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Historical recipes for preparatory layers for oil paintings in manuals, manuscripts and handbooks in North West Europe, 1550-1900: analysis and reconstructions

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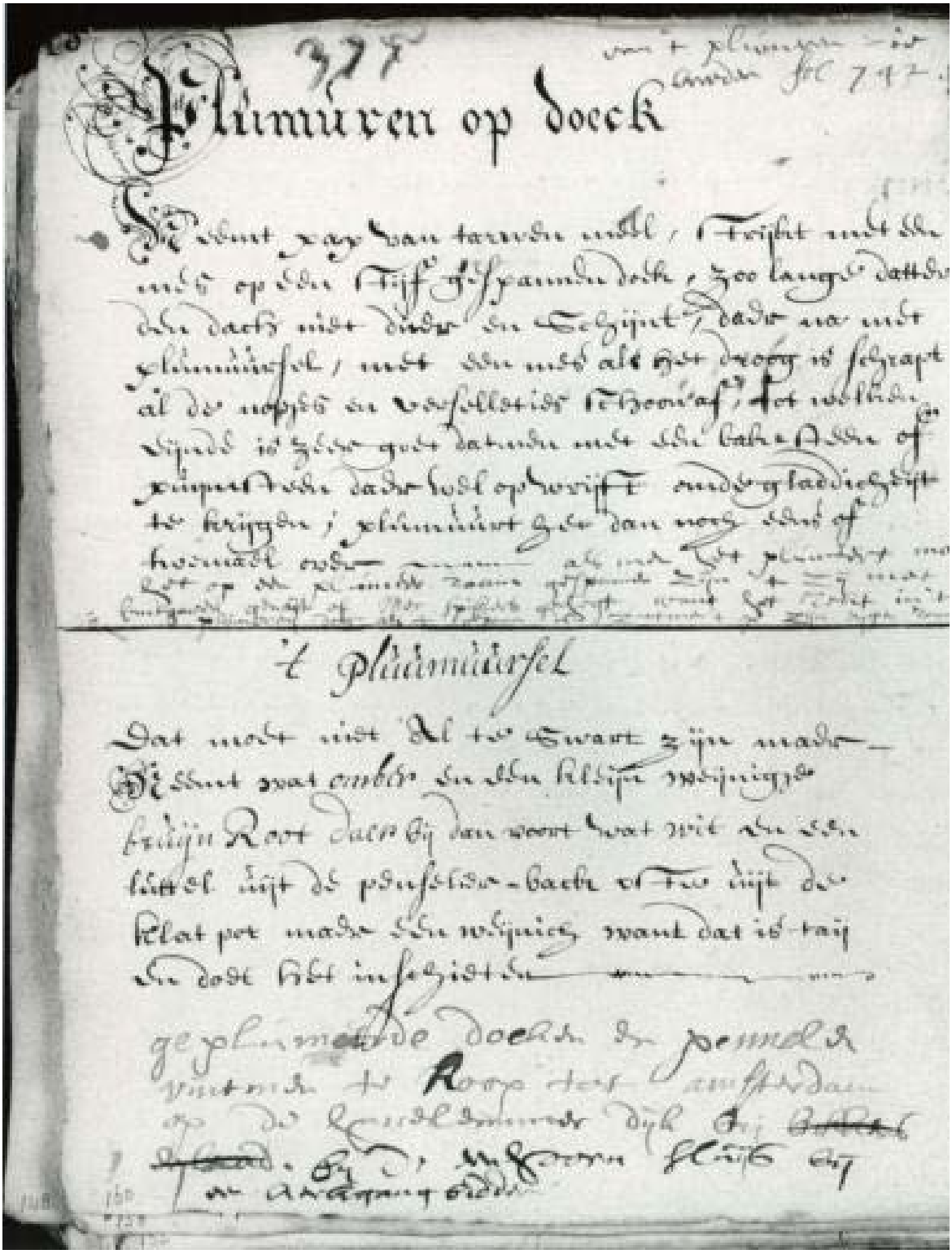

Figure 5.1 *Folio 377, containing recipes for a ground on canvas ('Plumuren op doeck' and ''t plumuursel', as well as notes concerning the availability of primed canvas in Amsterdam.*

Simon Eikelenberg. 'Aantekeningen'. manuscript. c. 1679-1704.

Photograph: © Alkmaar Municipal Archive.

Chapter 5 Chronological developments in preparatory layer recipes 1550-1900

Before speaking of the handling of oil colours, it is no diversion from our subject if we say something about the priming, on which, whether it is good or bad, depends the beauty and livelyness of colours

De Mayerne (1620-44)[1]

This chapter provides an overview of the chronology of materials and the layer structure described in recipes for preparatory layers for oil paintings in North West Europe, c. 1550-1900, with reference to selected Italian and Spanish sources. The data on which this chapter is based, are presented in the form of graphs in Appendices 5-12. The complete text of all recipes quoted is available in transcript on the CD provided.
Detailed description and analysis of the contents of the recipes in a wider context is a fundamental step when investigating written texts that discuss painting methods. Chapter 5 forms the basis for later chapters in this thesis, which focus on more specific aspects of ground ingredients, application, colour, etc.
The ground recipes are discussed per support. The chapter first deals with panel, then canvas, followed by stone, copper,paper and board. Each section follows the layer build-up from size via ground layers to isolation layers. In the final section, a comparison is made between preparatory layers for the different supports.

5.1 The painting support

5.1.1 The use of panel in comparison to canvas

$During the period under consideration, attention shifts from recipes for panel grounds to recipes for the preparation of canvas. This confirms earlier research.[2] Figure 2.2a demonstrates that while in the period before 1500, only one recipe for the preparation of canvas for painting could be located against six for panel preparation, the group of seventeenth century canvas ground recipes grows to sixty six, against twenty eight for panel. In the context of individual sources a shift in attention can also be noted: the fact that De Mayerne (1620-44) only provides four panel preparation recipes while he describes eight canvas grounds is exemplary for this development and other historical sources show a similar interest in canvas grounds.[3] Recipes for canvas preparation continue to form the largest group until the end of the nineteenth century (*see* Fig. 2.2a).

[1] De Mayerne 1620-44: 98v
[2] Miedema and Meijer 1979; Koller 1984: 386; Young and Katlan 2012: 126-7.
[3] *See* Witlox and Carlyle 2005. Miedema and Meijer (1979) investigated the prevalence of Dutch canvas and panel supports in seven large museum exhibitions that took place between 1953 and 1967. They noted a general decrease in the number of panel paintings in favour of canvas supports. This decrease took place earlier in Italy than in the Netherlands.

Early authors discuss the choice in support: Vasari (1550) describes the advantages of canvas painting, in particular for large-sized paintings: 'In order to be able to convey pictures from one place to another men have invented the convenient method of painting on canvas, which is of little weight, and when rolled up is easy to transport'.[4] By the time of writing of Félibien (1676), 'canvas is used much more often than other supports, primarily for large paintings; because it is easier to transport than wood, which is heavy, and also subject to cracking'.[5] Watin in 1776 confirms the fact that canvas is the most popular support:

> Since the invention of oil painting, painters of talent paint less on wood, copper, &c. and they use nothing else than canvases to represent the subject that they wish to paint; they have abandoned other methods.[6]

While nineteenth century sources also pay most attention to canvas preparation, Muckley (1882) has a preference for wooden panels: 'Both large and small cabinet picture ought to be painted on panel, when the durability of the work is of consideration'.[7] He feels that canvas paintings are much more vulnerable to moisture (leading to mildew), wrinkling and mechanical damage. Although he acknowledges that panels can suffer from delamination caused by a moisture-sensitive chalk and glue ground, he writes: 'In most instances, when a picture on panel has suffered, it might have been easily prevented by a little forethought'.[8]
Based on the number of recipes for its preparation, wooden panel remains the second most important support throughout the period. Recipes for the preparation of boards and paper are relatively scarce in the sources.

5.1.2 Preparation of the support before ground application

Only a small number of recipes from within the period devote attention to treatments of supports prior to the application of the preparatory layers.

The practice of applying strips of canvas or hemp fibres to panels to repair defects seems to have died out in the sixteenth century, as only three of the twenty late sixteenth and seventeenth century recipes for panel preparation (*see* Appendix 5) still mention the use of strips of canvas or hemp fibres for this purpose, and these appear in Spanish and Italian sources only.[9] While some nineteenth century sources refer to canvas applications, this is done solely in the context of discussions about techniques employed by earlier painters.[10]

[4] Vasari 1550 (edition 1568): 53. Translation: Brown 1960: 236.
[5] Félibien 1676: 407.
[6] Watin 1776: 113.
[7] Muckley 1882: 60-1.
[8] Muckley 1882: 62.
[9] Armenini 1587: 121-2; Bisagno 1642: 111-2; Pacheco 1649: 382-3.
[10] Jahn 1803: 48-50; Montabert 1829, vol. 9: 124-31; Arsenne and Denis 1833: 333-5; Sarsfield Taylor/Mérimée 1839: 214-5. Fernbach 1834: 5-6 advises to glue linen to the reverse side of a canvas.

