

***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>.

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## **The use of eau de vie in the reconstruction of dragon's blood**

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Course: The Art Technological Source

Under the guidance of: dr. M. A. H. Bol

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<Title id="p029v\_a6">

Sang de dragon </title>

<ab id="p029v\_b6">

Ayes de la larme diceluy bien choisie qui demonstre son rouge transparent Et mets dans une bouteille de verre dans suffisante quantite de la meilleure eau de vye que tu pourras Et lestoupe bien et si diligemment qui ne sesevente poinct Aultrement il ne vauldroict rien Et le laisse ainsy longuement Car tant plus il demeurera il sera plus beau et meilleur et se dissoudra sil est bon Sinon il viendra comme lie de vin Quand tu en voudras user fais un petit pertuis au tapon de la bouteille et en verse un peu et le rebouche a chasque fois puy laplique sur lor Le bon sang de dragon se trouve a grands lopins comme pieces de torteau cestuy la ne vault rien si est sophistique et estant rompu il monstre par les costes des escailles transparentes comme esmail rouge cler il est aussy grumelle en quelques endroits comme petits rubis Il fault que leau de vye soit fort ardente et plusieurs passes </ab>

<note id="p029v\_c6a">

Le plus obscur sang de dragon est le meilleur et ha plus de taincture cest la larme qui se trouve a lopins comme poix et grosses noisettes qui semble ++ </note>

<note id="p029v\_c6b">

Je lay mise dans eau de vye commune y meslant un peu deau fort pour luy donner force Au commencement leau tira un peu de taincture Mays en fin il ne se trouva quune apparence de gomme dragant avelq laquelle je croy quilz sophistiquent le sang de dragon </note>

<note id="p029v\_c6c">

Le posant sur lor bruny il est subject a sesclater Et pour ceste occasion aucuns couchent dessus du vernis de tourmentine Le froid retarde que leau nopere et face extraction de la couleur Et pour ceste occasion on la peult tenir au pres du feu </note>

<title id="p029v\_a6">

Dragon's blood </title>

<ab id="p029v\_b1">

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 very quickly so it doesn't blow out or it will be worth nothing otherwise 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 turn like some lie-de-vin. 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 [...] this one is 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 [...] </ab>

<note id="p029v\_c6a">

The darker dragon's blood is the best and the larme is the most dying one, which you can find in bits as big as pitch and big nuts which seems [symbol] </note>

<note id="p029v\_c6b">

I put it in some ordinary eau-de-vie, adding some aqua fortis to give it strength. At the beginning the water turns slightly coloured, but it just looked like some tragacanth gum with which they sophisticate I think the dragon's blood. </note>

<note id="p029v\_c6c">

When it is applied on gold, it is prone to break, this is why some apply on it some turpentine oil. Cold stops the water from pouring into and taking the colour off. And for that, you can hold it by the fire. </note>

## **The use of eau de vie in the reconstruction of dragon's blood**

In the manuscript BnF Ms. Fr. 640 written by an anonymous author in the 16<sup>th</sup> century several recipes that concern the mysteriously named material dragon's blood are present.<sup>1</sup> Dragon's blood is the name given to a resin that comes from several plant species of which the one from the *Dracaena Cinnabari* is the one historically most used [fig. 1].<sup>2</sup> The main characteristic of this material is its color that is a deep, dark, red, strongly resembling the color of blood. According to Pliny dragon's blood originated from the mixing of the blood of a dragon and an elephant, caused by a battle between the two animals wherein the dragon bit the elephant and drank all its blood after which the elephant fell down upon him and therewith crushed the dragon.<sup>3</sup> Although in all the recipes concerning dragon's blood it is used as a colorant, the specific purposes differ.<sup>4</sup> Dragon's blood can be applied on gold as well as on glass, can be made to look like enamel or used as a varnish.

One of the recipes concerning dragon's blood, on folio 29v, gives a description of the preparation of the resin. Within this recipe it is explained that the dragon's blood should be put in "a glass bottle with enough quantity of the best eau de vie possible". For the anonymous author-practitioner it presumably was self-explanatory what the best eau de vie [French: eau de vye] should encompass, but for the students performing the reconstruction of the recipe this was not clear. Therefore study of historic alcohols in 16th century France was undertaken, to help in the reconstruction of the dragon's blood recipes of BnF Ms. Fr. 640. Since eau de vie is often used throughout this manuscript, more knowledge about the material can be of

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<sup>1</sup> Bibliothèque Nationale de France, Paris, Manuscript Fr. 640 (henceforth cited as BnF Ms. Fr. 640): folios 007r, 029v, 038v, 040v, 098r, 102v, and 165r.

<sup>2</sup> Langenheim, 2003: 441.

<sup>3</sup> Pearson, 2002: 10.

<sup>4</sup> Fol. 038v is an exception, but it is highly probable that this is a reference to another material.

interest not only for the reconstruction of dragon's blood recipes, but for many other recipes as well.

