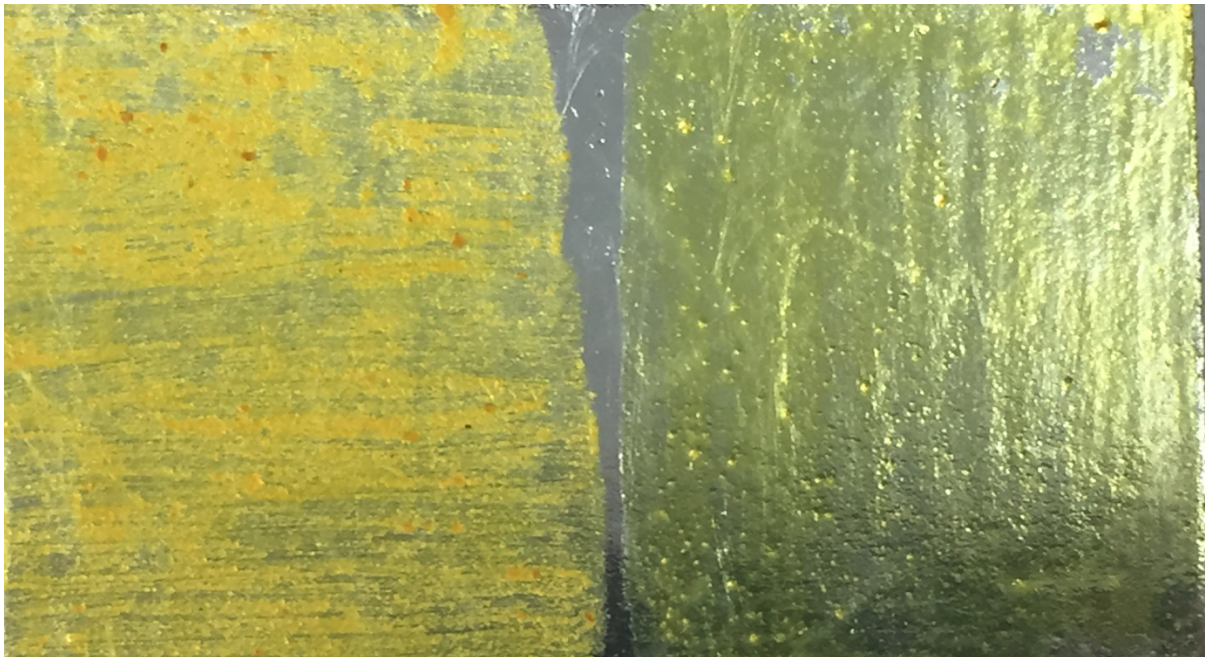
Note from the Making and Knowing Project:

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 Godborge, 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>.

The Use of Gold in the BnF Ms. Fr. 640 Manuscript



In Collaboration With
The Making and Knowing Project:
Craft and Science in a Sixteenth-Century Artists's Manuscript:
An Open-Access Digital Edition and Translation of BnF Ms. Fr. 640
(Columbia University, directed by Prof. dr. Pamela Smith)

University of Amsterdam
MA Conservation and Restoration of Cultural Heritage
Specialization: Modern and Contemporary Art

Date: 24-03-2016

Course: The Art Technological Source. History, Analysis and Reconstructions of Artists' Recipes

Instructor and coordinator: Marjolijn Bol

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Foreword

This annotation is written for *The Making and Knowing Project: Craft and Science in a Sixteenth-Century Manuscript*, which is directed by Dr. Pamela Smith from the Columbia University in New York. The French manuscript, which probably dates from the late sixteenth century Toulouse, will be referred to as the BnF Ms. Fr. 640 manuscript.¹ The aim of this international project is to produce a transcription and an English translation of the manuscript in an open-access digital edition that is accompanied by annotations that research into the recipes in different working groups. To have a better understanding of the text, it is important to have practical experience with materials and techniques mentioned in the manuscript. In the process of making these reconstructions, students work side to side with art and science historians in collaboration with specialists from other fields to obtain further pedagogy and humanistic research.²

As a part of this project, students of the master's degree in *Conservation and Restoration of Cultural Heritage* at the University of Amsterdam looked into the historic text and experimented with several recipes of the BnF Ms. Fr. 640 manuscript and formulated research questions on their findings. This was done in small groups during the course *The Art Technological Source. History, Analysis and Reconstructions of Artists' Recipes* under the supervision of Marjolijn Bol. The group of which this annotation is part looked into a recipe on fol. 29v to produce a 'Color of gold without gold on silver', aka imitation gold. The transcriptions and translations of the recipes that were used in this experiment are included, followed by a short description of the experiment conducted.

¹ The 170-folio manuscript now resides in the Bibliothèque Nationale in Paris as Ms. Fr. 640. The Making and Knowing Project. Accessed March 10, 2016. <http://www.makingandknowing.org>.

² "Historians, paleographers, makers, art and technical experts, and conservation and materials scientists are teaching and learning together as they collaborate on researching the manuscript." The Making and Knowing Project. Accessed March 4, 2016. <http://www.makingandknowing.org>.

Recipes for Reconstruction

BnF Ms. Fr. 640, fol. 29v, the recipe for imitation gold:

 <http://gallica.bnf.fr/ark:/12148/btv1b9059316c/f63.item>

Transcription <id>p029v_1</id>

<head><m>Couleur dor</m> sans <m>or</m> sur l<m>argent</m></head>

<ab>Colore ton <m>argent</m> de foeille aplique avecq de la <m>terre emerita</m><lb/>
et estant sec donne une main de vernis d<m>aspic</m> et de <m>sandaraque</m> Et<lb/>
il sera plus beau qu<m>or bel</m></ab></div>

Translation <id>p029v_1</id>

<head><m>Color of gold</m> without <m>gold</m> on <m>silver</m></head>

<ab>Color your applied <m>silver leaf</m> with some <m>terra emerita</m> and once dry, spread a
handful of varnish of <m>aspic</m> and <m>sandarac</m> and it will be more beautiful than fine
<m>gold</m>.</ab></div>

BnF Ms. Fr. 640, fol. 4r, the recipe for the varnish:

 <http://gallica.bnf.fr/ark:/12148/btv1b10500001g/f13.image>

Transcription <id>p004r_1</id>

<head><m>Vernis dhuile daspic</m></head>

<ab>Il fault faire chaufer l<m>huile daspic</m> & comme il comma{n}ce<lb/> a fremir mects dedans la
<m>gomme de sandaraque</m> en pouldre<lb/> affin quil soict bien tost fondu Et remue tousjours
jusque[s]<lb/> la <m>sandaraque</m> soict bien fondue sur foeu de <m>charbon</m> Ce<lb/> que tu
cognoistras en prenant un peu dudict vernis sur<lb/>une assiette Et sil est gras en le maniant avecq le
doigt<lb/>cest faict Et pour une lb. d<m>huile daspic</m> tu mectras<lb/> cinq onces de
<m>sandaraque</m> pulverisee combien quaulcuns<lb/> nen mectent que quatre onces Mais il nest
pas si bon<lb/>ni si gras Cestuy cy est promptem{ent} sec Les <pro>quadraniens</pro><lb/> pour eviter
la peyne de polir leur <m>hebene</m> le vernissent de<lb/> cestuy cy Les <pro>quaterniers</pro> aussi
Cestuy cy nest pas si<lb/> propre pour les tableaux que celuy de <m>tourmentine</m> fine<lb/> bien
est il bon pour les mouleures des tableaux On ne<lb/> souloit poinct vernir les paysages dun tableau
quand le<lb/> <m>vernis de lin</m> estoict en usage pource quil faisoict jaulnir<lb/> le paysage Mays

avecq celuy de <m>tourmentine</m> on vernist<lb/> par tout Tu y peulx mectre du <m>mastic</m> pulverise tire en larme ou<lb/> aultrement & il sera plus desiccatif au lieu de <m>sandaraque</m></ab>
<ab>Si tu veulx vernir sur le <m>plastre</m> ou muraille donne<lb/>premierement ta <m>colle de retaille</m> bien chaulde car si elle<lb/> estoict refroidie elle nentreroit poinct dans la muraille<lb/> & quand tu y aurois mis ton vernis elle senleveroit</ab>

