Annotation for 076v - G8906 Craft and Science

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<title id=”p076v\_a1”> Pour faire couleur dor fort belle et de peu de despance </title>

<ab id=”p076v\_b1”> Premierement prend escorce doranges bien jaulne les nettoiez bien du blanc qui est dedans et les pulverises tres bien en ung mortier bien net . Et prents aultant de souffre et broyes tout ensemble et mects le tout en une fiolle de verre et les garder en la cave ou autre lieu humide par lespace de huict ou dix jours puys et quand en vouldra verser fault le chaufer et en verser ou vous vouldres et vous verres une fort belle coulleur. </ab>

<title id=”p076v\_a1”> Making cheap and very beautiful gold color </title>

<ab id=”p076v\_b1”>First of all take some very yellow peel of orange, remove the white parts, and pulverize it in a very clean mortar. Take an equal quantity of sulphur, and grind all the ingredients together. Pour the mixture into a flask of glass, which is stored into a cellar or in a wet place for 8 or 10 days. When you want to use it, warm the mixture, apply it anywhere. You will obtain a very beautiful color. </ab>

Not many other colors in art or nature can inspire human admiration the way gold can. The seemingly countless religious and public monuments that are gilded with or constructed out of this material evidence our reverence for this precious metal and its color. Gold’s subtle mixture of yellows, oranges, and browns creates a warm inviting glowing color that has become synonymous with wealth and power throughout much of history and especially in the early modern period.[[1]](#footnote-1)

Given this appeal, it is not surprising then that artists, such as our author/practitioner would attempt to devise a way to replicate this color, at the lowest cost possible. Normally, gold pigment or coverings were achieved using real gold, ground and suspended in a solution or thin layers of gold, known as gold leaf, applied to a surface using an adhesive or binder.[[2]](#footnote-2) However, due to the scarcity of gold and its accompanying high-cost, artisans may not have been able to afford these inputs.

It is also possible that even if one could afford as much gold as they wished, it would still be impractical to utilize it for certain projects. As has been evidenced in several other places in BnF Ms. Fr. 640, the author/practitioner was very engaged with ephemeral art products and structures.[[3]](#footnote-3) The temporary nature of ephemeral art (as the name implies) has left little or no evidence as to how these works were constructed or employed. This gap in our knowledge has left art historians with not much to say on these materials and practices, which made up the vast majority of works constructed during the early modern era.

The recipe 076v – *Making cheap and very beautiful gold color* presents the opportunity to assess the material results of our author/practitioner’s approach and make inferences into viability as an ephemeral art product. This recipe, along with others in the manuscript, could further support the position that the author/practitioner was very involved with ephemeral art projects and, by extension, the public consumption of these products.

Alongside the recipe there exists a multitude of other recipes that attempt to imitate gold, some of which are more elaborate than others. William Phillip in his *A Booke of* Secrets of 1596, provides several recipes with which gold can be synthesized. Among them is a unique (and potentially troublesome) recipe that requires an egg, some mercury, and agreeable chicken for three weeks.[[4]](#footnote-4) The patience required to execute this recipe illustrates the extent to which artists and artisans were willing to go to achieve this color. While the recipe presented in BnF Ms. Fr. 640 is brief by comparison to Phillip’s, it is no less nuanced and complex.

To achieve a convincing gold color an artist or artisan must carefully balance the available inputs and understand how their properties change when they interact with other materials. The color gold has a range within which it can still be reasonably considered gold. As stated before, gold is a mixture of yellows, red, and browns, and as our experiments with this recipe indicate, failing to understand these inputs can produce wide variations in results, which could (and did) lead to failure.[[5]](#footnote-5)

Once again it is seen that the author is interested in reducing the costs of his inputs.[[6]](#footnote-6) Gold in the early modern era was a high value commodity as it is today, and it was rightly a symbol of wealth. Thus, oranges offer a potential alternative to more expensive versions of this pigmentation.

The first obstacle that had to be overcome was the availability of materials. It proved difficult to obtain oranges from the south of France while performing the experiment in New York City. Therefore, we selected three varieties of oranges, tangerine, navel, and Valencia to give us the greatest possible range with which to make a comparative analysis. [Fig. 1: Tangerine, Navel, and Valencia Oranges]

Modern American Valencia oranges are a hybridized version of an orange imported from Spain about 1565.[[7]](#footnote-7) Valencia oranges are not Spanish in origin however, “While this variety can be traced back to the Azores, it seems unlikely that it originated there and probable that it came from Portugal.”[[8]](#footnote-8) In respect to the species of oranges that would be the closest to what would be available to our author, the Valencia comes the closest with navel and tangerine being distant relatives at best.

Two iterations of this experiment were completed, with the second being the most successful. The first step in the recipe states that the reader should “take some very yellow peel of orange, remove the white parts, and pulverize it.”[[9]](#footnote-9) All three types oranges were washed and the zest was removed with a knife. [Fig. 2: The Zest of the Oranges] We ground half the peels from each type of orange individually in a “very clean mortar”[[10]](#footnote-10) while they were still wet, the other halves were placed aside to be dried. [Fig. 3: Grinding in the Mortar] We ground the peels for about ten minutes until they appeared to be a paste and then added an equal amount of sulfur. The mixtures were ground for an additional ten minutes until it appeared consistent throughout.