### **Eau de vie**

In the manuscript eau de vie serves multiple objectives: when making a mold it helps getting the model out more easily, it is used to kill animals by force-feeding it to them or to dissolve lacquers and glues. When consulting the Oxford English Dictionary the definition given for eau de vie is “brandy”, but in the translation of the manuscript as it exists so far different words are used.<sup>5</sup> Brandy, eau-de-vie, eau de vie, alcohol and spirits are used, of which the latter one most frequently.<sup>6</sup> The direct translation of eau de vie is water of life, which in Latin would translate to “aqua vita” but was also called “aqua ardens”, “esprit de vin” and many other names.<sup>7</sup> Although the Italian metallurgist Vannoccio Biringuccio (1480-c.1539) wrote: “If it is not made well it is more likely to be called water of death.”<sup>8</sup>

All these different names were given to a liquid made through the distillation of wine, which contained enough alcohol to burn. The contradiction of a liquid that looks like water, a material that was used to extinguish fires, but has the ability to burn itself, combined with its intoxicating effects after consumption, resulted in an early mystical status.<sup>9</sup> The isolation of the alcohol from the wine was seen as an analogy of the separation of the soul from an impure body.<sup>10</sup> Often three types of aqua vitae were distinguished. Simple aqua vitae was distilled from wine alone, whereas the composite aqua vitae was redistilled with the addition of herbs and

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<sup>5</sup> <http://www.oxforddictionaries.com/definition/english/eau-de-vie?q=eau+de+vie>. Consulted: May 19, 2015.

<sup>6</sup> To know which translation is used where and for what purpose see appendix 2.

<sup>7</sup> The Cotgrave dictionary from 1611 translates eau de vie as aquavite.

<sup>8</sup> Biringuccio, 1556: 347.

<sup>9</sup> Forbes, 1948: 90.

<sup>10</sup> Wilson, 2006: 130.

spices. The third one required further distillation, up until ten times, and the addition of even more spices.<sup>11</sup>

Eau de vie was often written about because its medicinal benefits, this can be concluded from the several historical sources. One example can be found in the writings of alchemist Jean de Roquetaillade (c.1310-1366) who writes about the life-enhancing features of aqua vitae.<sup>12</sup> He assigned it the function of the fifth element of Aristotle, the quintessence, although this was actually a specific type of eau de vie that was distilled so many times that almost nothing remained.<sup>13</sup> Also the Austrian physician Michael Puff von Schrick (1400-1473) spoke highly of its healing qualities: “Anyone who drinks half a spoon of brandy every morning will never be ill again”, as is written in his “Traktat von Tugenden der ausgebrannten Wässer” from 1478. Eau de vie even found its role in the context of warfare. In “De la Pirotechnia” (1540) Biringuccio reports the practice of increasing the strength of gunpowder by dampening it with camphorating aqua vitae, although he himself doubted the presumed effects.<sup>14</sup> Through Hieronymus Brunswick’s (c.1450 – c.1512) “Liber de arte distillandi de simplicibus” (1500) many images of different types of stills have come to us. Also in “Das neu gross Destillierbuch; Wolgegründter künstlicher Distillation” (1545) a distillation apparatus can be seen on the first page [fig. 2].

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<sup>11</sup> Wilson, 2006: 115.

<sup>12</sup> Devun, 2009, 5.

<sup>13</sup> Rasmussen, 2014: 94. & Multhauf, 1954.

<sup>14</sup> Biringuccio, 1556: 437.

Camphorated: impregnated or treated with camphor. Camphor: a white volatile crystalline substance with an aromatic smell and bitter taste, occurring in certain essential oils. Oxford Dictionary of English.

## Distillation

The practice of distillation was already quite far developed in the 16<sup>th</sup> century. It was used for the separation of mixtures of liquid as well as for the purification of aqueous solutions. Distillation makes use of the different boiling points of materials by heating it slowly and collecting the vapor of the liquid with the lowest boiling point in another container. Two important methods can be distinguished, in simple distillation (also called batch distillation) the material is vaporized once and then collected, when executing fractional distillation the vapors are condensed and re-vaporized several times making use of a fractionating column.<sup>15</sup>

The first indication of the knowledge of simple distillation can be traced back to the first century AD, although early texts contain recipes that employ this technique not for the production of alcohol but for the creation of sulfur water.<sup>16</sup> In the 9<sup>th</sup> century the distillation of wine was a known concept in the Middle East and was mentioned, for example, by the Arabic poet Abu Nuwas (756–814). He writes about drinking a wine that “has the color of rain-water but is as hot inside the ribs as a burning firebrand”. The art of distillation experienced great development in the 13<sup>th</sup> century. One invention contemporaneous to the manuscript was the use of a spiraling coil in a water barrel to condense the vapors in a simple distillation, often attributed to the alchemist Tadeo Alderotti (1210-1295).<sup>17</sup> This development increased the functionality of the still considerably and was also described by Biringuccio in his previously mentioned magnus opus “De la Pirotechnia”.<sup>18</sup>

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<sup>15</sup> <http://www.monashscientific.com.au/AlcoholDistillationTheory.htm#>. Retrieved: May 19, 2015.

A fractionating column is a long column in which the evaporated liquid condenses on trays or plates inside the column, and returns to the distilling vessel, therewith ensuring multiple distillations in one process. Oxford dictionary of English.

<sup>16</sup> Wilson, 2006: 17.

<sup>17</sup> Wilson, 2006:116.

<sup>18</sup> Biringuccio, 1556: 348.