<note>

<margin>left-top</margin>

Le <m>vernis dhuile<lb/> daspic</m> nest pas si<lb/> prope pour les couleurs<lb/> que celuy de <m>tourmentine</m><lb/> car l<m>huile daspic</m><lb/> faict mourir mange les couleurs<lb/> pour estre trop penetra{n}t</note>

</div>

Translation <id>p004r_1</id>

<head><m>Aspic oil varnish</m></head>

<ab>One must heat <m>lavender spike oil</m> and, as it begins to simmer, put in powdered <m>sandarac gum</m> so that it soon melts. And stir continuously over a <m>charcoal</m> fire until the <m>sandarac</m> is well melted, which you will know by taking a little of the said varnish on a plate and, if it is fat enough when you handle it with a finger, it is ready. And for one pound of <m>lavender spike oil</m>, you should put five ounces of ground <m>sandarac</m>. Some only put in four ounces but this is not as good, nor as fat. The former dries promptly. To avoid the trouble of polishing their <m>ebony</m>, <pro>framemakers</pro> varnish it with this. So do <pro>guitarmakers</pro>. This [varnish] is not as fitting for paintings as fine <m>turpentine varnish</m>, though it is good for the paintings' moldings. When <m>linseed varnish</m> was in use, one would not commonly varnish the landscape of a painting because it would turn the landscape yellow. But with <m>turpentine varnish</m> one varnishes everywhere. Instead of <m>sandarac</m>, you can add to it pulverized <m>mastic</m> drop by drop or otherwise, and it will dry more quickly.</ab>

<ab>If you want to varnish <m>plaster</m> or a wall, first put on your <m>glue de retaille</m>, very hot, because if cold it would not penetrate the wall at all. And when you would have put your varnish on, it would come off.</ab>

<note>

<margin>left-top</margin>

<m>Aspic oil varnish</m> is not as apt for colors as that of <m>turpentine</m>, because <m>aspic oil</m> eats the colors, since it is too penetrating.</note>

</div>

Annotation

Introduction

The BnF Ms. Fr. 640 manuscript is written by an anonymous author-practitioner and covers a wide variety of recipes, ranging from medicines to magic tricks, pigments to varnishes, and painting to metalwork.³ The use of gold in metalwork, paintings and many other substrates is widely represented in the manuscript. As alchemy, the transmutations of base metals into gold, was a common practice in the sixteenth century, it is not surprising that the BnF Ms. Fr. 640 manuscript includes several recipes on imitating gold with different materials and substrates.⁴ The practice of imitating gold by glazing silver and tin foil already existed since the eleventh century, although it started to be forbidden from the early fifteenth century onwards.⁵

The recipe on fol. 29v 'couleur d'or sans or sur l'argent' describes a way of imitating gold with terra emerita on silver leaf covered by an aspic varnish.⁶ The experiment that was done with this recipe emphasized on the visual outcome of the terra emerita and the varnish on the silver leaf substrate.⁷ There was no focus on historically reconstructing the application of silver leaf, so we therefore used modern techniques and materials to obtain the silver leaf substrate.⁸ The yellow color was applied as paint mulled with linseed oil and as an oil that was left overnight to extract the color of the terra emerita. While conducting this experiment, it struck us that the 'golden' color of the terra emerita oil resembled more a very bright yellow and that the paint was very coarse and a little too thick when applied on the silver leaf. Comparing it to gold leaf in different light sources, namely, outside light and studio light, we concluded that our modern eyes could not be fooled by our imitation. This raised questions as to what kind of color the author-practitioner had intended with this gold imitation. Emilie Foyer, who did an experiment with recipes for gold imitations on fol. 57 r and 29v, executed the recipe slightly differently and speaks of the most gold-like color with the recipe on fol. 57r, although she also questions the author-practitioner's intent.⁹ The author-practitioner mentions, "and it will be more beautiful than fine gold." While this is of course a very subjective statement and possibly a way of selling his recipe as being very good, it is an interesting comment.

³ The writer of the manuscript gave detailed descriptions of the recipes with notes of his own experience, sometimes correcting his previous text, making it a very interesting source since he possibly also put the recipes into practice. Smith, Pamela H. "In the Workshop of History: Making, Writing and Meaning." *West 86th: A Journal of Decorative Arts, Design History, and Material Culture* 19, no. 1 (Chicago: University of Chicago Press, Spring-Summer 2012), 11.

⁴ The translation of the recipes can be found in the appendix: fol. 7r, fol. 29v, fol. 41v, fol. 57r, fol. 73r, fol. 76v, fol. 78v, fol. 79r, fol. 99v, fol. 100r and fol. 104r.

⁵ This happened first in the Low Countries but also in Rouen and Cologne. Therefore, in some recipes they do not name specifically to apply it to a silver or tin foil substrate. Geelen, Ingrid, Delphine Steyaert, and Cécile Glaude. "Making Applied Brocade. Recipes and Methods." In *Imitation and Illusion: Applied Brocade in the Art of the Low Countries in the Fifteenth and Sixteenth Centuries*, 29. (Brussels: Koninklijk Instituut Voor Het Kunstpatrimonium, 2011), 71.

⁶ Terra emerita is a different name for turmeric or curcuma longa. See Emilie Foyer's annotation "Gold without Gold" AnnotationFall2015_Foyer_29v-57r, p. 1.

⁷ The experiment was conducted by three students of the MA *Conservation and Restoration* of Cultural Heritage: Alice Watkins, Moorea Hall and Eline van der Velde.

⁸ See logbook: we made use of silver leaf on a burnished bole and an oil gilded surface, both done with modern techniques.

⁹ 'The intention of the author-practitioner must be considered: was his primary concern to produce the color of gold, or to reproduce other properties, such as luster and shine, of the material faithfully.' Emilie Foyer's annotation "Gold without Gold" AnnotationFall2015_Foyer_29v-57r, p. 7.