Panel smoothing is advised by Peacham (1634), who advises to use a plane, [11] by Norgate (1640), who writes that ground is applied to the 'boards being made smoth',[12] and by Grandi (1806), Smith (1825) and Cawse (1840) who advise pumicing.[13]

For canvas, scraping to remove knots prior to sizing is described amongst others by King (1653-7), pumicing by Le Pileur d'Apligny (1779) and by Sully (1809-71).[14] De Montabert (1829) advises rubbing the canvas with absinth, garlic or a sliced onion, Hampel (1846) advises to wash the canvas with potash and rinse it with tepid water, while Vibert (1892) advises to wash the canvas with 'benzine'.[15]

Vasari (1550) discusses the fact that the adhesion between oil-bound preparatory layer and stone depends on the type of stone, some stones being more absorbent than others. Softer stones can be 'beaten' with an iron and smoothed by the preparation layer, while other stones require rubbing down with sand or a 'hearth stone' ('fasso di Tusi').[16]
No other instructions for pre-treatment of stone supports appear until the nineteenth century, when Hampel (1846) describes that stones should be etched. He provides two recipes for etching, one for precious the other for non-precious stones. In his recipe for the preparation of precious stones, the areas not to be etched are protected with a wax layer. The areas to be painted are then etched with fumes rising from a mixture of vitriol oil and 'Flußspath' ('river spar'). The wax is removed with turpentine oil and an oil ground is applied to the etched areas.[17] For non-precious stones, Hampel also advises etching, but with a solution of diluted vitriol oil. This liquid is allowed to form a froth on the stone surface (which takes 1-2 minutes) and is wiped off before application of an oil ground.[18]

The preparation of copper supports before the application of preparatory layers or of paint layers is focused on degreasing and creating texture in the support. De Piles (1684) advises to cut a garlic clove in half and rub it over the side of the copper on which you wish to paint.[19] Rubbing with garlic is also advised for copper onto which no ground layer is to be applied.[20] Smoothing and pumicing the surface is described in a number of recipes, the first of which is provided by De la Hire in 1730.[21] Whereas De la Fontaine (1679) prefers the use of very smooth copper ('cuivre bien poli')[22], Mérimée (1830) explains that pumicing is done to give the copper 'a little grain' which is supposed to increase paint adhesion.[23] Hampel (1846) advises to first treat the copper surface with

[11] Peacham 1634: 130
[12] Norgate 1640 (edition Hardie 1919): 91.
[13] Grandi 1806: 85-9; Smith 1825: 357-8; Cawse 1840: 20-1.
[14] King 1653-7: [48]; Pileur 1779: 70; Sully 1809-71 (recipe date 1856): 156. *See* Appendix 6 for more references to such pre-treatments.
[15] De Montabert 1829, vol. 9: 167; Hampel 1846: 22-5; Vibert 1892: 186-8. *See* Chapter 6 for more information on benzene.
[16] Vasari 1550 (edition 1568): 54-5.
[17] Hampel 1846: 30.
[18] Hampel 1846: 29-31.
[19] De Piles 1684: 65.
[20] De Piles 1684: 65; Jombert 1766: 137-8; *Nieuwen verlichter* 1777: 170-1; Dutens 1779: 62.
[21] De la Hire 1730: 709.
[22] De la Fontaine 1679, seconde partie: 28-9.
[23] Mérimée 1830: 246-7.

sandstone, then with pumice stone and to finally wash it with clear water in preparation for ground application.[24]
None of the collected recipes for paper or board preparation discuss pre-treatments of this support before the application of a preparatory system.

5.1.3 Painting on a support without a ground

In a thesis devoted to preparatory layers for oil painting, the fact that a small group of nineteenth century authors describe the use of unprimed supports cannot be left unnoticed. The first of these authors are Hodson and Dougall, who as early as 1805 write that 'many modern artists, whose works have met with general approbation, do not prime their cloths at all'.[25] De Montabert (1829) makes a distinction between course canvases that require a ground, and very fine canvas: 'The oil layer is also not necessary ('inutile') when you paint on very fine canvas of a light weave, on taffetas, even on papers, because in these instances a light sizing suffices'.[26] The 1845 *Handbook* notes that panels of 'great hardness and very fine grain' can be used without a preparation[27] and Blockx (1881) refers to painting on unprimed wood. He writes that only old planks that do not contain any resin should be used. To prepare them for painting, they should be washed with turpentine essence and covered with a light layer of oil. The reverse of such panels should be covered with lead white in oil or with shellac to prevent moisture penetration.[28]
For painting on unprimed canvas, Vibert (1892) advises to apply a little 'retouching varnish' or a more oil-rich 'painting varnish' to the support if it is too absorbent.[29]

On stone, a support chosen for its inert nature, or sometimes for its colour and pattern, grounds are often omitted and instructions for painting on unprimed stone appear earlier in the period.[30] No ground is applied in the case of the 'marbles of extraordinary colours' mentioned by Barrow (1735).[31] In those cases where the pattern plays a role in the

[24] Hampel 1846: 28.
[25] Hodson and Dougall 1805: 168. Hodson & Dougall employ the verb 'prime' for the application of ground layers on page 266, where they discuss the use of a priming or second ground containing lead white and peach stone black. Hodson and Dougall's comment is echoed in the *Complete Guide* 1841: 41. Analysis demonstrates that G.F. Watts executed his *King Alfred inciting the Saxons to prevent the landing of the Danes* (1846) on a course, glue sized canvas. He used an emulsion underpaint (egg and oil). The top layers appear to consist mainly of oil paint. Guerreiro et al. 2011.
[26] De Montabert 1829: 158. Taffetas are silks used for interior decoration (*See* for more on silk Taffeta in historic interiors: Thornton 1984, 1993) and also as fabrics for clothing and accessories such as fans.
[27] *Handbook* 1849: 113-4.
[28] Blockx 1881: 7, 31. In the 1830s, J.M.W. Turner worked on unprimed canvas. Townsend 1999: 21. Paul Gauguin and Emile Bernard experiment with unprimed canvas in 1888. Bomford, et al. 2004: 136-141; Jirat-Wasiutynski and Travers 1998: 237. Callen supports her assumption that at least some impressionist painters sought the unsaturated, chalky effect deliberately by the fact that artists used turpentine diluted paints and aqueous bindings like distemper. Callen 2000: 68.
Simultaneously with experiments of painting on unprimed canvas, artists experiment with unprimed panel or board. Influenced by Paul Gauguin, Paul Sérusier works both in oil and in aqueous media on unprimed canvas, unprimed cardboard and unprimed wood. The Nabis painters work in distemper technique on unprimed canvas, paper and boards. Jirat-Wasiutynski and Travers 998: 237. Also Edvard Munch in Norway uses unprimed cardboard, e.g. for *The scream* 1893. Plahter, Unn 2011: 244.
[29] Vibert 1892: 98. 'Vibert's retouching varnish' appeared in an 1896 Winsor and Newton catalogue. No details are provided on the composition of this varnish. Carlyle writes that the term refers to 'a resin varnish with a fast evaporating solvent' Carlyle 1991, vol 1: 295-6, Carlyle 2001: 216-7.
[30] Reifsnyder 1999; Scaillierez et al. 2007; Horovitz and Reifsnyder 2012
[31] Barrow 1735, vol 2: no page numbers, entry 'Painting on stones or metals'.

composition, the surface can be prepared by smoothing, polishing and probably degreasing.[32] Analyses of paintings executed on polished stone show the local application of a transparent oil or oil-resin layer in areas where paint is to be applied.[33]

5.2 Preparatory layers on panel, chronology in materials and layer build-up

5.2.1 Sixteenth and seventeenth century recipes for panel

In many recipes for the preparation of a support for oil painting, the size layer is the first layer to be applied. This is also the case for the preparation of wooden panels for painting. Figure 6.2a, which provides an overview of the size layer materials described in both North and South European recipes, demonstrates that the application of a size layer is not described in any of the sixteenth century recipes for panel preparation. While size layers are described in seventeenth century recipes, the majority of panel preparation recipes from this period omit the layer and describe a preparation that consists solely of ground layers with (in some recipes) a subsequent isolation layer (*See* Fig. 5.2).[34] If mentioned, the size layer in this period consists of animal glue. Whether the absence of size layers only means that size layers are considered 'too common to mention', is an interesting issue. Although this is certainly possible, one would expect a similar exclusion of the mention of size layers in contemporary recipes for canvas preparation. Nevertheless, Figure 6.2b demonstrates that nearly all sixteenth and seventeenth century recipes for canvas preparation include a size layer. It is conceivable that the nature of the support or the layer build-up of subsequent layers necessitates a different approach to size layers.[35]

Only one single sixteenth century North European recipe for panel preparation is available, from the anonymous French manuscript BnF Ms.Fr 640 (c. 1580-1600). The only context available for this recipe are the Italian contemporary recipes and seventeenth century North European recipes. All three sixteenth century Italian recipes available, by Vasari (1550), Borghini (1584) and Armenini (1587) mention a single gesso and glue layer brushed on in several coats, onto which an oil-based second ground layer is applied if the panel is intended for oil painting.[36]

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[32] Degreasing before the application of an oil ground is mentioned by De Montabert 1829, vol. 9: 162.
[33] Reifsnyder 1999: 401.
[34] *See* Chapters 11 and 12 for a detailed discussion of size layer materials.
[35] Chapter 10 discusses this issue in the context of comments by seventeenth century authors on the role of the size layer in the stability of paintings.
[36]Vasari (1550) in his description of the preparation of panel and canvas for oil painting pays very little attention to the gesso. He almost skips it, saying: 'when we want to begin on the panels, or stretched canvases that have been gessoed, …'. Vasari's interest rests with subsequent layers: four or five coats of glue size, covered by a pigmented, oil-based ground layer. Vasari 1550 (edition 1568): 52. Borghini (1584) gives more detail: he advises up to four applications of very soft Volterra gypsum and animal glue, each consecutive coat diluted slightly more with water to make the gesso 'soft'. For oil painting Borghini advises the subsequent application of a 'mestica', composed of lead white and colours ground in oil. Borghini does not describe the colour of the mestica, which he says can be composed of a number of colours. However in the section on oil paintings on walls, he provides an example: lead white, umber, black, mixed to form a greyish colour ('bigerognolo'). Borghini 1584 (edition 1730): 135-5. Armenini (1587) only mentions gesso in relation to techniques used by earlier painters. He explains that he considers the methods practiced by the 'ancients' –by which he means the use of gesso on panel– applicable for modern tempera painting but holds tempera painting to be old-fashioned. Instead, Armenini draws attention to the possibilities that oil painting have