The effectiveness of a distillation depends greatly on the still that is used. When performing a distillation the first batch results in the biggest difference in alcohol content. When starting off with a wine with c.7-10% alcohol content one is likely to retrieve a distillate between c.25-50%. By a second distillation an even higher alcohol percentage can be achieved. However, the difference is going to be smaller because the starting material is already higher in alcohol content. The maximum alcohol percentage possible to obtain through simple distillation lays around 80%.<sup>19</sup> It must be kept in mind that these are not absolute numbers. They are dependent on the still used and moreover on the temperature at which the liquid is vaporized: a low and steady heat results in the best distillation.<sup>20</sup>

When using fractional distillation the alcohol content of the product depends on the time the liquid stays in the distillation column. The maximum alcohol content that can be reached with this method is 95,6%.<sup>21</sup> The last five per cent are impossible to obtain through regular distillation, because of the azeotropic behavior of water and alcohol. In 1796 it was discovered that through the addition of chemical compounds, like benzene, cyclohexane or heptane, the water starts forming a new azeotrope and therewith the alcohol became free to vaporize.<sup>22</sup> Other types of stills were also employed like the rosenhut still or the moor's head still.<sup>23</sup>

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<sup>19</sup> <http://www.monashscientific.com.au/AlcoholDistillationTheory.htm#>. Retrieved: May 19, 2015.

<sup>20</sup> Forbes, 1948: 83.

<sup>21</sup> Rasmussen, 2014: 86.

<sup>22</sup> Azeotrope: mixture of two liquids that has a constant boiling point and composition throughout distillation. Oxford dictionary of English.

<sup>23</sup> Rasmussen, 2014: 89.

## Manuscript

On fol. 3 a drawing [fig. 3] is present of a still that is used for the production of turpentine oil but which can also be used for the distillation of eau de vie, as is mentioned in the accompanying text. The form of the still and the mentioning of a cooling system on top suggests that this is a type of still called moor's head. In this type of still the condensation of the vapors occurs in the head through the presence of cold water in the surrounding reservoir [fig. 4 and 5]. In the accompanying text it is said that when using this vessel for the production of alcohol "one does not even need to distil it again". This contradicts with what is written on folio 163r; here the author mentions that the best eau de vie, used for the making of sand, is distilled three times.

In the reconstructed recipe the author-practitioner distinguishes different qualities of eau de vie; at first the use of the best eau de vie possible [la meilleure eau de vye] is advised whereas a few sentences down ordinary eau de vie suffices [eau de vye commune]. It is not plausible that the mentioning of quality refers to the taste of the liquid since the only reference to the consumption of eau de vie is made on folio 71r where it is only written that the Irish do not drink much wine but are accustomed to drink eau de vie. So exact explanation of what comprises an eau de vie of the best quality is given, but is stated that "Il fault que leau de vye soict fort ardente et plusieurs passes".<sup>24</sup> This can be translated as "it must be that the eau de vie is strongly burning and has been passed multiple times", which probably means that it has gone through several distillations and therefor has a higher alcohol content.<sup>25</sup> Therefor when dissolving the dragon's blood an eau de vie should be used that has been passed multiple times and has a higher alcohol content than an eau de vie

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<sup>24</sup> As is written in the transcription, the translation only states: *the eau de vie must be very..*  
[...]

<sup>25</sup> Translation by author

simple.<sup>26</sup> It can be speculated that an eau de vie simple was used on a regular basis and only when it did not suffice a multiple times distilled eau de vie was used.

Although the making of eau de vie is mentioned in the manuscript one cannot be certain that the author always made it himself. The first known distillers to sell their wares commercially probably came from Armagnac, which is just around 40 kilometers away from Toulouse where it is thought the author lived.<sup>27</sup> The possibility of purchased eau de vie instead of manufactured eau de vie requires further investigation.

## Experiments

In the reconstruction, that was performed before the study of historic alcohols was done, three types of alcohol have been used to dissolve the dragon's blood; an amber colored brandy (Hennessy fine de cognac, 40%), a colorless cherry distillation (Kirschwasser Specht, 40%) and ethanol (waterfree, 100%).<sup>28</sup> Initially only the first two were used due to translation given in the vocabulary, where eau de vie was translated as brandy. The brandy and cherry distillation were chosen because of the color difference, which could have an effect on the appearance of the dragon's blood.

After immersing a 'drop' of dragon's blood, weighing circa 0,5 grams, in two milliliter of each of the liquids the two liquids both started coloring a light pink,

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<sup>26</sup> Eau de vie simple: an eau de vie that has gone through one simple distillation.

<sup>27</sup> Faith, 1995: 51.

<sup>28</sup> Dragon's blood used for reconstruction: Pure lumps of resin that exudes naturally from the base of the leaf rosettes of the *Dracaena Cinnabari* tree in the great heat of the summer. Deep red, locally called "Emzolo" or "Edah Amsello", small pieces. The color of the Dragon's blood solution is less brown and very similar to the Madder lake. Kremer: 37016 Dragon's Blood Emzolo, pieces, from Socotra (Natural Red 31).

Kirschwasser Specht: clear liquor produced by the double distillation of fermented cherry juice.

Hennessy fine de cognac: amber colored liquor produced by the double distillation of fermented grapes.