Is it possible to determine what gold really looked like in the sixteenth century? What characteristics of gold were of value and which of these characteristics were used for the imitation of gold recipes in this manuscript? And if it was indeed not about imitating the color of gold but instead the shine and luster, what was this shine and luster of gold? Taking these concerns into account,, this annotation will address the following question: *How do the visual characteristics of gold as described by the author-practitioner provide insight into the recipes of imitation gold in the BnF Ms. Fr. 640 manuscript?*

The main focus will be on the use of gold leaf and gold powder though a recipe on making gold ‘flow’ is discussed to determine the word ‘fine’ gold. This will be further explained by the use of other manuscripts and secondary literature. A selection of gold and imitation recipes is made to look at their use, visual characteristics, requirements and appreciation of the author-practitioner. It can be of use for the Making and Knowing Project when looking at the other imitations recipes in the manuscript.

‘Fine’ gold and alloys

To understand the recipe of fol. 29v better it is important to determine what the author-practitioner meant with ‘fine gold’: the translation of ‘or belle’ in the original text.

The term is frequently used in the translated manuscript—whereas in some recipes it indicates a level of coarseness, in others it states if a material is beautiful or of good quality, especially concerning metals such as gold. In fol. 7r the author-practitioner speaks of coloring tinsel to make it ‘look as fine as pure gold’, allowing us to assume that with fine gold, an unalloyed gold or a ‘refined’ gold of good quality is meant.¹⁰ The connection between fine and unalloyed gold is also made in fol. 124r *Fine gold*, in which he explains that unalloyed gold is very difficult to process:

*There is a kind of gold which, even though it is very fine and unalloyed, is passed through aqua fortis and antimony, it is however so brittle that it cannot withstand the hammer. And the mixture of verdigris mentioned above [that is used] to make gold flow, will make it as soft as lead.*¹¹

As mentioned above and in other folios, one must alloy gold in order to make it flow and to hammer it, making it reasonable to assume that castings and gold leaves are usually not made of pure gold.¹²

Benvenuto Cellini gives different types of alloyed gold foils in *The treatises on Goldsmithing*, such as a yellow colored foil also called common foil, which is used for jewels and as a backing for transparent foils and contains 9 karats of fine gold.¹³ The red foil contains 20 karats of fine gold, the blue foil contains only

¹⁰ Fol. 7r: ‘To gild with gold color and tinsel. [...]And if you have made your gilt with tinsel, color it with smoke from a partridge or from yellow or red cloth, and it will look as fine as pure gold.[...]’ Original text: fol.7r: ‘Pour dorer d’or couleur et d’or bel. [...]Et si tu auras doré d’or bel, colore le avecq fumée de perdrix ou de drap rouge ou jaulne & il sera beau comme l’or fin.[...]’.

¹¹ Original text: Fol.124r. ‘Or fin. Il y a une nature d’or qu’encores qu’il soit fin & sans alliage & passé par l’eau fort & l’antimoine, est touteffoys si aigre qu’il n’endure presque pas le marteau. Et la composition du verdet cy dessus descrite pour fayre courre l’or, le rend si doux comme plomb.’

¹² There is another recipe in where he says pure gold does not flow, on fol. 124v. ‘*Casting gold*: [...]Fine gold does not flow but alloyed gold flows well. [...]’ There are no specific recipes for gold alloys in the manuscript.

¹³ Common (yellow) foil: 9 karats of fine gold, 18 karats of fine silver and 72 karats of fine copper. Red foil: 20 karats of fine gold, 16 karats of fine silver and 18 karats of fine copper. Blue foil: 16 karats of fine copper, 4 karats of fine gold, 2 karats of fine silver. Green foil: 10 karats of fine copper, 6 karats of fine silver, 1 karats of fine gold. Cellini, Benvenuto, and C. R. Ashbee. *The Treatises of Benvenuto Cellini on Goldsmithing and Sculpture: Made into English from the Italian of the Marcian Codex by C.R. Ashbee*. (London: E. Arnold, 1898), 28.

4 karats of gold and more copper, and lastly, green foil contains 1 karat of fine gold. In *The Craftsman's Handbook*, Cennino Cennini does not only warn that gold alloys can turn black, he advises to 'make an effort, always to embellish with fine gold, especially for the figure of Our Lady'.¹⁴

Even though the practice of purifying gold was well known in the Middle Ages, the gold that was commonly used in the painters and goldsmiths workshop was not of that quality since it originated, although forbidden by law, through the melting of coins.¹⁵ The goldsmith received his gold mainly in the form of coins from different countries of different karats.¹⁶ This is also shown in the manuscript on fol. 124v on *Rouge Clair Enamel*:

*'Pure gold does not work well with enamel because the enamel remains yellowish. Alloyed gold, such as that of escu or pistolet coins, works better. The pale color of pure gold makes the enamel seem faded.[...]'*¹⁷

The casting of gold and hammering of gold leaves require a gold alloy, since alloys are more convenient for grinding gold into a powder, but gold requires an extra material to become a powder, since the small particles will clump together under the pressure of the mortar and pestle. This could either be an amalgam gold alloy or another substance, such as salt, that can be removed from the gold powder after grinding leaving behind the 'pure' gold.¹⁸ In the BnF Ms. Fr. 640 manuscript there are two recipes for grinding gold in fol. 8v; by the use of amalgam gold and in fol. 75r, by adding aqua fortis, saltpeter and ammonia salt.¹⁹

In summary, fine gold was much appreciated and seen as a sign of quality, although in the use of gold, a gold alloy was often employed. These alloys had different colors, depending on the amounts of karats of the coins that were melted. It is reasonable to assume that when the author-practitioner speaks of fine gold, in relation to gold leaf, he means a gold leaf with a high amount of karats, such as the red foil

¹⁴ This warning is mostly against using fake gold. Cennini, Cennino, *The Craftsman's Handbook "Il Libro Dell'Arte"*. Translated by Daniel V. Thompson Jr. (New York: Dover, 1960), 60.

¹⁵ These coins were not entirely made of pure gold, since they were melted many times. Thompson, Daniel V., *The Materials and Techniques of Medieval Painting*. (New York: Dover Publications), 191.

¹⁶ It could either be of European origin or the Byzantine gold coin, the bezant or dinars from Muslim Spain or North Africa. In the sixteenth century the largest part of the gold came from Hungary. Cherry, John, *Medieval Goldsmiths* (London: British Museum, 2011), 32.

¹⁷ Fol. 124v 'Rouge clair enamel. Pure gold does not work well with enamel because the enamel remains yellowish. Alloyed gold, such as that of escu or pistolet coins, works better. The pale color of pure gold makes the enamel seem faded. That is why you must heat it again after being cut to make it reddish so that the enamel will be beautiful, otherwise it will be dull. A kind of light rouge clair which, scratched with sand, will lose its beauty. There are some with gold grains in it. And also, good goldsmiths agree that the good one is made with gold.'

¹⁸ Thompson compares grinding gold with grinding a wax, since the process of making smaller gold particles will counteract itself because the fine gold particles will tend to weld by the pressure and heat that is formed by the mortar and pestle. It needs an extra substance to keep these particles separated from each other. This can be a honey or a salt, that is washed away after the grinding and the fine gold remains. Another option is to grind an alloyed gold, cleaning out the base metal with an acid. By combining mercury with gold you create an amalgam, if the material is heated the mercury will fly off leaving the gold. Thompson, *The Materials and Techniques of Medieval Painting*, 191-193.