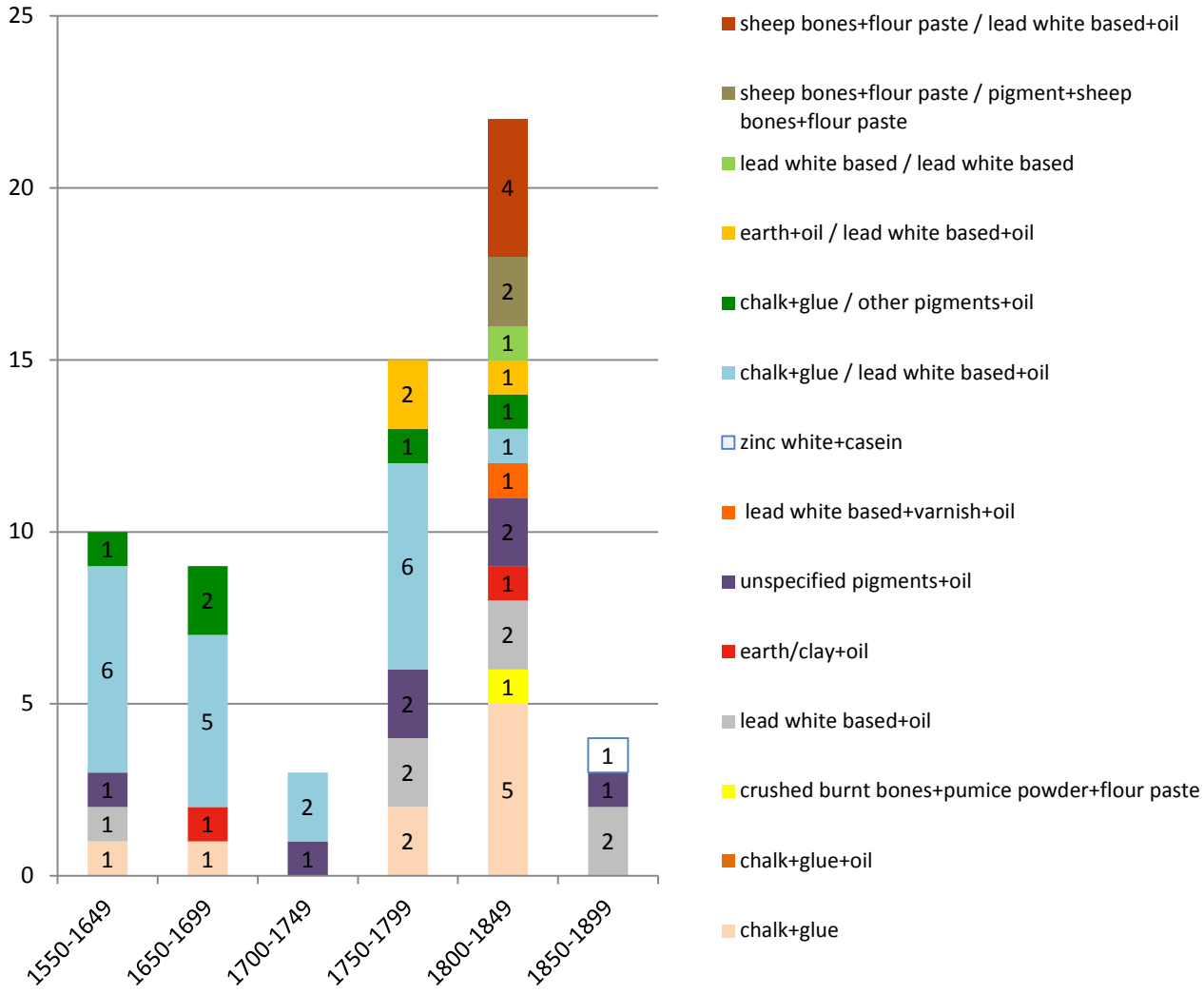

Figure 5.2 Recipes for panel preparation, 1550-1900

For grounds that consist of multiple layers, the layers are separated by a slash.

The fact that these recipes pay little attention to the execution of the gesso layers is interesting in the light of the remark of Dunkerton et al., that they find less carefully executed gesso grounds in some sixteenth century paintings.[37]

While gypsum is the filler mentioned in contemporary Italian recipes, the recipe in the the BnF Ms.Fr 640 (c. 1580-1600) employs chalk. The two-layer ground consists of a first layer of chalk, covered by a second layer identified as a 'primer' ('imprimeure'). Unfortunately the information in this recipe is very incomplete. Neither the binder nor the pigmentation of the second layer are described. The anonymous author adds that 'the Flemish' prepare

created, before describing in detail how canvases –not panels–, should be prepared for painting in oil. Armenini 1587: 121-2

[37] Dunkerton et al. 1999: 218

panels in this manner by the dozen, suggesting that the recipe describes common contemporary practice.[38]
Seventeenth century recipes for two-layer grounds for panel most commonly describe a first layer of chalk and glue (Fig. 5.2), covered with an oil-bound second layer. As the details provided by the sixteenth century French manuscript fit with this type of ground, it seems plausible that a similar ground was refered to.

The following recipe in the 'De Mayerne manuscript' (1620-44) is a typical example of such a two-layer ground for panel:

> take ground chalk, apply with glue, which is glue ¼; water two pounds, dissolve, and when all has disappeared add so much chalk as it takes to make a coating; then smooth it and even it with a knife. Afterwards apply ceruse and umber ground with oil.[39]

Figure 5.2 demonstrates that such double grounds are not only popular for panel preparation during the seventeenth century, but are also regularly described in eighteenth century sources.

Chalk is the most commonly mentioned filler for aqueous first ground layers in North West European recipes,[40] however possibly also calcined bones should be considered as a filler for this period. Their use is described in a recipe in the anonymous manuscript Sloane 1990 (1623-44).[41] It advises a glue size layer, two coats of chalk and glue, a layer of ochre in oil with minium as a siccative and finally a layer of burnt sheep bones, a little lead white and a little massicot.[42] Considering similarities between the layer build-up and contemporary panel grounds, the recipe may well have been intended for panel. Unfortunately the author does not specify the intended support.[43]

While the majority of seventeenth century recipes describes the application of a second, usually oil-bound ground layer on top of the chalk and glue layer, Marshall Smith (1693) advises to paint straight onto the chalk and glue ground after it has been smoothed.[44] Oil paint application on a chalk and glue layer can be challenging, at least if we believe Smith's contemporary De Piles (1684).[45] De Piles advises beginning painters to leave aqueous grounds to more experienced painters, as the colours applied to such grounds change

[38] BnF Ms. Fr 640 c. 1580-1600: 57 perso 115
[39] De Mayerne 1620-44: 90v.
[40] South European sources describe gesso first layers on panel. *See* Vasari 1550 (edition 1568): 52
[41] Manuscript Sloane 1990 (1623-44) is also called the 'second De Mayerne Manscuript' although its attribution to De Mayerne is not certain. Werner 1964: 130-3 discusses the provenance of the manuscript. *See* Appendix 2.
[42] Manuscript Sloane 1990, 1623-44: 78-9.
[43] This is the reason why this ground does not feature in Figure 5.2, the overview of recipes for panel preparation.
[44] Smith 1693: 75. Koller discusses examples of the use of single chalk-and-glue grounds *without* an oil priming for Flemish and Dutch panels dating from the first half of the seventeenth century. In such cases sometimes the chalk ground itself is pigmented (greyish, yellow or tinted with red ochre). Koller 1984: 348.
[45] Chapter 10, discussing ground absorbency, provides a context for De Piles' comment.

their tone upon drying and because spreading of the colours is hindered by partial absorption of the paint binder into the ground.[46]

De la Fontaine (1679) advises the application of two coats of animal glue size to a scraped chalk-and-glue ground on panel.[47] He does not explain the reasons for the application of the size, but possibly it is intended to lower the absorbency of the ground.[48]

Isolation layers also feature in recipes for double grounds. Both the sixteenth century South French Ms Fr 640 (c. 1580-1600)[49] and De la Fontaine (1679)[50] advise to apply a layer of animal glue over a chalk and glue ground before application of the second, oil-bound ground.[51]

Besides panel grounds bound in glue and double grounds with a first glue-bound layer, a small number of sixteenth and seventeenth century authors give recipes for oil-bound preparatory systems. The BnF Ms. Fr 640 (c. 1580-1600) includes a recipe a single oil ground, tinted with ceruse and 'scudegrum', a green organic pigment that is not mentioned in any other recipe for preparatory layers.[52] Another recipe from the same source describes the use of 'common ashes'[53] mixed with oil and chalk, or with the colours accumulated at the bottom of the rinsing jar for brushes. This mixture is applied as a first layer and covered with a second layer containing ceruse or 'mixed colours'.[54] Simon Eikelenberg, a Dutch town historiographer with an interest in painting techniques, includes a number of recipes for preparatory layers in his manuscript (dated c. 1679-1704). His recipe for panel preparation advises a single layer of oil-bound potter's clay ('potaarde'), a material that he praises for its low cost and stability, a quality he assigns to the 'tough and black particles'.[55] The fact that Eikelenberg refers to black particles here indicates that the potter's clay is not a whitish kaolin or ball clay resembling material, but more likely a dark, possibly dark grey, unfired clay.[56]

[46] De Piles 1684: 64-5.
[47] De la Fontaine 1679, seconde partie: 27-8. This is one out of two options. According to De la Fontaine, painters could either paint on top of such a double size layer or apply only a single size layer followed by a grey oil-based ground.
[48] Similar layers are also described to isolate absorbent grounds on canvas, as described in Paragraph 6.4 and in Chapter 9.
[49] BnF Ms. Fr 640 c. 1580-1600: 57 perso 115.
[50] De la Fontaine 1679, seconde partie: 27-8.
[51] In South Europe, Vasari (1550) advises to use five layers of soft glue, followed by an oil-based imprimatura with a flesh tone made from lead white and 'terra da campane' [earth for bells, a reddish earth] and a siccative. This pigment mixture is spread with the palm of the hand. Vasari 1550 (edition 1568): 52.
[52] Ms. Fr 640 c. 1580-1600: 48 perso 114. 'Scudegrün' is mentioned by De Mayerne as an organic green lake pigment. De Mayerne 1620-44: 15; *See also* Guineau 2005: 648. Organic greens are notorious for their instability (*see* for instance Bristow 1996: 24). The appearance of the pigment in this context is puzzling.
[53] 'Common ashes' probably refers to burnt wood. *See* Chapter 6 for more information on ashes.
[54] BnF Ms.Fr. 640 c. 1580-1600: 57 perso 115.
[55] 'taije en swarte deeltjes bestaande enz.' Eikelenberg 1679-1704: 403. After application, he advises polishing the ground with water and a flat hand. Although Eikelenberg's recipe is the only panel preparation recipe that mentions the use of clay as a filler, the position of this recipe is not entirely isolated: clays are mentioned a number of times in recipes for canvas preparation (*See* Paragraph 5.3 on canvas preparation).
[56] *See* Chapter 6 for more information on clays.