Ethanol: dehydrated, denatured with 1% MEK. At first also a white wine was used, but since this conducted no effects it is not mentioned in the annotation but only in the report.

although the brandy had a more yellow tone to it [fig. 6]. The measuring cylinders were closed off with parafilm.<sup>29</sup> After one hour the liquids were examined and it could be seen that both had obtained a stronger red color but that the rock was still there. It was left alone as is mentioned in the manuscript (“then leave it for a long time”).

Five hours after immersion both the stones had partially dissolved, but the material remained an unworkable, sticky layer of the darkest red on the bottom of the cylinder [fig. 7]. The use of ethanol was considered to speed up the process, although this idea was met with reluctance because of the wish to remain as close to the manuscript as possible. Three days later the stones had completely dissolved, but the liquid had separated in a thick dark red layer on the bottom and a translucent, light red liquid floating on top [fig 8]. The color difference between the two solutions had disappeared. The opaque substance as well as the liquid on top was applied on several supports to test its features.<sup>30</sup>

To improve and fasten the dissolving of dragon’s blood the drops were crushed and sieved and the amount of eau de vie increased. Four milliliter of both the Kirschwasser and the cognac was added to 0,5 grams of crushed dragon’s blood and altogether stirred, this was difficult because of the stickiness of the emulsion, and immediately afterwards closed off with parafilm. The Kirschwasser made the dragon’s blood very dark and gave it a crumbly substance whilst the liquid turned red; the dragon’s blood was not completely dissolved [fig. 9]. When adding the cognac the same results were observed. Because of the disappointing outcomes ethanol was used, in spite of its possible disagreement with the manuscript. When performing the same test again but with ethanol the dragon’s blood becomes very dark again but does not become crumbly and dissolves completely. This fuelled the idea that the solutions

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<sup>29</sup> Parafilm is a plastic paraffin film commonly used for sealing or protecting vessels.

<sup>30</sup> The complete tests, results and conclusion can be found in the labreport of April 17, 2015.

initially used were not consistent with the material meant by the author of the manuscript.

## **Conclusion**

Historical sources revealed that the knowledge of distillation was already quite far developed in the 16<sup>th</sup> century. Through the way of fractional distillation an alcohol percentage of 95% could be obtained. But in the discussed manuscript BnF Ms. Fr. 640 another type of still is used, this type is called a moor's head still. The author writes that with this still one distillation is sufficient, but on another folio it is written that three distillations give the best eau de vie for the making of sand. In the reconstructed recipe the description given to eau de vie is "the best eau de vie possible", this would suggest not the use of an eau de vie simple but one one that has gone through several distillations. This assumption is backed by the last line of the recipe where it says that the eau de vie must be strongly burning and must have been passed several times.

After performing experiments wherein dragon's blood rocks or powder were immersed in three different types of alcohol solutions, two of 40% and one of 100%, it can be said that the latter undoubtedly performed better than the ones with lower alcohol contents. Since threefold batch distillations would result in a liquid that contains more than 40% alcohol, it is highly likely that to dissolve dragon's blood an eau de vie was used that had a higher alcohol content than the ones that were initially used in the reconstruction. But it cannot be as high as the ethanol that was used afterwards. Because through simple distillation it is not likely to obtain more than 80% alcohol and the knowledge to obtain pure alcohol was only there after 1796. To obtain the best historically accurate results while performing experiments, attention

should be paid to the description given to the eau de vie used. If it is written to use the “best eau de vie possible” or a good or strong eau de vie than an aqueous solution should be used with a higher alcoholic content. But when nothing is said or ordinary eau de vie is written than presumably a c.40% distillate will suffice.

## References

Brunswick, H. *Liber de arte distillandi simplicibus*. 1500

DeVun, L. *Prophecy, Alchemy and the end of time. John of Rupescissa in the late middle ages*. Columbia University Press, 2009.

<<http://www.pbm.com/~lindahl/cotgrave/>> May 18, 2015. [www.pbm.com](http://www.pbm.com).

Faith, N. *Cognac*. Octopus Publishing Group: 1995.

Forbes, R. J. *A short history of the art of distillation*. Leiden, J. Brill: 1948, herdrukt in 1970.

<<http://www.history-science-technology.com/notes/notes7.html>> May, 18, 2015.  
[www.history-science-technology.com](http://www.history-science-technology.com).

Huizenga, E. Een nuttelike practijke van chirurgien. Geneeskunde en astrologie in het Middelnederlandse handschrift Wenen, Österreichische Nationalbibliothek, 2818.

Multhaulf R. P. *John of Rupescissa and the Origin of Medical Chemistry*. 1954.

Pearson, J. *Dragon's blood*. In: *The Horticulturist*: 2002, p. 11.

Needham, J., H. Ping-Yu, L. Gwei-Djen, N. Sivin. *Science and civilisation in China: Volume 5*. Cambridge: Cambridge University Press, 1980.

Rasmussen, S. C. *The quest for aqua vitae: The history and chemistry of alcohol from antiquity to the middle ages*. Springer, 2014.

Biringuccio, V. *De la pirotechnia*. 1540. Translated by Smith C. T. & M. T. Gnudi.  
Courier Dover Publications. Dover books on earth sciences, 1959.

Ryff, W. H. *Das neu gross distillierbuch*. 1545.