¹⁹ Fol. 8v: 'Ground gold and silver: You have to calcine your pure gold with <figure> and then let your amalgam dry well and the said mercury fly off. Then crush it on marble with gummed water.[...]'

Fol. 75r 'Ground gold: Take some fine gold and put it on a very clean marble slab. Add aqua fortis and start grinding. Then take some saltpetre and ammonia salt, pour it into a large, clean shell.'

mentioned by Cellini. It is hard to determine the exact color the author-practitioner envisions with 'fine' gold.

The use and visual characteristic of gold powder and gold leaf as described in the BnF Ms. Fr. 640 manuscript

There were three different types of gold that painters used in the sixteenth century: ground gold, for illuminating images or writing with pencil, and burnished gold and mat gold.²⁰ The important difference in burnished gold and matte gold is not explained by the author-practitioner. According to Cennini in the Handbook, one must take a clean burnishing stone and make it warm by rubbing it against a clean cloth, and then burnish the gold substrate gradually, first in one direction and in the other direction until one has a mirror-like surface. "*When shall you know that it is burnished properly? – The gold then becomes almost dark from its own brilliance.*"²¹ It changes the matte gold from a bright yellow to a dark and metallic brown.²² The dark luster over the gold is also determined by the shape and size of the burnisher and the direction of burnishing, which makes it possible to leave some parts unburnished to have an interesting difference in shimmer and to give more depth.²³ The different usages and the visual characteristics connected with the application of these types of gold is explained below.²⁴

Gold powder

One way of using gold leaf was to grind it so that it could be used as a pigment for paintings or as an ink. Compared to lettering a manuscript with gold leaf, gold ink was a more flexible but expensive alternative and was often called 'shell gold' since it was usually stored in a shell.²⁵ The recipe on fol. 75v illustrates this: '*Take a coquille of gold, soak it with gum water before you intend to work, and then apply it with a brush, and polish it with a wolf's tooth once it is dry.*'²⁶ These gold inks were generally applied to deep purple- or red-dyed parchments to enhance their beauty, making them very expensive books not only for the amount of gold leaf that needed to be powdered for the ink but also the expensive dyes.²⁷ Ground gold could also be used as a pigment to paint on panel paintings and was usually not burnished so that it could function for highlights on other colors or as a luminous bright yellow color.²⁸

Gold leaf

Another way of making gold lettering was by applying a tacky substance to make the gold leaf stick, as in shown on fol. 8r where the author-practitioner uses a fig tree milk to gild letters on paper.²⁹ In another recipe for gold leaf on parchment and paper (fol.10v), he suggests to apply a starch glue but gives no specific purpose. Therefore, it can also be used to create patches of gold that are usually to be

²⁰ Ground gold *aurum contusum*, for illuminating images or writing with pencil, burnished gold *aurum politum* and mat gold, *aurum impolitum*. Merryfield, Mary. *Medieval and renaissance treatises on the arts of painting* (London: John Murray, 18490), 498.

²¹ Cennini, *The Craftman's Handbook "Il Libro Dell'Arte"*, 85.

²² Burnishing means 'making brown' and comes from the Latin word brunire. Thompspon, *The Materials and Techniques of Medieval Painting*, 196 - 197.

²³ Thompspon, *The Materials and Techniques of Medieval Painting*, 213.

²⁴ The transcriptions and translations of recipes mentioned below can be found in the appendix. Even though there are many interesting recipes on gold in the manuscript a selection is made.

²⁵ Accessed March 19, 2016. <https://anitachowdry.wordpress.com/2015/02/23/how-to-paint-with-24-carat-shell-gold/>

²⁶ Fol. 75 'Gilding with ground gold. Take a coquille of gold, soak it with gum water before you intend to work, and then apply it with a brush, and polish it with a wolf's tooth once it is dry.'

²⁷ Thompspon, *The Materials and Techniques of Medieval Painting*, 199.

²⁸ Thompspon, *The Materials and Techniques of Medieval Painting*, 200.

²⁹ Fol. 8r 'Gold lettering on paper . Write with fig tree milk then let it dry a little, afterwards apply the gold in leaf and, once quite dry, rub with linen and only the lettering will hold.'

surrounded with color.³⁰ In a third recipe on this technique (fol. 32r), 'To lay down gold in distemper,' the author-practitioner gives two options: to 'draw letters or whatever they want to gild with a brush,' or to use gold as an under layer.³¹ All these recipes are difficult to burnish because of the soft substrates, such as the fig milk, and are therefore matte gold with a more yellow color. These techniques are very similar to gilding with an oil mordant. The recipe in fol. 7r, *To gild with gold color and tinsel*, is an example of making an oil with pigments as an under layer for the gold leaf.³² It is a very interesting recipe because it also gives an option for imitation gold with tin. Considering that this type of gold leaf is matte, did the author-practitioner choose an imitation that would resemble this?

There are several recipes for matte gold in fol. 66r, one in which the author-practitioner emphasizes the benefits of using matte gold and states that it is 'beautiful' and is hardly inferior to burnished gold:

To make beautiful matte gold put in a bit of varnish or greasy oil, not the kind that is made from cleaning brushes but the kind that is made greasy in the sun, or mix with ceruse. Matte gold of this kind is scarcely less beautiful than the burnished gold and lasts longer in the rain and otherwise, and is made more quickly. Burnished gold cracks with time and is damaged in the rain.

In Western Europe, the substrates for gold leaf can be divided into water- and oil-based ones that all fall under the term mordant and seem to exist prior to the twelfth century.³³ The pigments that are used in the substrate function as a filler and warm up the color of the gold leaf.³⁴ Fol. 6r gives an example for making a substrate for a water gilded gold leaf:

'[...] for burnished gold take some good chalk, quite white, well ground and soaked with distemper glue and with it, make four coats one after the other on the wood. And the last being dry, rub it [...] to render it well polished. Afterwards, take some fine Armenian bole and some sanguine, as much of one as of the other, [and] also lamb tallow [...] and a little bit of willow charcoal or as much as of tallow and half a walnut shell filled with half-burned saffron; some put in a little candy sugar. Grind everything together with water and apply it without gum or glue and let it dry and rub the place that you would like to gild with a piece of white cloth to better unify [it] and when the rubbed place is a little shiny it is a sign that the gold will be well. Having

³⁰ Fol. 10v 'Layer of gold leaf on parchment or paper. Make a very transparent starch glue colle d'amydon with little body. And apply six or five layers, and when the last is almost dry, apply your gold.' And Thomspen, *The Materials and Techniques of Medieval Painting*, 203.

³¹ Fol. 32r. 'To lay down gold in distemper. Scribes and mediocre painters make "batture", which is joiner's glue tempered in water over the fire, somewhat clear, mixed with very little honey, that is a few drops to make it thicken, and then they use it to draw letters or whatever they want to gild with a brush, and immediately after lay down the gold, but the work they do is never quite neat, and if there is a lot of honey it dries only with great difficulty. This layer will be damaged in the rain. Others do better, they temper candy sugar in water and mix it with sanguine that they call "cocon", very crushed, and add a little soap. This makes it neat, and renders gold beautiful if one uses it as the under layer.'