The recipe then states, “Pour the mixture into a flask of glass, which is stored into a cellar or in a wet place for 8 or 10 days.”[[11]](#footnote-11) Accordingly, the three mixtures were placed in individual glass flasks and then placed in a sealed container with about an inch of water. [Fig. 4: The Individual Mixtures in Flasks] [Fig. 5: Flasks in the Container] We stored the vials in a temperature controlled environment at approximately 5°C, for 8 days.

The purpose of storing the mixture in ‘a cellar or in a wet place’ is still unknown. After removing the mixture from the cold environment, it was noted that it had absorbed some of the moisture. The powder was moist to the touch and compacted easier than before, but no visual coloration changes were observed.

The next step in the procedure compounded this conundrum even further. The recipe states “When you want to use it, heat the mixture, apply it anywhere. You will obtain a very beautiful color.”[[12]](#footnote-12) Heating the mixture would dry it out, seemingly undoing the process of storing it in a cool damp place. Nevertheless, we heated the mixture to a variety of temperatures in order to assess the impact.

One of the mixtures was heated in an attempt to melt the sulfur. Unfortunately, this mixture ignited and burned off. [Fig. 6: Heating the First Mixture] [Fig. 7: The First Mixture Approaching Ignition] [Fig. 8: The ‘results’ of the First Attempt at Heating] We then slowly added heat over ten minutes with a target temperature just over the melting point of sulfur, which is 115.2°C. The organic matter browned and the mixture became blackened even before we reached 110°C. [Fig. 9: The Browning of the Mixture After Slow Heating] The mixture was then heated with the target temperature being 100°C, and again browning was observed although not to the point where the mixture lost all of its yellowish appearance. [Fig. 10: The Slow Heated Results]

It was then that the heating trials were stopped and the results were ground on a marble slab.[[13]](#footnote-13) Various bases for pigments (i.e. turpentine from Venice, linseed oil, and a one to one mixture of turpentine and linseed oil) were added to the heated results and some of the unheated mixtures.[[14]](#footnote-14) The resulting ‘pigments’ were strained through linen cloth and applied to stucco models.[[15]](#footnote-15)

The results were less than appealing. The mixtures did not behave like normal pigments. The organic matter in the mixture had bonded together into large particles that spotted the pigment. [Fig. 11: A Mixed Uncooked Pigment] The pigments, especially those that had been heated, resembled brownish mustard rather than a beautiful gold color.

For comparison, an alternative contemporaneous recipe was attempted. The recipe came from Phillip’s *A Booke of Secrets*. It reads “A good gold colour. Take linseed oile, put into it a little Aloe Epaticum, and alum, let them seeth well in a leaded pot.”[[16]](#footnote-16) As the recipe states, linseed oil was combined with alum and aloe epacticum[[17]](#footnote-17) and was brought to a boil. This mixture was then set to cool, ground in a mortar and pestle, and was applied to the stucco models with similar results to the orange/sulfur mixtures. It appeared slightly yellow and but mostly brown. [Fig. 12: Alternative Mixture Applied to the Model]

While the results of our first attempt were similar to the alternative recipe, we still doubted that we had achieved the desired results. The orange/sulfur pigment looked basically brown. There were large chunks of particulates in the solution even after straining. In short, it just did not look right. Thus, another attempt was made. The procedure remained fundamentally unchanged, except that the orange peels were not ground while wet. The peels had been allowed to sit for approximately two weeks and were very dry as a result. With the aid of several others in the lab, the orange peels were pulverized into a fine powder. [Fig. 13: Finely Pulverized Mixture of Dried Orange Peels and Sulfur] This powder was combined with an equal amount of sulfur. Half of the mixture was placed in a glass flask in a sealed container with an inch of water, and then placed in temperature controlled storage at 5°C.

The other half was combined with linseed oil and painted onto the stucco models. [Fig. 14: The Finished Results Placed on the Model] The results were better than our first attempt. There were still particles in the pigment, however they were far less evident than before. The color was more consistent throughout as well, but lacked the interplay between the browns and yellows that one would expect of gold.

In summary, this recipe at best creates a slightly orange-yellow color that is closer to pure yellow than any kind of gold. The sulfur overpowers the oranges both in smell and color, and disqualifies it from being considered a one-to-one replication of gold coloring. Up close, it is difficult to take this pigment seriously; it is simply filled with too much particulate and it fails to approach anything resembling gold.

Its shortcomings do not disqualify it as a pigment that could have been utilized in ephemeral art projects. At a distance, and in the right cultural context (i.e. celebratory public events or private occasions of a festive nature), the pigment would be perfectly acceptable, even desirable. The hyperactive nature of the yellow sulfur and oranges would heighten the impact of any surface it was applied on, alluding again to a celebratory purpose. In all, by performing this reconstruction we were able to determine that this pigment is more than likely related to art object of a temporary nature.