Wilson, C. A. *Water of life*. Prospect books, 2006.

Langenheim, J. H. *Plant resins: chemistry, evolution, ecology, and ethnobotany*.  
Portland: Timber Press, 2003.

<<http://www.monahscientific.com.au/AlcoholDistillationTheory.htm#>>. May 15,  
2015. [www.monahscientific.com](http://www.monahscientific.com)



## Appendix 1: Figures



Fig. 1. Dragon's blood used for reconstruction: Pure lumps of resin that exudes naturally from the base of the leaf rosettes of the *Dracaena Cinnabari* tree in the great heat of the summer. Deep red, locally called "Emzolo" or "Edah Amsello", small pieces. The color of the Dragon's blood solution is less brown and very similar to the Madder lake. Kremer: 37016 Dragon's Blood EMZOLO, pieces, from Socotra (Natural Red 31). Source: [http://www.kremerpigmente.com/media/files\\_public/37000-37016e.pdf](http://www.kremerpigmente.com/media/files_public/37000-37016e.pdf) Consulted: May 29, 2015.

# Das New groß Distillier

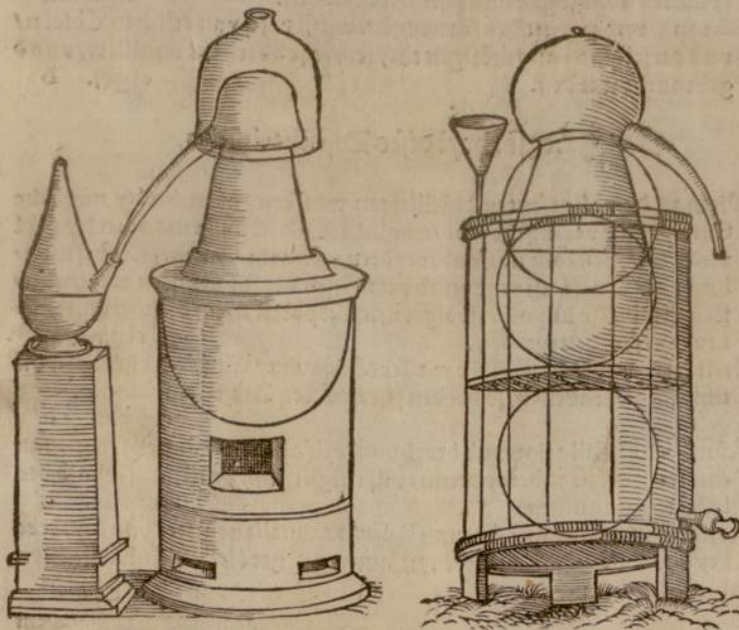
Buch/Wolgegründter Künstlicher Distillation.

GVALTHERI H. RYFF,

Medici, & Chirurgi.

Vnderweisung vnd bericht / die fürnehmste Distil-  
lierte Wasser / Kostliche Aquasuitæ, Quintam essentiam, Heyls-  
same öl / Balsam / vnd dergleichen vil güter Abzüg / so zu vilfaltigen  
Kranckheiten / sehr vñ gebrechen menschlichen Cörper / fast nützlich gebraucht  
werden mögen / Recht künstlich / vnd vil auff bequembere art dann bißher /  
auch mit bequemern zeug der Gefäß vnd Instrument / des ganzen  
Distillierzeugs / Von Kreuttern / Blumen / Wurzlen / Früch-  
ten / Gethier vñnd anderen stucken / darinn natürliche  
feuchte vnd Elementische krasse / Einfach oder  
mancherley gestalt vermischet vnd Compos-  
niert / Künstlichen abzuziehen  
oder Separieren.

Mit ordenlichen vnd vollkommenen Registern.



Mit Kais. Mai. vnd Röm. Königlichen Privilegien.  
Zu Frankfurt/Bei Christian Egenolff.

Fig. 2. Moor's head still (left) as drawn in Walther Hermann Ryff's Das neu gross Destillierbuch; Wolgegründter künstlicher Distillation 1545. P.1.

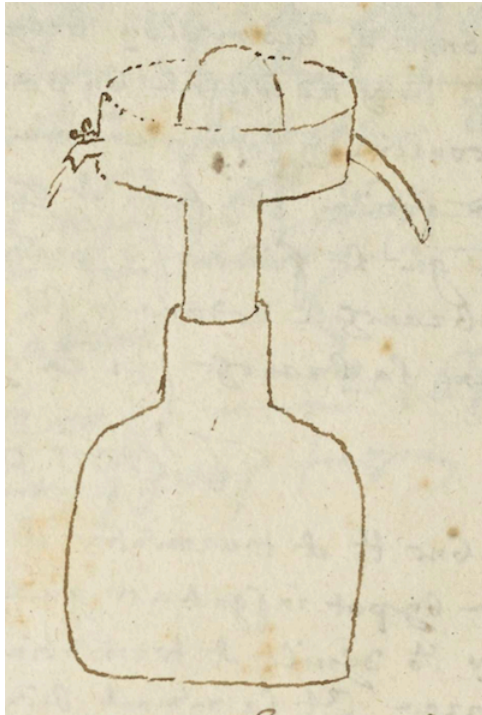


Fig.3. Fragment of folio 003V. Drawing represents a still that can be used to make turpentine oil as well as eau de vie. Source: BnF Ms. Fr. 640.