³² 'Once you have colored [or] made your stamped ornament in tin (as previously described), or in iron or copper, you must not put glue as on wood, but just have some fatty oil, which is made in seven or eight days in the sun from walnut oil and white lead, stirring often, or cooked on fire if one should be in hurry. Then, with the oil thus made fatty, grind a little white lead, massicot and black graphite, at discretion, as much of one as of the other.[...] apply an even layer of that onto your stamp, taking care you do not fill the hollows. And once it is almost dry, apply the gold leaf on it using cotton. Such gold will withstand rain on houses or elsewhere. And if you have made your gilt with tinsel, color it with smoke from a partridge or from yellow or red cloth, and it will look as fine as pure gold. [...]'

³³ Leonida, Mihaela D. *The Materials and Craft of Early Iconographers*, (New Jersey 2014), 43.

³⁴ Leonida, Mihaela D. *The Materials and Craft of Early Iconographers*, 47.

rubbed, wash the place that you want to gild with a clean brush soaked with clear water and promptly apply the gold which you will burnish once dry.'

As can be concluded from the recipes above, water gilding is more work than oil gilding and results in a different kind of gold with different visual characteristics. The divergence is determined when the gold is either burnished, which results in a gold with a dark shine, or is matte, which yields a brighter yellow color. Even though the darker burnished gold was more appreciated in sixteenth century manuscripts, it is notable that the author-practitioner expresses his appreciation of the matte gold.

Imitations

In the Bnf. Ms. Fr. 640 manuscript there are eleven different recipes on imitating gold, all with very different materials and possibly different purposes. It remains uncertain to what extent they were intended to really imitate gold. According to Thompson, the medieval eyes were easily tricked, considering that most of the gold imitations looked little like real gold: *'If they were yellow and shiny, and particularly if they had any sort of metallic sparkle, they were accepted.'* Perhaps it was easier to imitate the 'golden' yellow color by using different types of pigments—the imitation of shine and luster was more difficult to accomplish. While we reconstructed the recipe on fol.29v *Color of gold without gold on silver*, it was notable that the color did not resemble the color of the burnished frame as a consequence of the terra emerita being too yellow and the brightness of silver shining through. Furthermore, it was difficult to mimic the luster and mirror-like surface because the particles that remained visible in the paint covered the shine of the silver; the application of the varnish did not give it more shine. With this recipe, the author-practitioner perhaps intended to imitate more of a matte gold. Whereas in fol.56v he uses a turmeric powder boiled with a varnish on a burnished silver surface, it would still be difficult to make a visually compatible surface since the substrate is not as smooth. Even if the silver is burnished, the reflection of the silver is changed by covering it with a layer, possibly making the reflection more shattered. Nevertheless, as Emily noted, the turpentine varnish with turmeric had a deeper golden color compared to the other applications. Therefore it is interesting that he suggests to add aloes to make it even brighter. In this recipe, it is assumed that the silver leaf is burnished before applying the varnish; in a recipe on fol. 78v on giving bronze the color of gold it seems that the author-practitioner intends to 'polish' the layer with a tooth.³⁵ This is presumably an option because of the added copper filings.

In the sense of imitating the shine and luster of burnished gold, maybe the recipe on fol. 99, *To gilt frames paintings without gold*, sheds more light on the intent of the author-practitioner in imitating this visual characteristic:

Some use some leaved orpiment and then powder it and make the leaves look Moorish, burnish them, and the orpiment shines like gold. However, ground metals or ground crystalline or touchstone are the best.

It is very interesting that he speaks of making the orpiment look Moorish, so darker, but admits that using ground metals may have a better effect, probably because ground metals can be burnished with high shine.

For some recipes, the author-practitioner gives no specific substrate for the gold layer, as can be seen in the recipes on fol. 29v, *Layer of Gold*, and fol. 76V, *To make a very beautiful and inexpensive golden color*.

³⁵ Fol. 78v. 'To make bronze the color of gold. Take copper filings, ochre, gum, and alum, grind it all together in a stone mortar, and when it is well ground, lay it as needed with a paintbrush, and then polish it with wolf tooth or dog tooth.'

³⁶ Recipes as such are possibly used for highlights in paintings, where in the case of real gold one would use ground gold as a pigment with which to paint, or, as the title says, to have an inexpensive substitute.
³⁷

Besides the recipes for imitating gold, the author practitioner also gives recipes for using gold for imitating other materials, such as an imitation of marbled jasper with horn and lines of gold leaves or the imitation of alabaster with white paper and gold leaves that could be burnished. Also mentioned is the use of dragon's blood, a resin, to imitate red enamel on gold. Also worth noting is the recipe for the glaze on fol. 124v, *Rouge Clair Enamel*, which is supposed to be applied to a burnished gold leaf and falls in line with the author-practitioner's warning against using a dull gold.

Thompson points out something interesting on the use of gold leaf that can possibly be connected to imitations. As modern viewers, we accept gold leaf as a decoration, but we won't be fooled that it is solid gold. It can be viewed upon as 'cheating,' but according to Thompson it can be seen as perhaps more 'playing,' as the viewer knew it wasn't solid gold. Perhaps this theory can also apply to the use of imitation gold.

Conclusion

Reading through the recipes in the BnF Ms. Fr. 640 manuscript, it seems particularly difficult to imitate the visual characteristics of the burnished gold, such as the dark shine and luster that can be seen in the gold lettering made by gold powder or by water gilding. This is partly because of the change in reflection that occurs when a burnished silver leaf is covered by a glaze or a varnish. This makes it plausible that most of the recipes on imitating gold are used in the same way as matte gold, like the recipes for oil gilding gold leaf on a tin ornament that also has the option to color the tin foil. It is hard to determine the exact colors of the imitation golds of the sixteenth century since few examples are known, possibly because of the ephemeral character of the materials used. Also, to determine the color of 'fine' gold in sixteenth century Toulouse would require further research. To fully understand the recipes on imitating gold and their visual characteristics it is very useful to conduct the recipes themselves.

³⁶ Fol. 29v. 'Layer of gold. Ground terra emerita with some saffron, altogether mixed with some strong very white glue and sieved through a cloth.'

Fol. 76v. 'To make a very beautiful and inexpensive golden color. First of all take a very yellow orange peel and carefully remove the white parts, and pulverize it very well it in a very clean mortar. Take the same amount of sulphur, grind all the ingredients together, pour the mixture into a glass vial, and store it in a cellar or other damp place for eight or ten days. When you want to apply it, you must warm the mixture and apply it wherever you like and you will see a very beautiful color.'

³⁷ 'Several reasons can be singled out and each most likely contributed to the apparent need for a gold substitute: scarcity, economics, or even deceit.' Bogović-Zeskoski, Srebrenka. "Gold and Not So Real Gold in Medieval Treatises." *Conservar Património* 22 (2015), 52.

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Appendix

Coloring gold

Fol. 29v Brown gold layer on paper

Prepare your underlayer of starch soaked in water and your gold will turn brown very well. Clear starch water laid down on paper, then dried, and so by three times, is a good base for brown gold on paper and is not thick.

p075v_2 Gilding wood

First of all it is necessary to apply a coat of very clear glue; and when it is dry, you will apply a coat of yellow gold; and when this is done you will take fig tree wood and soak it for a while, and wash the place you want to gild, and cut your gold with a knife near where you will put it; and you must apply said gold with cotton, and if you can find some fig tree, take an egg white and stir it frequently. If your gold does not have a nice enough color, you will take a partridge feather burn it in a chafing-dish, and turn the smoke toward what you have gilded.