5.2.2 Eighteenth and nineteenth century recipes for panel

No widespread changes seem to occur during the eighteenth century with regard to panel size layers. Animal glue continues to be the panel size layer material mentioned most frequently. Two authors advise to employ oil as a size layer, the author of the anonymous Swiss manuscript Hist.Helv.XVII.234 (second half 18th century) and English author Dossie (1758). The Swiss manuscript gives a choice between application of 'glue water' or oil.[57] Dossie (1758), on the other hand, is categorically against all aqueous preparations:

> if any moisture find access to the wood, the paint rises in blisters, which are liable to be burst, and to cause a flaking off and peeling of the paint, in a very detrimental manner. For paintings of any value, the wood should, therefore, be brushed over with hot drying oil, as long as it will soak it in; and then covered with a coat of white lead, of flake, coloured according to what may be desired.[58]

Also in nineteenth century sources, animal glue remains the size material most commonly advised. Casein is introduced as a size layer material by Vergnaud (1831), who considers it a good alternative to the relatively moisture sensitive animal glue size layers.[59] Oil reappears as well. It is mentioned by Hampel (1846), who in his manual on restoration advises saturating the wooden support with oil varnish (oil heated with siccatives)[60] and by Belgian colourman Blockx (1881), who prescribes the application of a thin layer of oil.[61]

Figure 5.2 demonstrates that in eighteenth century recipes, double grounds consisting of a lower layer of chalk and glue and covered by an oil-bound second layer remain the most common preparation for panel. During the nineteenth century chalk is also the filler most regularly advised for animal glue bound panel grounds in North European recipes. Two nineteenth century sources draw attention to the use of gypsum in glue-bound grounds: According to Cawse (1840), some gypsum ('plaster of Paris') can be added to a chalk and glue ground, alternatively gypsum can replace the chalk.[62] The German periodical *Technische Mitteilungen* (1891) prints a plea by an 'A. Reith', for the use of gypsum in grounds on account of its whiteness.[63]

Of those eighteenth and nineteenth century authors describing chalk and glue ground layers, only two do not advise a second ground on top of this layer: Le Pileur d'Apligny (1779)[64] and Fokke Simonsz (1803-4).[65] In both cases, the painting is executed straight on top of the smoothed chalk and glue ground. No isolation layers are mentioned.

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[57] Mss.Hist.Helv.XVII.234 1750-1800: 85-6 (transcribed in Stettler 1987: 87)
[58] Dossie 1758: 203-4.
[59] The Winsor and Newton manuscripts refer regularly to the application of a size layer. However none of these recipes concern the preparation of wooden panels for painting, they focus on canvas and millboard. It is interesting to mention that in these recipes, alternatives to animal glue are sought that have a higher moisture resistance. *See* paragraph 6.1.
[60] Hampel 1846: 26.
[61] Blockx 1881: 31.
[62] Cawse 1840: 20-1, 26.
[63] *Technische Mitteilungen*, nr. 123 (1891): 91-2.
[64] Le Pileur d'Apligny 1779: 72.

Double grounds with a chalk and glue first layer and an oil-bound second layer are described for instance by De la Hire (1730). The recipe reveals the goals of the author in applying the chalk and glue: it serves to fill the 'pores' in the wood and to make the surface more even. When this result has been achieved, an oil-bound second ground is applied.[66] Not all recipes are equally specific about chalk and glue application. Chomel (1743) and the *École de la mignature* (1759) simply advise a layer of chalk and glue, covered with oil paint.[67]

In the second half of the eighteenth century the role of the traditional double ground with a chalk and glue first layer and an oil-bound second layer decreases, while interest in other preparatory systems grows. Particularly oil-bound grounds become more regular in the recipes.[68] Dossie (1758) advises oil-bound preparatory layers based on lead white,[69] Chomel (1767) an oil-bound priming layer.[70] The Swiss Mss.Hist.Helv.XVII.234 (c. 1750-1800) gives a recipe for a two-layer oil-bound ground. It consists of a first layer of brown red and a second ground layer of grey paint consisting of charcoal black and lead white in linseed oil,[71] a layer build-up similar to contemporary recipes for canvas preparation.

During the nineteenth century, the variety in materials advised for preparatory layers increases. The double ground of chalk and glue covered by a second oil-bound layer plays a small role. Mérimée (1830) describes it as a method practiced by earlier painters[72] and only Fernbach (1834) provides a recipe for a double ground of this type.[73]

Some nineteenth century authors describe both traditional preparatory systems and more innovative methods to prepare the panel. For instance in 1840 Cawse on the one hand advises a combination of materials not previously mentioned, an emulsion of water and drying oil with pipe clay and 'Spanish white' as fillers and with pigments to modify the tint,[74] while he also gives a recipe for a traditional oil-based ground with lead white.[75]

As shown in Appendix 5, a number of recipes for grounds advise additions of turpentine oil, 'turpentine essence' or 'turpentine spirit'[76] to dilute oil-bound ground mixtures. Such recipes appear from very early on in the nineteenth century, for instance in a recipe by Van Leen (c. 1800). Van Leen describes the application of a double ground consisting of a first layer of yellow ochre turpentine-thinned oil paint with some white, covered by a

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[65] Fokke Simonsz 1803-4: 84-5.
[66] De la Hire 1730: 708-9
[67] Chomel 1743: 948; *École de la mignature* 1759: 173.
[68] Also earlier in the century, oil-bound grounds are mentioned. Barrow (1735) offers the choice between a preparatory layer consisting of chalk and glue or the use of an oil-bound layer. Barrow 1735: no page numbers, entry 'painting on wood'. (*Valuable secrets* 1775: 133) repeats this recipe.
[69] Dossie 1758: 203-5
[70] Chomel 1767: 869
[71] Mss.Hist.Helv.XVII.234 1750-1800: 85-6 (transcribed in Stettler 1987: 87)
[72] Mérimée 1830: 241
[73] Fernbach 1834: 5-7
[74] Cawse 1840: 21. Although emulsions are described in a number of recipes for preparatory layers for canvas (*see* Paragraph 5.3 and Appendix 6), such recipes seem to have been rather uncommon for panel preparation. Cawse's recipe is the only example.
[75] Cawse 1840: 21. Cawse calls for 'common leadwhite'. Chapter 13 discusses lead white qualities and terminology.
[76] *See* Chapter 6 for more information on turpentine products

second layer that contains lead white which has been heated until it has turned light yellow,[77] then mixed with boiled oil and turpentine balsam and subsequently thinned with turpentine oil.[78]

Another manner in which turpentine is introduced in preparatory layers is by using 'flatting', i.e. lead white in oil to which a large proportion of turpentine oil had been added.[79] Ibbetson (1803) advises a ground build-up consisting of several layers of 'flatting', thinned down with turpentine oil 'to a proper consistence' for the first coat, while the second and third coats are applied without the addition of extra turpentine. Ibbetson explains that the amount of ground thus applied should be sufficient to fill the wood grain and the brush marks left by the first application. This method results in 'a most beautiful face, and very hard', which 'will never crack or separate from the wood'.[80] Turpentine additions to thin down oil-bound preparatory layers are also mentioned later in the century, in the *Complete guide to the arts* (1841) and by Grace (1881).[81]

While flour paste appears regularly in recipes for canvas preparation, it plays a much smaller role in panel ground descriptions, and only in a number of recipes that date from the first half of the nineteenth century (*see* Fig. 5.2. Chapter 12 examines recipes for flour paste and starch paste size layers and grounds in detail). As noted by Carlyle (1991, 2001), during the period 1750-1900 flour paste is mentioned for the first time in Britain in a recipe provided by Sebastian Grandi (1806), where it is mixed with the calcined and crushed bones of sheep's trotters and applied in several coats.[82] Pigments can be added to the last layer if the artist wishes for a coloured ground.[83] The impact of Grandi's recipe is demonstrated by the fact that it is repeated in France by Smith (1825) and in England by Fielding (1839).[84] Also a mid nineteenth century German author, Hundertpfund (1847), advises flour paste for panel preparation. In Hundertpfund's recipe, it is mixed with pipe clay and covered with a second ground layer of oil and pigments.[85] Grandi's recipe appears at a time when there seems to be a particular focus on the use of calcined bones, since other recipes appear that include this material. In France, De Montabert (1829)

[77] probably the recipe describes the chemical reaction of basic/neutral lead carbonate to lead monoxide or Pb(II)O.
[78] (Van Leen c. 1800: 18) describes first glowing the lead white in a crucible before mixing it with oil and turpentine, (Hundertpfund 1847: 125-7) mentions lead white and oil with an addition of turpentine oil.
[79] *See* Chapter 6 for more information on flatting.
[80] Ibbetson 1803: 11-2 . 'Flatting' is also described by Field 1850: 153. *See* for Bouvier's arguments against turpentine additions to oil grounds for canvas. Bouvier 1827: 553
[81] *Complete guide* 1841: 41; Grace 1881: 87. Other examples are for instance: Francis 1854: 70; Knowlton 1879: 29-30.
[82] Carlyle 1991, vol. 1: 232; Carlyle 2001: 167. In Paragraph 5.2.1 a seventeenth century recipe with calcined bones is mentioned. Manuscript Sloane 1990 1623-44: 78-9.
[83] The same material is advised for canvas and fibreboard preparation, although in a different number of applications. Grandi 1806: 85-9. Grandi's recipe was reconstructed on canvas and panel by Carlyle (2008), as part of a reconstruction-based evaluative study of a number of nineteenth century recipes for flour-paste grounds. Carlyle's reconstructions resulted in a convincing preparatory system, although Carlyle's rendering of Grandi's recipe on canvas developed cracks in the first layer even before subsequent layers are applied. Carlyle et al. 2008: 126. Carlyle also reconstructed recipes provided by Hundertpfund (1847/1849) and Sully (1809-71).
[84] Smith 1825: 357-8; and as noted by Carlyle (1991, 2001) also in Fielding 1839: 79-80. Fielding slightly modifies the layer structure, with two layers of flour paste, covered by a 'coat or two of coloured ground', by which he probably means an oil-based artist paint.
[85] Hundertpfund 1847: 125-7.