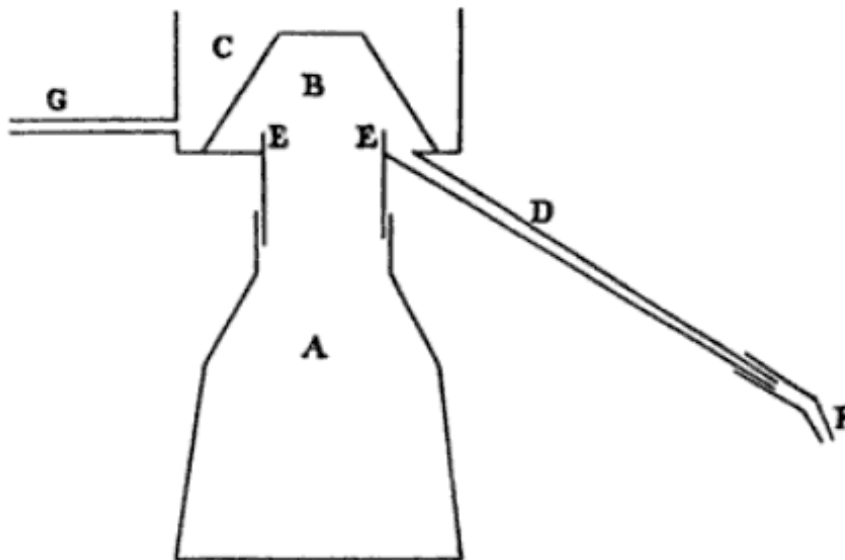


Fig. 4. Moor's head still, cross-section of the Algerian steam distillation apparatus. A. Still body; B. Still-head; C. Cooling reservoir; D. Side-tube; E. Beading forming the annular gutter; F. Receiver; G. Tube for withdrawal of heated water. All parts are made of tinned copper. Source: Needham, 1980: 130.





Fig. 5. Colored woodcut of moor's head still. Source: [www.ghettyimages.nl](http://www.ghettyimages.nl)

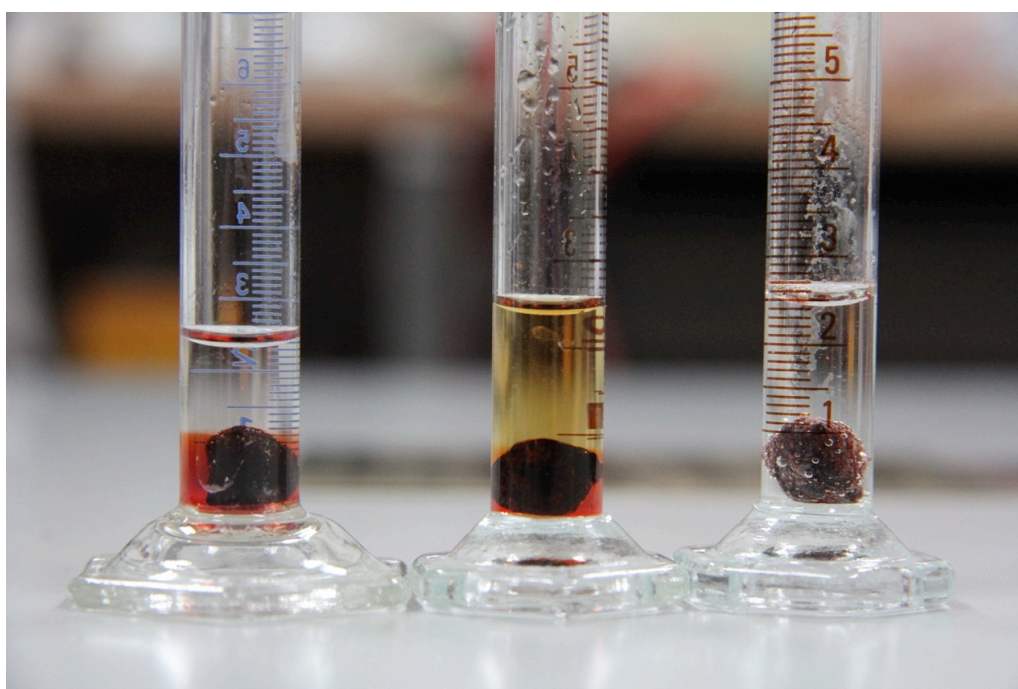


Fig. 6. Trial 1: Three pieces of dragon's blood (0,5 grams) dissolved in 2 milliliter of cherry distillation, cognac and white wine. Photo was taken ca. 15 minutes after immersion.