Imitations of gold on metallic substrates:

Fol. 29v Color of gold without gold on silver

Color your applied silver leaf with some terra emerita and once dry, spread a handful of varnish of aspic and sandarac and it will be more beautiful than fine gold.

Fol. 57r

White turpentine varnish or aspic oil and turpentine is colored with powdered turmeric boiled together with it. It gives a gold color on silver which is even more beautiful when burnished. It dries within a quarter of an hour. Aloes would made an even brighter color but it takes time to dry whereas the other one dries within a quarter of an hour in winter as well as in summer.

Fol. 76v Gilding iron or tin

First you must wash whatever you want to gild in wine lees. Then wash it once again with white wine. Take three ounces of terra emerita and one chopine of white wine. Boil the matter for half an hour, and apply your colors over your iron or tin, or whatever else. Then leave to dry on a sheet of paper and do not put your hand in your materials.

Fol. 78v To make bronze the color of gold

Take copper filings, ochre, gum, and alum, grind it all together in a stone mortar, and when it is well ground, lay it as needed with a paintbrush, and then polish it with wolf tooth or dog tooth.

Fol. 73r To make bronze with a gold color

Take one ounce of sal ammoniac and crush it in an iron mortar. When it is well crushed, take one ounce of sulfur, and ..(translation not finished)

Fol. 79r Making gold colored bronze

Take six ounces of tin [...], six ounces of natural sulphur, and sal ammoniac. Melt the tin in a spoon. When it is molten add quicksilver and cast in a line. Then crush all the drugs together in a mortar, and .. (translation not finished)

Imitations of gold on specific substrate:

Fol. 41v Colors and gilt on glass

You should not put as strong gummed water on glass for the silver layer as for the gold layer because a silver leaf is twice as strong as gold leaf. Also, silver is harder and therefore does not scratch as easily. And if gum was not a little [too] strong for silver, it would not crack so clearly. When you work, the exhalation of your breath humidifies the leaf lying on the glass and therefore it would be good, when working, to heat it up a few times. You have to very thoroughly wash what you want to be empty and used as a surface painted with colors, because if it is not really clean of the gum's grease and viscosity, and of other things, the colors will not be so clear on it. To advance your work you can smooth with a pumice stone, or [you can do this] to better lay down gum and leaf on a cut paper. This way, you will have to do very little repairs. If you want a gold color there without gold mix soaked dried saffron with a little bit of massicot.

Fol. 99v To gilt frames paintings without gold

Some use some leaved orpiment and then powder it and make the leaves look Moorish, burnish them, and the orpiment shines like gold. However, ground metals or ground crystalline or touchstone are the best.

Fol. 7r To gild with gold color and tinsel

Once you have colored [or] made your stamped ornament in tin (as previously described), or in iron or copper, you must not put glue as on wood, but just have some fatty oil, which is made in seven or eight days in the sun from walnut oil and white lead, stirring often, or cooked on fire if one should be in hurry. Then, with the oil thus made fatty, grind a little white lead, massicot and black graphite, at discretion, as much of one as of the other. Minium will color the gold. Then apply an even layer of that onto your stamp, taking care you do not fill the hollows. And once it is almost dry, apply the gold leaf on it using cotton. Such gold will withstand rain on houses or elsewhere. And if you have made your gilt with tinsel, color it with smoke from a partridge or from yellow or red cloth, and it will look as fine as pure gold. You can cover trunks, mirrors, bed valances and posts in colored velvet or satin and then apply the gilded stamped ornament on them with strong glue.

Imitations of gold, no specific substrate:

Fol. 29v Layer of gold

Ground terra emerita with some saffron, altogether mixed with some strong very white glue and sieved through a cloth.

Fol. 76v To make a very beautiful and inexpensive golden color

First of all take a very yellow orange peel and carefully remove the white parts, and pulverize it very well in a very clean mortar. Take the same amount of sulphur, grind all the ingredients together, pour the mixture into a glass vial, and store it in a cellar or other damp place for eight or ten days. When you want to apply it, you must warm the mixture and apply it wherever you like and you will see a very beautiful color.

Fol. 104r Good mixture to color gold

Sulphur and small gravel as much of one as of the other, and the third part of this quantity of salt, and as much turmeric as sulphur.

The use of gold to imitate other materials

Fol. 10r Imitation jasper

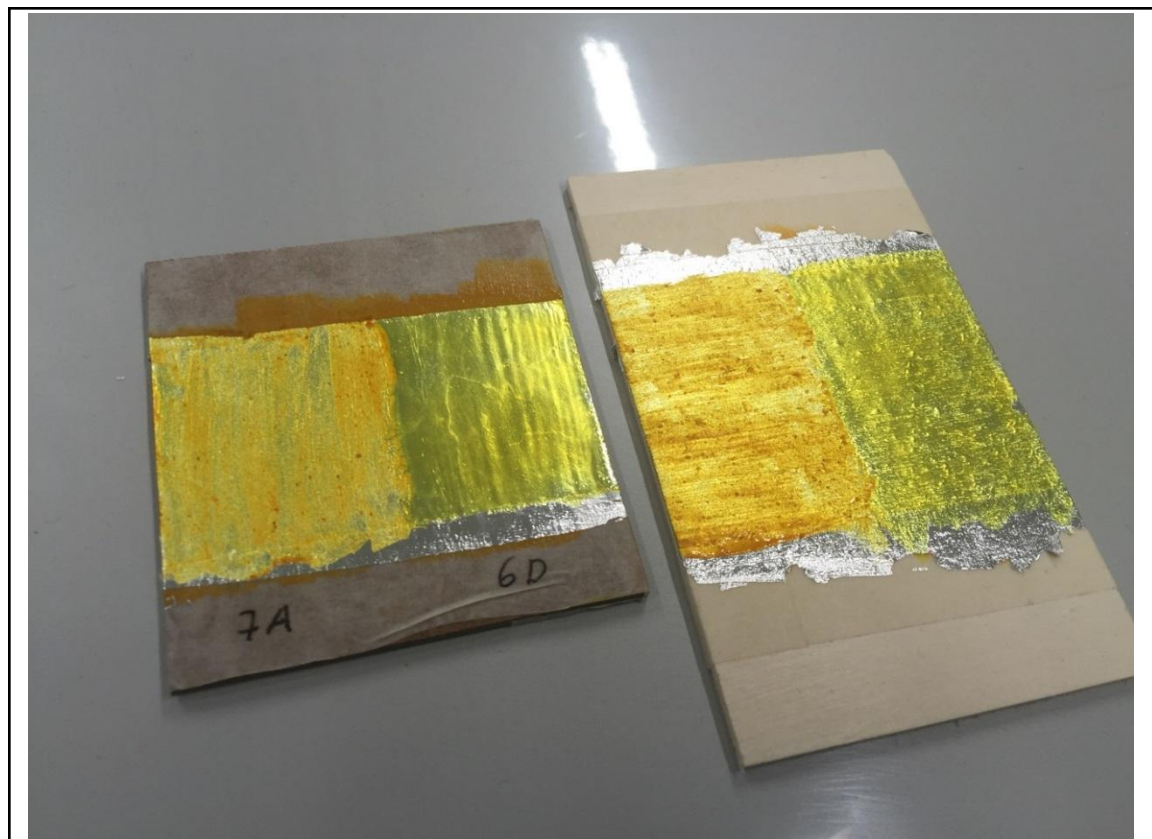
Take horn as is used to make lanterns, quite thin, and underneath imitate your jasper, cornaline, and other stones. That will look more appropriate than doing it on glass, which is too shiny. And the horn gives a lustre and a fatty polish similar to jasper. You know how you can imitate roses with scrapings of the said horn. The colors for this jasper need to have as a base clear turpentine or spike lavender varnish. And matte, opaque colours are not appropriate, no matter how fine they are. You have to oil the unpainted underside with spike lavender oil. top Thin glass looks very fine for this effect left-top You can inlay beds with it, and on the joints you can throw talc or metal filings on the fresh cement of the said joints. You have to bond them with gum amoniacum soaked in vinegar. To better imitate marbled jasper, apply heavy yarn dyed various colors and intermingled. After applying all the colors, scrape oblique lines into them then apply gold and silver leaves. If you apply colors made of turpentine on the horn, give it a backing of silver or of tin leaf. You can also file horn and mix it with strong glue and apply it to the joints of the horn piece and finish with a joiner's plane.