provides a recipe using ground calcined bones, in his instructions mixed with wheat flour paste and pumice powder.[86]

The treatise of De Montabert (1829) contains many references to a number of new materials and techniques for panel preparation. This author for example describes a mixture of varnish (which contains copal,[87] elemi[88] and spike oil) and poppy oil for a panel ground with lead white or with ochre.[89] De Montabert explains that he advises to include copal for its strength and elemi for its flexibility. The resins are dissolved in spike oil by heating. In order to create a somewhat rough surface, thought to increase adhesion of the paint to the preparatory layer, De Montabert suggests sprinkling pumice powder onto the wet ground layer. When the layer is dry, all loose powder is removed.[90] De Montabert also gives a curious recipe for a ground composed of quicklime in pig's blood, which he links to Chinese practices. He writes that he 'labels this recipe as excellent, on account of its solidity'.[91] De Montabert introduces (and is the only author to describe) 'sucre noir de réglisse' ('black liquorice sugar') as an isolation layer for white aqueous grounds on panel and canvas.[92] According to De Montabert this material serves a dual purpose: first of all it tones the preparatory layer, secondly it 'prevents the glue from absorbing the colours'.[93] De Montabert advises against animal glue as an isolation layer. His wording suggests that he is concerned with the adhesion of paint applied over animal glue isolation layers, since he ends his advice to apply liquorice water as: 'this is in no way adverse to the adhesion: this method is preferable to a final size, that consists of passing over everything a glaze of glove glue, in gelled state'.[94]

Additions of resin varnish are not unique to De Montabert. German author Fernbach (1834) advises lead white and chalk bound in amber varnish and thinned with turpentine oil as a second ground layer on panel. It is applied over a layer of chalk and glue, which is isolated with a glue layer. The ground is supposed to be very hard but slightly absorbent and, according to Fernbach, will for that reason provide a good adhesion for subsequent

[86] De Montabert 1829, vol. 9: 166-9.
[87] Copal varnishes are advised in British nineteenth century sources for a number of purposes. The first mention of copal resin in a recipe for preparatory layers appears in Sheldrake, where it is employed to isolate a distemper ground upon which the dark parts of the picture have already been applied. Sheldrake 1798: 297. Carlyle describes their use in binders for preparatory layers and for paint layers and as final varnishes. Carlyle 1991, vol. 1: 81-94; Carlyle 2001: 57-77. De Montabert advises their use in varnish-based binding media for decorative objects. De Montabert 1829, vol 9: 396-7, 399-400. Carlyle employs a varnish prepared from copal, drying oil and siccatives for her reconstruction of a 1871 Winsor and Newton ground recipe, since similar varnishes appear in recipes in the Winsor and Newton Archive. Carlyle et al. 2008: 120-1.
[88] Elemi resin is advised as a plasticizer in varnishes by a number of nineteenth century recipes. *See* also Carlyle 1991, vol. 1: 111 and Carlyle 2001: 81. Elemi is an oleo-resin extracted from the *Canarium commune* L. Guineau 2005: 283.
[89] De Montabert 1829, vol. 9: 163.
[90] De Montabert 1829, vol. 9: 163.
[91] De Montabert 1829, vol. 9: 169.
[92] De Montabert describes the use of lead white, chalk or pipe clay as fillers for these grounds.
[93] The isolation layer is applied over a glue-based ground with chalk, lead white or pipe clay as fillers and applied in several layers. In contrast to De Montabert's recipe for canvas preparation which employs the same materials applied twice, for panel 'one may make the layer more thick, by superposing several layers'. De Montabert 1829, vol. 9: 169.
[94] De Montabert 1829, vol. 9: 169.

paint layers.[95] Also oil varnishes, as described by Dossie (1758, *see* above) appear in nineteenth century sources. Hampel (1846) advises soaking the panel in oil boiled with siccatives, after which it is covered with lead white and ochre, ground in the same binder.[96]

Proof of the fact that varnishes are actually used in nineteenth century panel preparation is found in the archive of London colourmen Winsor & Newton. In a workshop recipe dated 1843 and titled 'oil panel colour', lead white oil paint is mixed with oak varnish, turpentine with driers, 'Grecian powder', boiled oil, yellow, Venetian red and umber.[97] Another Winsor & Newton recipe (dated 1844) for a 'panel colour', described as a 'very good batch – came down very well & is not absorbent', consists of lead white in oil from the tube, mixed with turpentine, 'Grecian powder', anime varnish and 'patent dryers'.[98]

Late in the century, varnish additions are advised by Vibert (1892) who describes the addition of 'painting varnish with a little siccative' to lead white ground in oil.[99] Vibert does not give the exact composition of the 'painting varnish'. All we can read in his paragraph on the use of such varnishes is that they consist of 'solid matter' dissolved in petroleum.[100] They are called 'painting varnish' on account of the fact that some varnish can be added to paints on the palette for 'fluidity, brilliancy and solidity'.[101] As a ground, the 'painting varnish' with lead white oil paint is applied in several coats and each coat is sanded before the next is applied.[102]

In another recipe, Vibert (1892) advises an entirely different type of panel ground, consisting of zinc white in casein. Vibert includes instructions for the production of casein paste from white cheese, in case no commercial paste is available to the painter.[103] Zinc white is also described in nineteenth century recipes for canvas preparation, where it is introduced as a more stable alternative to lead white (*see* Chapter 10 on the stability of preparatory layers).

[95] Fernbach 1834: 5-7. Unfortunatly Fernbach himself does not include a recipe for the amber varnish employed in this recipe. *See* Chapter 6 on of amber varnishes.
[96] On pages 127 and 128, Hampel provides recipes for 'oil varnishes'. *See* Chapter 6 on the oil varnishes. Hampel 1846: 26.
[97] Chapter 6 provides details about the production of oak varnish. Unfortunately the identity of 'Grecian powder' remains unresolved. It is not explained in the Winsor and Newton Archive. W & N manuscript 'Omnm Gath No 01', 1838-44, recipe date 1843: 01P018L01.
[98] W & N manuscript 'Omnm Gathm No 04', 1844-6, recipe date December 1844: 04P016L04. By 'patent dryers' a mixture of different siccatives is meant. *See* for information on patent driers Chapter 6.
[99] This mixture is applied both to the front and the back of the panel.
[100] *See* Chapter 6 for information about naptha and petroleum.
[101] Vibert 1892: 93.
[102] Vibert 1892: 184.
[103] Vibert 1892: 107-8, 186-8.

5.3 Preparatory layers on canvas, chronology in materials and layer build-up

5.3.1 Sixteenth and seventeenth century recipes for canvas

In contrast to ground recipes for panels, which often do not necessarily include a size layer, size layers are nearly always mentioned in sixteenth and seventeenth century recipes for canvas preparation. This is demonstrated in Figure 6.2b.
The size material mentioned most frequently in sixteenth and seventeenth century recipes is animal glue. Flour paste, which is absent from panel size recipes prior to the nineteenth century, is the second most important size layer material recommended for canvas. In some recipes for flour paste size layers, additions of oil, glue and/or honey are described. (*See* Chapters 6, 11 and 12 for detailed descriptions of animal glue and flour or starch paste size layer composition).

Flour appears in sixteenth century *ground* layer recipes as well, but only in Italian and Spanish sources, not in North European recipes. Vasari (1550) and Armenini (1587) both provide instructions for the application of mixtures of flour and linseed oil with lead white.[104] The anonymous Spanish 'Reglas para pintar' (c. 1575-1600) describes a first ground for canvas which consists of glue, gypsum and flour; here no oil is added.[105]
These recipes for flour-based ground layers appear to stand in close relationship with recipes for flour-paste size layers. The authors employ similar pastes, however now mixed with pigments and fillers to create a more bulky mixture that is able to fill the canvas interstices and smooth the support. As in recipes for size layers, some authors advise adding a little oil to the paste.

It is puzzling why flour paste is described as a binder for grounds only in Italian and Spanish recipes. None of the sources discuss the absence of flour paste from North West European ground layer recipes during this period.[106] The fact that flour paste *size* layers do feature in North West European recipes dating from the seventeenth and eighteenth centuries demonstrates that the absence of flour paste from ground layer recipes is not caused by a lack of familiarity with this material.[107]
Figure 5.3 and Appendix 6c show that flour paste grounds are advised in the nineteenth century in North European recipes.

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[104] In Vasari's recipe, this is preceded by an animal glue size layer, followed by an intermediate isolation layer of animal glue and finished with an oil bound laye, consisting of lead white, siccatives and 'earth used for bells'. Vasari 1550 (edition 1568): 53. Armenini advises a final layer of lead white and a little red, bound in 'common varnish' ('vernice commune'). Armenini 1587: 124-5. *See* Chapter 6 about 'vernice commune'.
[105] Bruquetas-Galán 2002: 336. The layer is applied to a canvas first sized with animal glue. The manuscript mentions a second option, considered more modern, which is the application of a layer of oil paint, for instance lead white, minium and black to the glue sized canvas.
[106] As noted in Chapter 4, prior to this period a North European recipe for a flour paste gound was provided in the 'Liber illuministarum', which describes a mixture of flour and wood glue (probably animal glue). 'Liber Illuministarum' c. 1500 (edition Bartl et al. 2005: 184-5).
[107] From the fact that Vasari and Armenini were auctioned in the auction of books owned by Hendrik van Limborch and P.V.W. in 1759, it can be concluded that Vasari and Armenini were read in the eighteenth century Netherlands, although the catalogues do not indicate their books were widely owned. *See* Appendix 3.4

Late sixteenth century South European authors seem to be aware of the materials employed for canvas preparation by their North European contemporaries. This is demonstrated by the Italian Borghini (1584), who writes that the Flemish prepare their canvases with one or two coats of glue, followed by oil paint to fill the canvas interstices. Borghini points out that canvases prepared in this manner are easy to roll and carry everywhere,[108] undoubtedly a feature that would have been of importance to Flemish painters exporting canvases to Italy.
Borghini knows what he is talking about. This is clear from the fact that oil-bound ground recipes are indeed described frequently in sixteenth and seventeenth century North European sources, both as a single-layer and as a double-layer preparatory systems. Recipes for each of these types are discussed below.