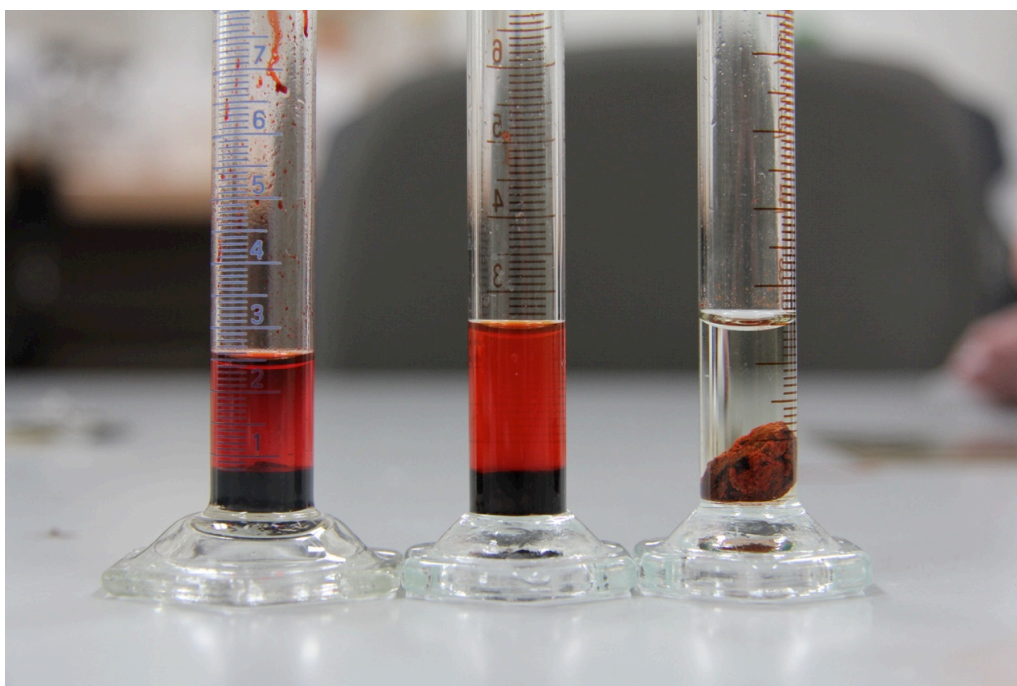


Fig. 7. Trial 1: Three pieces of dragon's blood (0,5 grams) dissolved in 2 milliliter of cherry distillation, cognac and white wine. Photo taken directly one day after immersion.

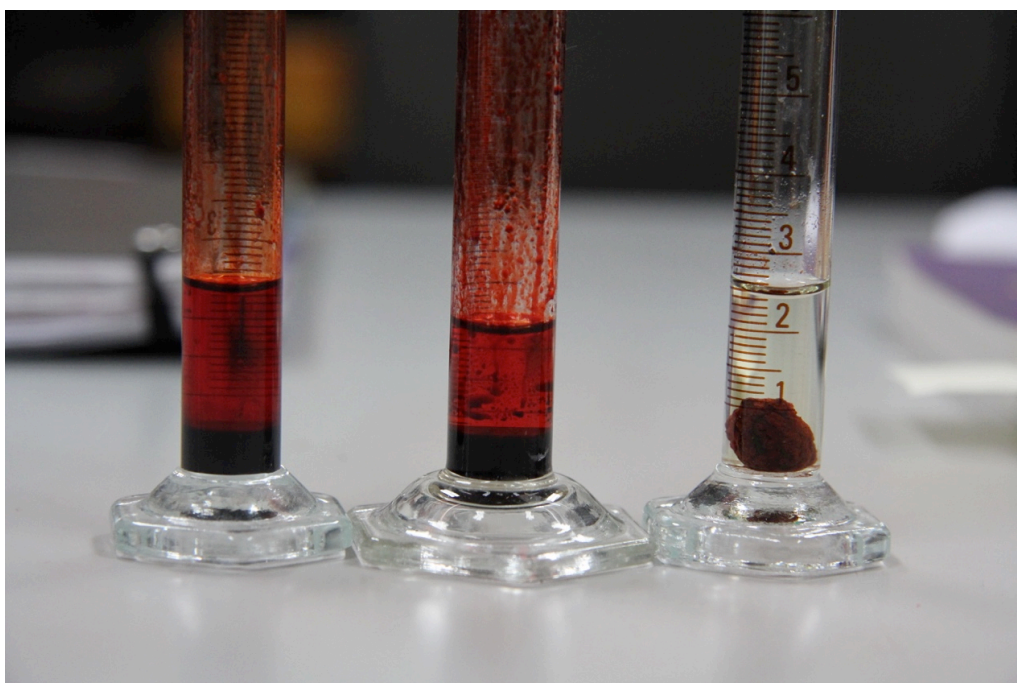


Fig. 8. Trial 1: Three pieces of dragon's blood (0,5 grams) dissolved in 2 milliliter of cherry distillation, cognac and white wine. Photo was taken directly three days after immersion. Containers have been shook.