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1. For more on the meanings of color in western society see John Gage. *Color and Culture: Practice and Meaning from Antiquity to Abstraction*. (Boston: Little, Brown and Company, 1993); and Marcia B. Hall. *Color and Meaning: Practice and Theory in Renaissance Painting*. (Cambridge: Cambridge University Press, 1992). [↑](#footnote-ref-1)
2. Cennini provides many approaches to gold coloring and pigmentation. See Cennino Cennini, and Daniel V. Thompson, *The Craftsman's Handbook* (New York: Dover Pubications, 1954). Experimentation and documentation of gold pigments were also seen as far away as Persia in the early modern era, see Sadiqi Beg Afshar, *The Canon of Forms* (1597), 96-109. [↑](#footnote-ref-2)
3. For examples of ephemeral art and its relationship to other forms of expression during the early modern era, see Yuri Long, *From the Library: The Fleeting Structures of Early Modern Europe, February 4 – July 29, 2012* (National Gallery of Art, Washington, 2012). Accessed December 22, 2014. www.nga.gov/exhibitions/fleetingstructures.htm; Alina Alexandra Payne, *The Architectural Treatise in the Italian Renaissance: Architectural Invention, Ornament, and Literary Culture* (Cambridge: Cambridge University Press, 1999); and Tamar Cholcman. *Art on Paper: Ephemeral Art in the Low Countries: The Triumphal Entry of the Archdukes Albert and Isabella into Antwerp, 1599*. Turnhout: Brepols, 2012. [↑](#footnote-ref-3)
4. William Phillip, *A Booke of Secrets* (STC 2nd ed. 3355, 1596), 15. Phillip’s recipe reads as follows: To write a gold color. Take a new laid hens eg, make a hole at the one end of it, and let the substance out, then take the yolk of an eg without the white, and foure times as much in quantity of quick siluer, grind them well together, slop the hole of the egshell with chalke & the white of an eg, the[n] lay it vnder a hen that sitteth with six egs more, let hir sit vpon it three weekes; then breake it vp & write therewith, some say it must bee laid vnder three seueral hens, and vnder each hen three weekes. [↑](#footnote-ref-4)
5. See field notes – Palframan, Jef R. for 14 Nov 14, 18 Nov 14, 24 Nov 14, 26 Nov 14, and 2 Dec 14, on gold coloring. [↑](#footnote-ref-5)
6. See annotation of 029r – *Stucco for molding* for a more detailed explanation of costs and factors of production. [↑](#footnote-ref-6)
7. Walter Reuther and Herbert John Webber. *The Citrus Industry*. (Berkeley: University of California, Division of Agricultural Sciences, 1967), Ch. 1. Available online at http://websites.lib.ucr.edu/agnic/webber/ [↑](#footnote-ref-7)
8. Ibid., Ch. 4. [↑](#footnote-ref-8)
9. BnF Ms. Fr. 640, 076v. The reference to ‘very yellow peel of orange’ may have also indicated that the author/practitioner intended these to be unripe oranges. The effects of this variable were not assessed in this experiment. [↑](#footnote-ref-9)
10. Ibid., 076v. [↑](#footnote-ref-10)
11. Ibid., 076v. [↑](#footnote-ref-11)
12. Ibid., 076v. [↑](#footnote-ref-12)
13. The heating experiments were conducted with the melting of properties of sulfur in mind. Knowing that sulfur melts into a reddish brownish liquid raised the possibility that there was an unknown interaction between the melted sulfur and oil found in the peel. Of course, as our results indicate this did not turnout to be the case. In turn, this made us reassess the vocabulary found in the original French; ‘chaufer’ does not mean to heat, and almost certainly means ‘warm’ or bring the mixture back to room temperature, which was assessed when we mixed the uncooked mixtures.. [↑](#footnote-ref-13)
14. The recipe also tacitly assumes that the reader possesses some knowledge about bases for pigments and their application to prepared surfaces. The possibility exists then that the author/practitioner was a painter himself or at the very least he possessed some training. [↑](#footnote-ref-14)
15. These stucco models were the results of the experiments associated with recipe 029r – *Stucco for molding*. The results were sized with two layers of rabbit skin glue and three layers of a traditional gesso mix which consisted of 3 parts rabbit skin glue, 2 parts powdered marble, and 2 parts plaster of Paris. For more information on traditional gesso mixes and sizing see Mayer, *The Artist's Handbook of Materials and Techniques*; and Cennini, *The Craftsman's Handbook.* [↑](#footnote-ref-15)
16. William Phillip, *A Booke of Secrets* (STC 2nd ed. 3355), 15. [↑](#footnote-ref-16)
17. Aloe epacticum is made by drying out the juice of the aloe plant and grinding the residue. For more information see Nicholas Eastaugh. *The Pigment Compendium: A Dictionary of Historical Pigments*. (Amsterdam: Elsevier Butterworth-Heinemann, 2004), 11-12. [↑](#footnote-ref-17)