The earliest North European recipes for single-layer oil grounds within the period 1550-1900 are two recipes found in the Manuscript BnF Ms. Fr 640 (1580-1600). In one of the recipe texts, which is actually a recipe for cleaning the paint grinding stone with 'common ashes',[109] the anonymous author mentions that these ashes can subsequently be used in preparatory layers for both panel and canvas. Unlike a two-layer preparation with ashes advised for panel, the author explains that on canvas only a single layer is needed, for which 'the same ashes will serve'.[110] Note that if these ashes have first been employed to clean the grinding stone, they are likely to contain pigments that have been picked up during cleaning of the stone.

In the other recipe for canvas preparation, a thin layer of lead white, yellow ochre and a little massicot is advised. Here, the author discusses the use of pigments from the brush rinsing jar. This is a practice through which complicated pigment mixtures may end up in the preparatory system. The manuscript advises against the use of pigments from the rinsing jar, as the presence of 'corrosive' pigments such as verdigris in such deposits, will cause sinking-in of subsequent layers. Instead, the advice is given to apply.[111]

Throughout the seventeenth and early eighteenth century, recipes appear for single oil-bound grounds based on lead white, usually with smaller amounts of other pigments to provide a tone or possibly as an auxiliary drier (*See* Appendix 6a and Fig. 5.3).[112] Amongst the thirteen recipes for canvas preparation that De Mayerne (1620-44) provides, are two recipes for such grounds. His other recipes for canvas preparation describe mainly double grounds, details of which are provided below. One description of a single oil-bound ground, that De Mayerne has picked up from painter Abraham Latombé of Amsterdam,[113]

[108] Borghini prefers a different preparation for canvas: Volterra gypsum, heated with flour ('fiore di farina'), glue and linseed oil, spread with an iron knife. This mixture is not advised if the artist intends to roll the paintings and transport them to other countries, because of the risk of flaking. Borghini 1584 (edition 1730): 136-8.
[109] 'cendre commune' can be identified as wood ashes. *See* Chapter 6.
[110] BnF Ms. Fr 640 c. 1580-1600: 57 perso 115.
[111] BnF Ms.Fr 640 c. 1580-1600: perso 8.
[112] Not all recipes provided information on pigmentation. For instance King 1653-7: 48 described to lay on 'your primer' to the canvas sized with starch; Pictorius 1747: 355 advises to apply 'your paint' to the sized canvas.
[113] According to Bischoff, Abraham Latombé might be identified as Nicolas Latombe (Amsterdam 1616-1676) a painter of landscapes and conversation pieces. Bischoff 2002: 302. The Rijksmuseum Amsterdam owns a three landscape painted by an Abraham de Latombé, dated between 1640 and 1676.

calls for a size layer of glove-leather glue, covered by a single ground layer that contains lead white and a little umber. A second coat can be applied if one wishes for a more 'even' canvas.[114] The second recipe for a single lead white based ground was given to De Mayerne by a painter identified as 'the little painter' ('le petit peintre'). It prescribes an oil-bound mixture of lead white, red ochre, a little umber and a pinch of charcoal black, applied in a single layer.[115]

The oil-bound canvas ground advised in the anonymous 'Art of painting in oyle by the life' (1664) consists of two coats of a mixture that contains lead white, a little minium, Spanish brown and umber.[116] Late in the seventeenth century, Wilhelmus Beurs (1692) advises a single lead white-based oil ground containing umber or black, depending on the subject to be painted.[117]

Next to lead white, clays are also prescribed in recipes for single canvas grounds (*see* Appendix 6a).[118] In 1635, Lebrun provides a recipe for an oil ground pigmented with potter's earth ('terre de potier'), with additions of yellow earth or ochre.[119] The colour of the clay advised by Lebrun is unfortunately not known, and since pottery clays found in nature can range from cream or light sand colour to dark grey, red or brown, the colour of this clay-based ground is uncertain. The Dutch author Eikelenberg (1679-1704) similarly advises 'potters earth' ('potaard') in oil for canvas preparation, as he also does for panel preparation. The earth is ground in linseed oil and applied with a palette knife.[120]

Seventeenth century recipes relating to Spanish or Italian practice describe the use of clay as well. 'Sevilla clay' is mentioned in recipes for preparatory layers by Pacheco (1649),[121] Richard Symonds (1650-2), an Englishman writing in Italy, mentions the use of 'the earth that bricks are made of',[122] and Spanish Hidalgo (1693) advises a layer of 'almagra'[123] and umber or Fuller's earth[124] in linseed oil.[125]

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http://www.rijksmuseum.nl/en/search?ps=12&maker=Abraham%20de%20Latombe&ii=0&p=1

[114] De Mayerne 1620-44: 11. The word used for 'even' is 'unie' in the original French recipe.

[115] De Mayerne 1620-44: f85. The idetntity of this painter is not known. He has given De Mayerne a second canvas ground recipe, for a double ground, described further on.

[116] 'Art of painting in oyle by the life' 1664: 96.

[117] Beurs 1692: 19-20. Mixtures with black he considers suited to landscapes, mixtures with umber to other subjects. Beurs advises to apply the same oil-bound ground layer to both panel and canvas, for panel preceded by a chalk and glue layer.

[118] Clays or other (coloured) earths or soils are also mentioned as first layers of double grounds. Recipes that fall within that category are described below.

[119] Lebrun 1635 (transcribed in Merrifield 1849 (1999): 772).

[120] Eikelenberg 1679-1704: 404-5.

[121] This preparation he considers the best of all. It consists of a flour paste size that contains linseed oil, glue and flour or mill dust. This layer is covered by Sevilla clay ground in linseed oil, applied twice. If desired, a third coat can be applied, to which a little lead white may be added. Pacheco 1649: 384-5

[122] Symonds c. 1650-2 (edition Beal 1984: 218): 10.

[123] A natural reddish iron oxide pigment. Eastaugh et al. 2008: 11.

[124] Described by Eastaugh et al. 2008: 168 as a white clay with a very high capacity for absorbing water and organic molecules. Eastaugh mentions that the term is sometimes used as a synonym for kaolin, even though both are different materials.

[125] Hidalgo 1693 (translated in Veliz 1986: 137).

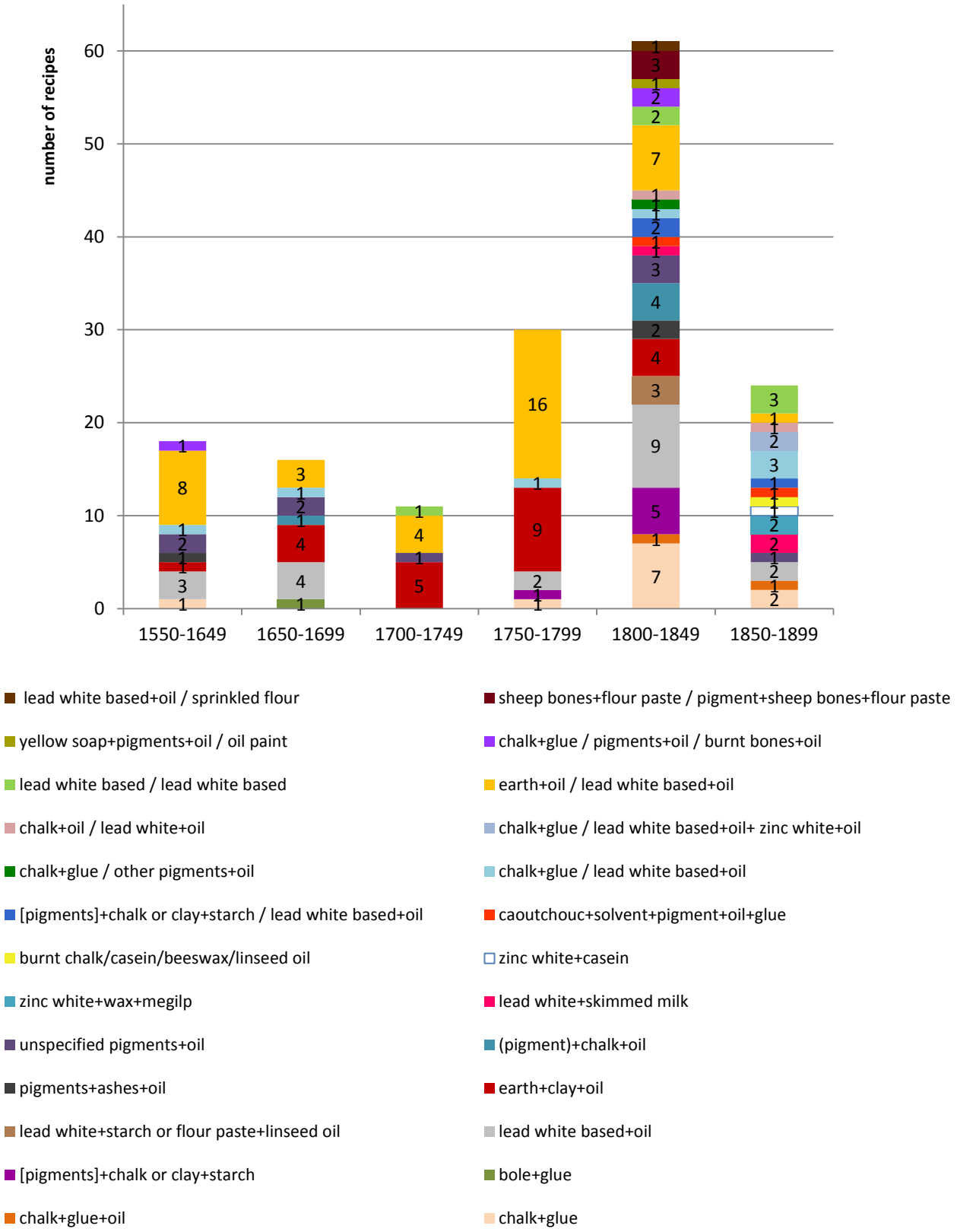

Figure 5.3 Recipes for canvas preparation, 1550-1900

For grounds that consist of multiple layers, the layers are separated by a slash.