Fol. 12r Paper

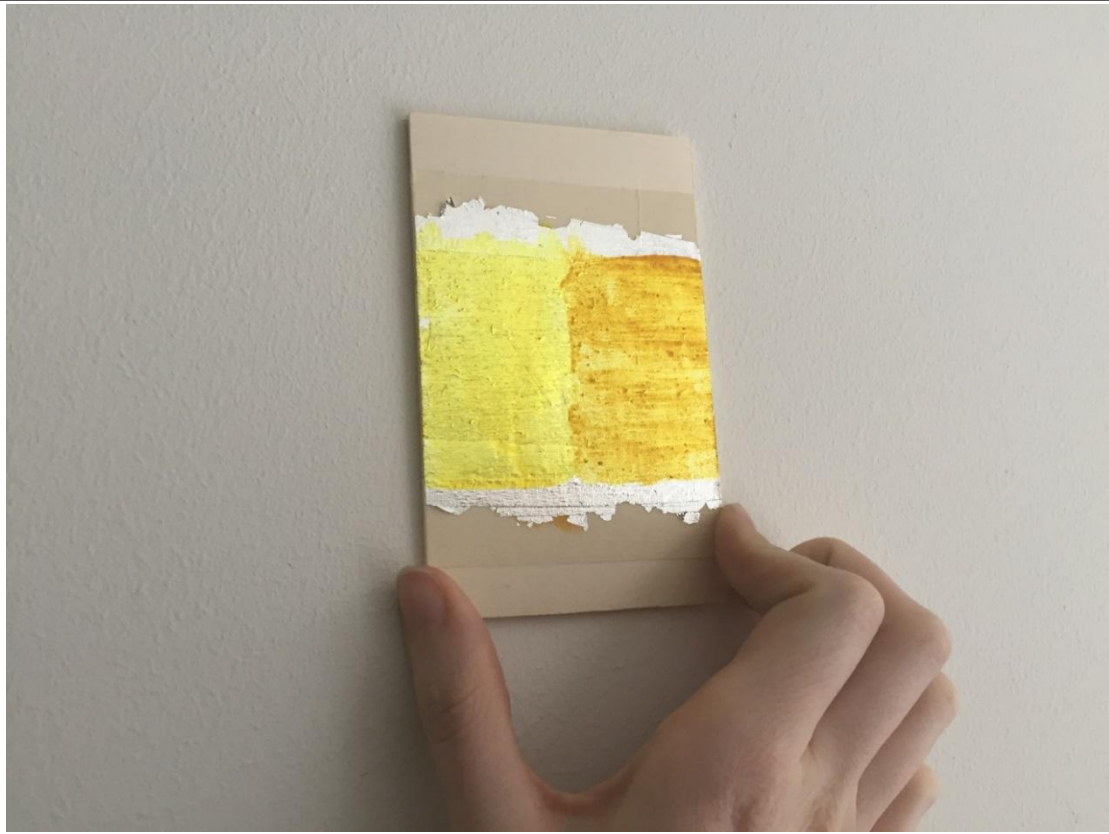
The whitest and thinnest is the best. And when the hollow mold is quite clean, as when it is made of sulfur or baked cimolee, [the paper] comes out very clean. You can apply a layer or two of white, with a border of gold, to imitate alabaster. And after applying the white you may burnish it with a tooth. Yet in order for it to take burnish you should soak the lead white with egg white and fig peel. Or better still, varnish your work with white varnish. Also while you are molding with paper, as it starts drying, burnish the back of it with the tooth.

Fol. 29v Dragon's blood

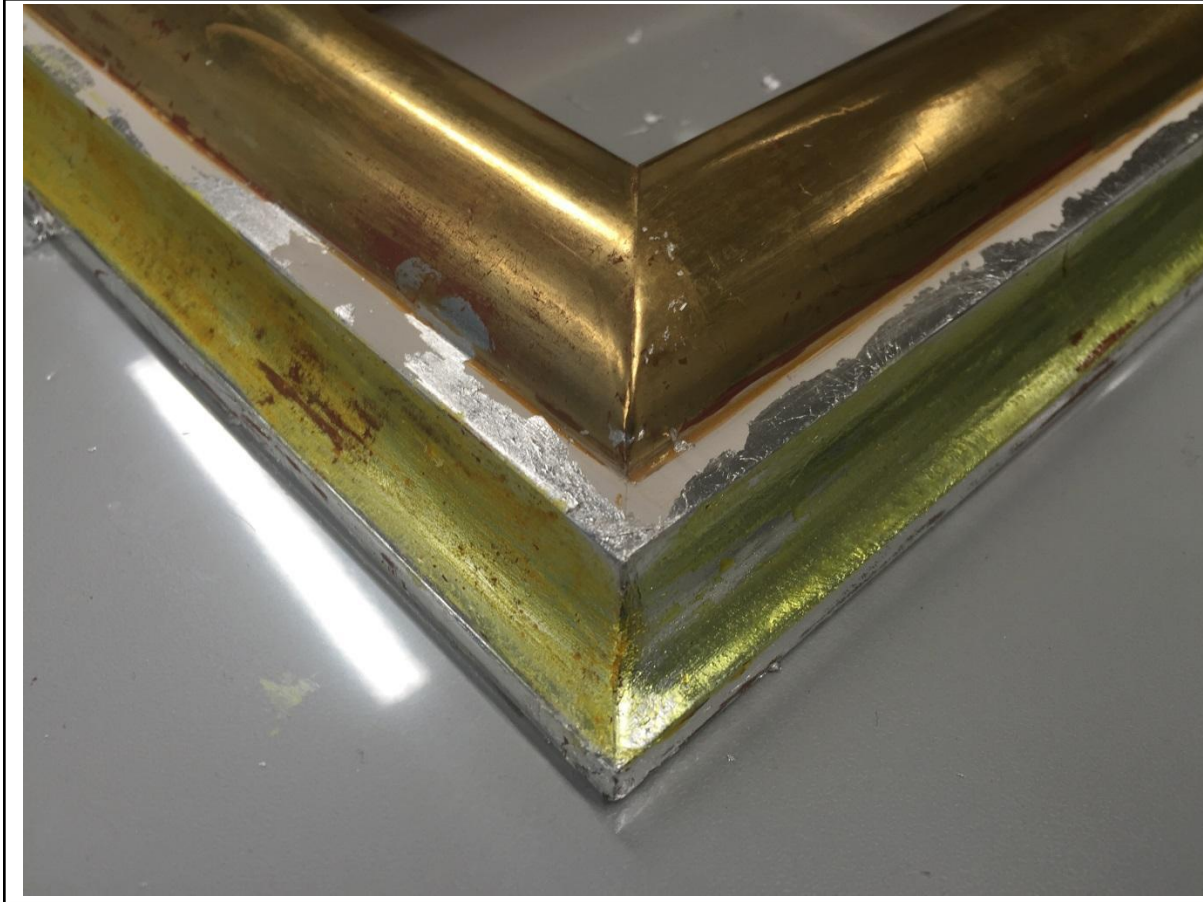
Have a well chosen drop of it which shows its transparent red and put it in a glass bottle with enough quantity of the best eau de vie possible and close it diligently so it does not get exposed to air otherwise it will be worth nothing and leave it so for a long time, because the longer it stays, the more beautiful and better it will be and it will dissolve if it is good otherwise it will become like lees. When you want to use some, make a small hole in the bottle stopper and pour some and close it again each time and apply it on gold. Good dragon's blood can be found in grands lopins like cattle cakethis one has no worth if it is sophisticated and broken it shows on its edges some transparent scale as light red enamel, it is also lumpy in some points like small rubies. The eau de vie must be very strong and plusieurs passes.