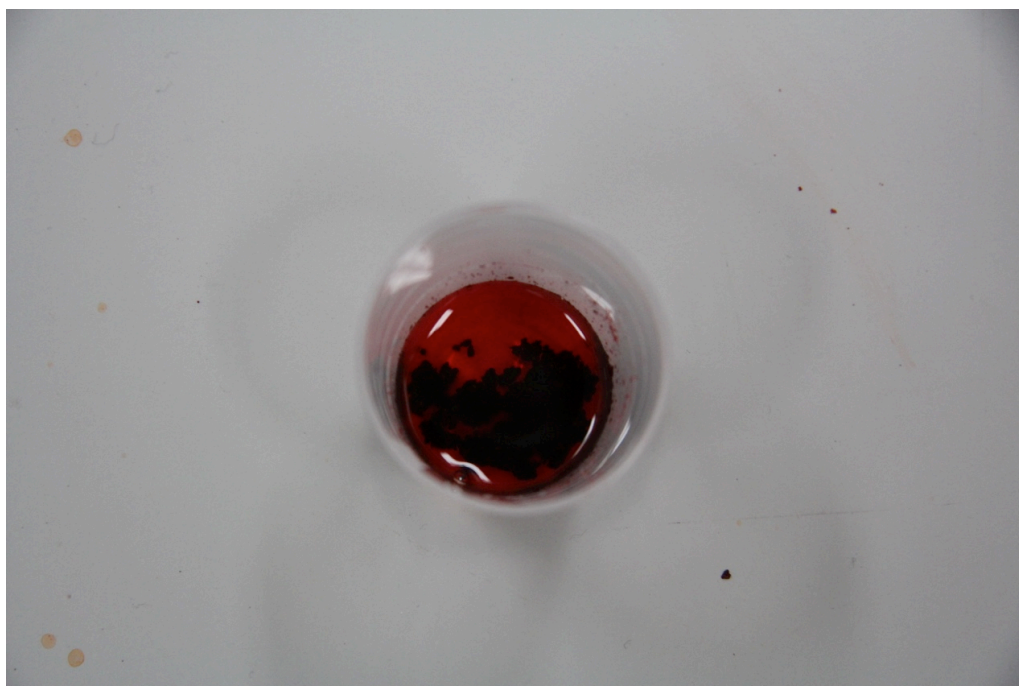


Fig. 9. Trial 2, pulverized dragon's blood immersed in cherry distillation. It can be seen that that the dragon's blood does not solve very well but forms a crumbly substance at the bottom.

## Appendix 2: Tables

| Folio | Term                                       | Function                                           |
|-------|--------------------------------------------|----------------------------------------------------|
| 003v  | Alcohol                                    | How to make it                                     |
| 007r  | Spirits                                    | Soak glue                                          |
| 007r  | Spirits                                    | Dissolve dragon's blood                            |
| 024r  | Eau-de-vie                                 | Soften gunpowder                                   |
| 029v  | Good eau-de-vie                            | Clean                                              |
| 029v  | Best eau-de-vie possible                   | Dissolve dragon's blood                            |
| 029v  | Ordinary eau-de-vie                        | Dissolve dragon's blood                            |
| 031r  | Eau-de-vie                                 | Color water                                        |
| 040v  | Eau-de-vie                                 | Dissolving dragon's blood                          |
| 060v  | Eau-de-vie                                 | Making varnish                                     |
| 071r  | Brandy                                     | Wine converts to brandy                            |
| 077r  | Spirits                                    | Making varnish                                     |
| 088r  | Eau-de-vie                                 | Make varnish                                       |
| 097v  | Eau de vie                                 | Making varnish                                     |
| 099v  | Spirits                                    | Make varnish                                       |
| 106r  | Spirits                                    | Making the sand for a mold                         |
| 108R  | Spirits                                    | Preparing a mold                                   |
| 109v  | Spirits                                    | Killing snakes                                     |
| 109r  | Spirits                                    | Preparing a mold                                   |
| 112v  | Good spirits or spirits mixed with vinegar | Kill animals without deforming them                |
| 113r  | Spirits                                    | Preparing the mold                                 |
| 114v  | Spirits                                    | Preparing the mold                                 |
| 116r  | Good spirits                               | Dip the flowers you want to mold into good spirits |
| 117v  | Spirits                                    | Preparing a mold (wax figures/lead medals)         |
| 117r  | Spirits                                    | Preparing the mold                                 |



|             |         |                                      |
|-------------|---------|--------------------------------------|
| <b>118v</b> | Spirits | Making the sand for a mold           |
| <b>121v</b> | Spirits | Making a mold                        |
| <b>127v</b> | Spirits | Preparing a mold                     |
| <b>131r</b> | Brandy  | Molded letter paper                  |
| <b>137v</b> | Spirits | Preparing the mold                   |
| <b>140v</b> | Spirits | Preparing a mold                     |
| <b>141r</b> | Brandy  | Preparing the mold                   |
| <b>141r</b> | Brandy  | Preparing a mold (crayfish)          |
| <b>143r</b> | Spirits | Molding turtles                      |
| <b>143r</b> | Spirits | Killing turtles                      |
| <b>144v</b> | Brandy  | Molding a turtle                     |
| <b>146v</b> | Brandy  | Preparing the mold                   |
| <b>155r</b> | Spirits | Preparing a mold (rose)              |
| <b>156v</b> | Spirits | Can not penetrate wheat germ oil     |
| <b>157v</b> | Brandy  | Preparing the mold (of a bird)       |
| <b>159r</b> | Spirits | Dilute fish glue                     |
| <b>163v</b> | Spirits | Adding color                         |
| <b>163r</b> | Brandy  | Preparing a mold (distilled 3 times) |
| <b>165v</b> | Spirits | Storing animals                      |
| <b>165v</b> | Spirits | Dissolving glue                      |

Table 1. In this table the different folios where the material eau de vie are mentioned as well as the translation used and the function.