While the above recipes specify oil as the binder for clay-based grounds, animal glue is described to bind red bole in the ground recipe provided by an anonymous recipe book in the Frans Hals Museum, which can be dated in the second half of the seventeenth century. This is the only recipe found to date that specifies a mixture of clay with animal glue as a binder for a North European canvas ground.[126] Water is however encountered in two seventeenth century recipes that advise emulsion binders:
De Mayerne (1620-44) gives a recipe for an ochre pigmented ground bound with an 'unguent' oil. This binder is prepared by heating litharge-treated[127] nut oil with water until it has the consistency of 'butter in summer'. Ochre is ground with this 'unguent' and the mixture is applied to an unsized canvas. After the coat has dried, it is pumiced and covered with a second coat of the same mixture. According to the recipe, this preparation will never to crack or flake.[128] The description does not clarify whether the 'butter' created would still contain water or if it has evaporated.[129]
Lebrun (1635) also discusses an emulsion-bound ground, in a recipe titled: 'to prime a canvas quickly, so that one may paint on it the same day that it is primed'. Parchment glue and oil priming are ground together and applied to the canvas. Lebrun writes that this mixture hardens instantly, which is very convenient for those in haste. However, the canvas cannot be rolled without flaking of the preparation, as Lebrun warns.[130]

De Mayerne's recipe (1620-44) for an 'unguent' ground, is the first seventeenth century North European recipe to describe a canvas ground based on earth pigments. While ochre, presumably yellow ochre, does not feature as the main ground component in any other later seventeenth century recipe, a number of seventeenth century recipe books write about single-layer grounds composed of the earth pigment 'brown red', with minor additions of other pigments or siccatives.[131]

[126] Anonymous recipe book, Frans Hals Museum, 1650-1700: 5. A late nineteenth century recipe from the *Technische Mitteilungen* does mention the use of 'white bole'('weisser Bolus') or just 'bole' in an aqueous binder. A different recipe in another volume of the same periodical clarifies however that the word bole is used here as a broadly applicable term, which includes Siena earth, raw umber and different clays. *Technische Mitteilungen*, nr 6 (1885): 20 (reference for bole), *Technische Mitteilungen* nr 25, (1886): 39 (recipe for a single ground with chalk or bole).
[127] Litharge is lead (II) oxide. *See* Chapter 6 for more information on siccatives.
[128] De Mayerne 1620-44: 28v. The use of water as an addition to an oil ground is also discussed in a seventeenth-century Italian recipe. Volpato (c. 1670) advises potters earth that is first steeped in water, after which most of the water is pressed out and the same amount of linseed oil is added. The mixture receives an addition of highly siccative oil that has been pressed from brushes during cleaning and has been boiled with the sediment of those colours. It is stirred with a spatula and applied to the canvas. For the second layer, which contains umber as a siccative (the oil from cleaning brushes is omitted from this layer), the mixture is ground, not stirred like the first layer. Volpato writes 'This method succeeds well and is quickly done'. Volpato c. 1670 (transcribed in Merrifield 1849 (1999): 731).
[129] It is clear that the recipe describes a rather viscous binder, but such a consistency can result from two different processes. Heating the litharge treated oil with water can lead to an emulsion with a higher viscosity than that of oil. However it is equally possible that the resulting binder contains no water at all. Heat allows water to evaporate, creating gas bubbles inside of the liquid. Bubble formation will facilitate the uptake of oxygen from the air by the oil and can thus result in an oxidized, viscous oil. In any case, after drying and ageing all water will have evaporated rendering this ground in essence an oil ground, although possibly a relatively porous and leanly bound type. (*See* Carlyle 2005 on emulsion grounds.)
[130] Lebrun 1635 (transcribed in Merrifield 1849: 820).
[131] *See* Chapter 6 for a discussion of yellow and reddish earth pigments and clays.

Although most of the recipes that describe brown-red earths in grounds are concentrated in Spanish and Italian sources,[132] brown-red single grounds are also described in French recipes that date from the late seventeenth and the eighteenth century. These recipes are all based on a single source, a recipe published by Félibien in 1676.[133] The popularity of his recipe is unparallelled, at least if we count the number of occurrences of the recipe in later sources (Appendix 14). Throughout the seventeenth and eighteenth centuries, Félibien's text is taken up by other authors and is even repeated in the nineteenth century. The recipe also appears in British, German, Dutch, Danish and Italian sources. The fact that André Félibien (1619-1695) was a well-established French writer, court historian to the French king and friend of Poussin, whose biography he wrote, may have contributed to the faith placed in this author's instructions and may have ensured long-term interest.[134]

Félibien's recipe calls for the following build-up: after a glue size, a first ground layer is applied that consists of brown-red, ground in either nut or linseed oil. This single ground layer *can* be covered with a second ground layer if the painter wishes so.[135] If painters prefer a thin single ground out of fear that the canvas will become too brittle, no second layer should be applied. In particular if painters want the painting to be rolled, a second layer is advised against. However, because a single ground will leave the canvas texture more visible than a double ground, Félibien only considers the omission of the second ground admissible for larger works.

A comparison of different verions of the recipe is interesting. The table in Appendix 14 shows that some later versions of Félibien's recipe make small modifications in the term used to describe the earth pigment (in one instance advising yellow ochre instead), prescribe other siccatives for the first ground layer (minium or lead white) or add a red pigment to the second ground layer to render it a warm grey. Although Félibien has described the second grey ground layer as optional, some of the later copies or translations present it as a fixed part of the ground layer build-up.
The fact that recipes are adapted could indicate that they still carry a practical value, as it is less expected to see such changes in recipes reproduced for their literary or historical value only. However, at the same time, comparison of these recipes demonstrates that while the original recipe appears in a source that is written in the close vicinity of artists, later versions are included in encyclopedias and manuals written for the general public, thus a growing distance seems evident between this recipe and actual painting practice.

A small number of seventeenth century recipes describe canvas preparations that include chalk and glue layers, a combination of materials that is more frequently associated with

[132] The first is Spanish Pacheco (1649), who describes a ground of 'common red earth' in linseed oil, which he says is used in Madrid. Pacheco 1649: 384-5. Symonds (1650-2) writes down a recipe in his Italian manuscripts about a ground that consists of red earth mixed with a little white, chalk and a very little carbon black, applied over a glue sizing. Symonds c. 1650-52 (edition Beal 1984: 218): 10. N.B. Beal (1984: 87) writes that the term 'creta' in this recipe may possibly also embrace silicious earths. To support this comment, she quotes Gettens, Fitzhugh and White 1993: 203-226 and S. Augusti, *I colori Pompeiani*, Rome: De Luca 1967: 53-9.
[133] Félibien 1676: 407-8.
[134] *See* Appendix 2, Félibien 1676.
[135] This second layer consists of lead white and a black pigment, ground in oil.

traditional panel preparation. Whether such recipes are indeed inspired by contemporary practice for panel preparation is uncertain, but the similarity is striking.[136]

Chalk and glue is described as a single ground by Bate (1633), with an addition of honey, as 'the honey keeps it from cracking, peeling, and breaking out'.[137] Recipes that advise a first layer of chalk and glue with a second oil-bound layer are however more common in the seventeenth century than single grounds of this type. A recipe for such a double ground is present in Manuscript Sloane 1990 (c. 1623-44), which describes the application of a glue size layer, the chalk and glue layer (with a little honey) and an oil-bound second lead white based ground.[138] Later in the century, an English source compiled for the general public includes a recipe with a rather similar layer build-up: William Salmon (1672) advises two to three thin coats of animal glue and chalk, followed by an oil-bound layer with lead white.[139]

Symonds (c. 1650-2) and Félibien (1676) provide a possible reason for the use of chalk and glue grounds on canvas. Symonds writes: 'Those clothes that have gesso in the imprimatura the gesso makes the colour keep fresher and absorbs the bad qualities of the oil'. However Symonds adds: 'but they crack sooner and that is the worst of the gesso'.[140] In a discussion of the painting techniques of Titian and Veronese, who he claims have painted on aqueous grounds, Félibien (1676) also explains how aqueous grounds absorb some of the oil from subsequent layers and thus help achieve long-lasting brightness of the colours, which would otherwise be obscured by darkening of the ageing oil binder.[141] Chapter 10 discusses comments on the influence of ground absorbency on the stability and degradation of oil paintings and places Symonds's and Félibien's comments in a wider context.