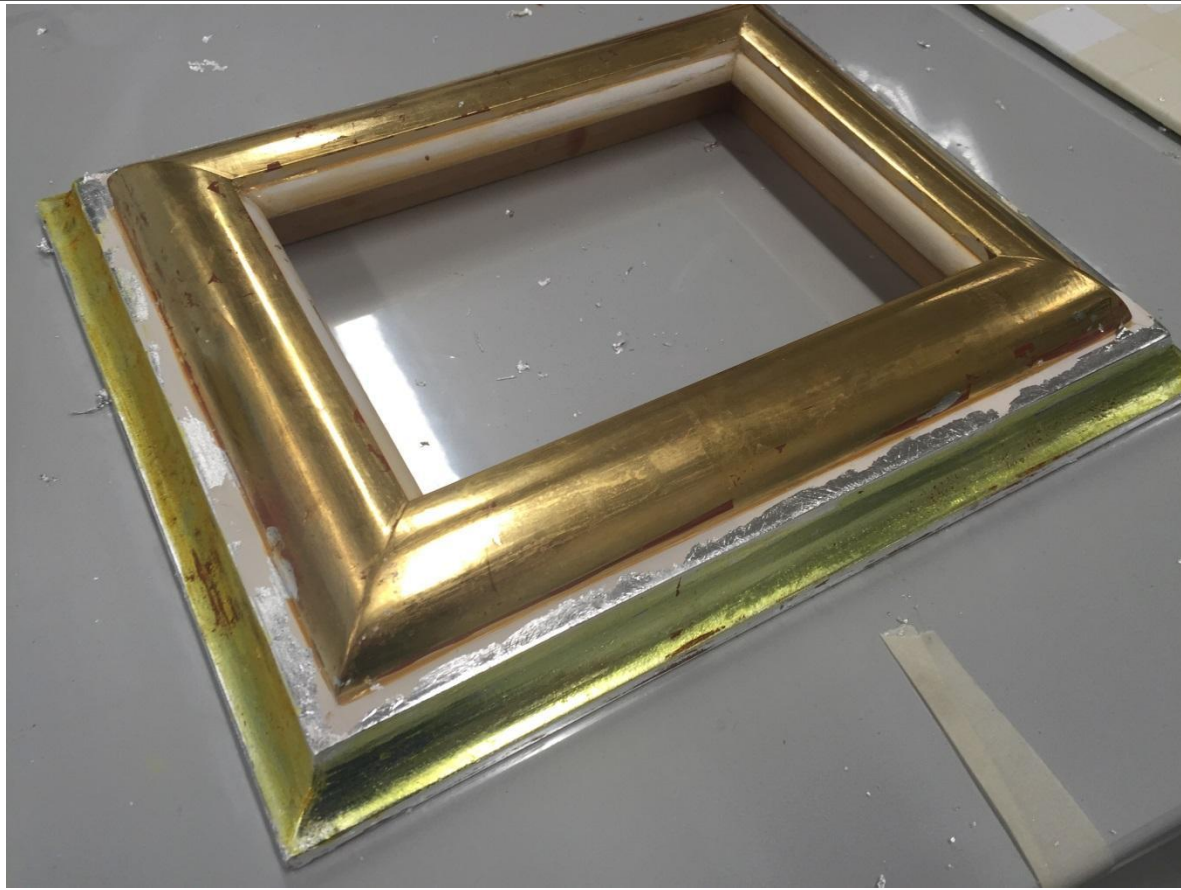


The application of the tumeric paint (left) and tumeric oil (right) on an oil gilded silver substrate in studio light. (picture from author)

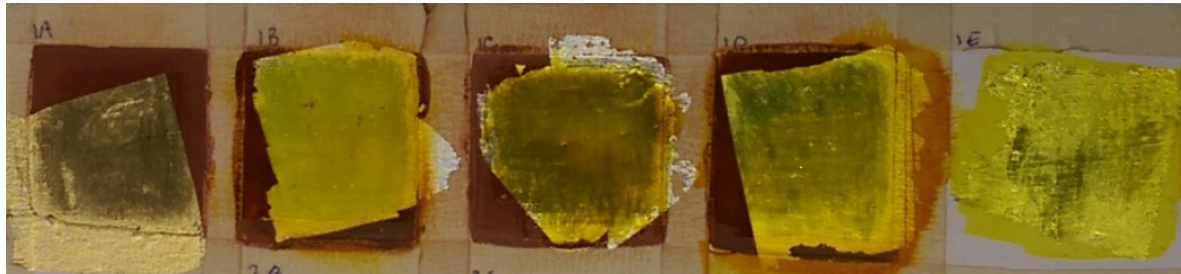


The application of the tumeric paint (left) and tumeric oil (right) on an oil gilded silver substrate in outside light. (picture from author)





The application of the tumeric paint (left) and tumeric oil (right) on an water gilded silver substrate in studio light beside a gold burnished substrate. (Pictures from author)



The results of Emilie Foyer: 1A Gold leaf, 1B with terra emerita paint with turpentine varnish, 1C golden turpentine varnish, 1D terre emerita paint with aspic varnish, 1E golden aspic varnish. Picture taken from: Foyer, Emilie, Annotation "Gold without Gold" AnnotationFall2015_Foyer_29v-57r.