While the above recipes demonstrate that glue-bound ground layers are occasionally advised for canvas preparation in seventeenth century sources, double oil-bound grounds with a lower layer composed mainly of cheap extenders and a top layer based on lead white feature more regularly in seventeenth century North West European sources. They continue to appear in the sources until well into the nineteenth century.[142]

Exactly why preparatory layers consisting of two distinct oil-bound layers are frequently advised is not entirely certain. De Mayerne (1620-44) notes: 'if one wishes to save one could make the first layer of ochre before applying a lead white based ground layer'.[143] A conclusion that their appearance may have been driven by economical motives seems

[136] In Chapter 4 the fact was discussed, that in Italian fifteenth century recipes, gesso layers were advised for canvas. This situation seems to demonstrate similarities with the occurrence of chalk and glue grounds in sixteenth and seventeenth century Northern European recipes for canvas preparation.
[137] Bate 1633: 167.
[138] Manuscript Sloane 1990, 1623-44: 78-79.
[139] Salmon 1672: 141. A comparable recipe is provided by Pacheco 1649: 68.
[140] Symonds c. 1660-52: 4v
[141] Félibien 1676: 407-8. Instrumental analysis of the paintings of both artists confirm that they actually employed aqueous grounds, although Titian also frequently added a second oil-based ground layer. Birkmaier et al. 1995: 119, Dunkerton et al. 1999: 271.
[142] *See* Appendix 6b.
[143] De Mayerne 1620-44: 98v.

fair.[144] By introducing a first ground layer composed mainly of cheap pigments or fillers and by covering this first layer with only a thin layer containing lead white, less of this expensive pigment is required to deliver a more or less smooth surface with a suitable base tone for painting. This hypothesis was raised in prior resarch.[145]
The first recipes for this type of double ground appear in the De Mayerne manuscript (1620-44). De Mayerne (1620-44) provides a number of recipes for double oil-based grounds that employ a reddish first layer covered by a second lead white based layer. In some recipes, De Mayerne does not specify which red pigment is used for the lower layer, at other times he is specific. In a recipe from the Wallonian primer living in London, the layer containing 'brown red, or brown red of England' ('Braun rot, ou rouge brun d'Angleterre') is covered with a second ground consisting of lead white, charcoal black and a little umber, the umber added 'to make it dry sooner'.[146]

Clays are also advised for use as the first layer of double grounds. In a recipe of the 'petit peintre' in the De Mayerne manuscript (1620-44), bole is mixed with a smaller quantity of umber and ground in oil as a first layer for a canvas, previously sized with animal glue.[147] After drying, a second ground consisting of lead white and umber is applied. De Mayerne adds a note in the margin that instead of umber, yellow ochre or 'burnt red' can be used.[148] Mixtures of bole and umber are prescribed in three additional ground recipes in De Mayerne's manuscript.[149]

Somewhat later in the seventeenth century, Félibien's fellow countryman De la Fontaine (1679) describes a double ground consisting of a layer of umber and 'brown red', covered with a second ground containing lead white tinted with umber and a little carbon black.[150] Although different pigments are advised, it is close in type to Félibien's instructions.

5.3.2 Eighteenth century recipes for canvas

As stated above, during the eighteenth century repetitions of Félibien's recipe appear in France, Germany, England, Italy, Denmark and the Netherlands (*see* Appendix 14). The version by De la Hire (1730) describes the addition of 'a little brown red' to the second grey layer,[151] which renders this ground warmer in tone than the earlier recipes that

[144] Groen (2005) suggests an additional motive in a discussion of grounds employed by Rembrandt van Rijn and other seventeenth century artists, the optical effect of the double ground. She believes that the reddish colour of the lower layer frequently used in such double oil-grounds shimmers through and modifies the tone of the usually grey top layer and concludes that this combination of light over dark had an aesthetic purpose. Groen 2005c:19. However, as noted by Van de Wetering (1997: 130), in many paintings the upper ground layer has been applied too opaquely for a lower layer to influence tonality. Groen quotes a recipe from the anonymous *Nieuwen verlichter* (1777) to support her theory. This recipe, however, does not describe a lower layer that shimmers through, but the addition of the pigment 'brown red' to render the grey top layer a reddish grey. *Nieuwen verlichter* 1777: 167-8.
[145] A number of modern authors link the use of double grounds with a first layer of earth pigments to their economic advantages: Van de Wetering 1997: 129-130, (in note 96 on page 304, Van de Wetering compares the prices of lead white and of ochres); Kirby 1999: 28-9; Roy 2006: 29; Wallert and Dik 2007: 38.
[146] De Mayerne 1620-44: 5.
[147] De Mayerne 1620-44: 87.
[148] De Mayerne 1620-44: 87.
[149] De Mayerne 1620-44: 90, 95, 96.
[150] De la Fontaine 1679: 43-4.
[151] De la Hire 1730: 710.

advise only lead white and black. The addition of brown red also appears in recipes provided by Jombert (1766)[152] and in the *Nieuwen verlichter* (1777).[153] These recipes are apparently not based on Félibien but on De la Hire (1730). Other versions of the recipe continue to advise the cooler mix of lead white and black as described in 1676 by Félibien.
Relatively few original recipes appear during the first half of the eighteenth century: Cröker (1729) advises a single ground of red bole, ground in varnish.[154] A recipe in German, dated between 1726 and 1739[155] and preserved inside the Dutch Wiltschut manuscript, describes a double ground in which all layers contain a large proportion of lead white. The first layer, applied in two coats, consists of lead white in oil with a few drops of painter's varnish.[156] It is applied over an animal glue or flour paste size layer with an addition of oil. The second layer consists of lead white mixed with a little Berlin blue, ground in nut oil.[157] In contrast to the seventeenth century recipes, none of the original ground recipes from the first half of the eighteenth century mention lead white based single grounds.

Recipes from the second half of the eighteenth century are more numerous and also more varied. Recipes for single lead white-based grounds are published by Dossie (1758),[158] Le Pileur d'Apligny and by Dutens (both dated 1779).[159] Dossie (1758) describes several types of grounds in his *Handmaid to the Arts*. He also provides a recipe that results in a double ground similar to the ground advised by Félibien (1676), but Dossie adds an isolation layer and – in contrast to Félibien – is liberal in his use of oil. He advises to soak the canvas in drying oil before applying the first red ochre ground, applied in three coats. After drying, this layer is brushed with drying oil and covered with a lead white based second ground layer.[160]

Besides repetitions and translations of Félibien's 1676 recipe, single layer grounds composed of (mainly) brown or orange earth pigments are rare in sources from the second half of the eighteenth century in The Netherlands, France or England. Red bole is

[152] Jombert 1766: 126-131.
[153] *Nieuwen verlichter* 1777: 166-8.
[154] Cröker 1729: 74-7. *See* Chapter 6 on the nature of boles and of the historical use of this term.
[155] Although the main text of the Wiltschut manuscript is dated around 1701, the recipes in German that are written in a different hand are dated later, between 1726 and 1739. *See* (Wallert et al. 1999: 36) for a discussion of the contents and dating of the manuscript.
[156] *See* Chapter 6 for more information about different types of varnishes described in recipes for preparatory layers.
[157] Wiltschut manuscript c. 1701/1726-39: n.p. [78 in pdf]. Berlin blue or Prussian blue is a relatively recent discovery when it is described in the Wiltschut manuscript. It had been first synthesized between c. 1704 and 1710 in Berlin. Eastaugh et al. describe occurrences of the pigment in paintings dating from the 1720s, with some earlier examples in Germany. Eastaugh et al. 2008: 314-5.
[158] A composition of lead white ('flake white') ground in fat oil is advised for canvas, wooden panel and on copper. Dossie 1758: 204-5. Dossie's recipe for the preparation of this 'fat oil' is discussed in Chapter 6.
[159] Le Pileur d'Apligny 1779: 70 describes a single layer of lead white in an unidentified binder, with an addition of honey. The use of honey creates uncertainty about the binder, since honey is elsewhere described only as an additive for aqueous grounds. Lead white, on the other hand, is only mentioned in oil- or varnish-bound ground layers in contemporary recipes. Unfortunately hardly anything is known about the author, who wrote his treatise for a general public interested in the 'mechanical' arts. Dutens 1779: 62 advises a single oil ground tinted grey with a mixture of black, ochre and a little brown red.
[160] Dossie 1758: 203. *See* Chapter 6 for a discussion of the materials employed for size layers for canvas, for a discussion of Dossie's preference for oil instead of a glue or flour paste sizing. *See* also Chapter 10 for a general examination of texts on the topic of ground absorbency in historical recipe books.

advised however, in two German eighteenth century recipes. In 1761, Hallen prescribes the application of a single oil ground with red bole 'or other low quality/common paint' ('andrer schlechten Farbe'),[161] and the Swiss manuscript Mss.Hist.Helv.XVII.233B (c. 1750-1800) advises a single layer of brown red and 'Keselbraun', with a little lead white or chalk.[162]

A mixture of chalk and glue is mentioned for canvas preparation once in an eighteenth century North West European source, by Godfrey Smith (1756), who advises its use as a first layer in a double ground, covered with a linseed oil bound layer containing lead white and a little black.[163]

5.3.3 Nineteenth century recipes for canvas

As during former centuries, animal glue remains the size layer material most frequently advised in nineteenth century recipes (*See* Fig. 6.2b). The fact that the Winsor & Newton Archive manuscripts include animal glue size layers in a number of recipes, confirms its use in commercial preparatory layers. Besides animal glue, flour paste or starch are advised for sizing. Soaking the canvas in milk is described as a first preparatory step in the *Technische Mitteilungen* (1897).[164] Contrary to recipes for panel preparation, no oil or varnish size layers are advised.
Notes in the Winsor & Newton Archive record experiments with additions and alternatives to the traditional size layer. Size layers of shellac in ammonia and an addition of shellac in ammonia to an animal glue size layer are suggested as possible alternatives to render the layer more water-resistant.[165]
The most remarkable difference in use of size layers however, is the fact that contrary to earlier centuries, a large proportion of nineteenth century recipes for canvas preparation do *not* describe a size layer. This is an interesting development. The following overview of nineteenth century recipes for canvas preparation will discuss the increase in aqueous binders and emulsion binders in nineteenth century recipes. Whether the fact that oil grounds are advised less frequently for canvas preparation explains the reduced frequency of size layer descriptions, seems plausible but is not fully certain, as omission of the size layer is seen both in recipes for aqueous grounds and recipes for oleous grounds or varnish-bound grounds (*See* Appendix 6).

Some nineteenth century authors describe size layers and ground types that are similar to those encountered in recipes that date from the second half of the eighteenth century.

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[161] Hallen 1761: 322.
[162] Mss.Hist.Helv.XVII.233B c. 1750-1800: 48-9 (transcribed in Stettler 1987: 14). According to Stettler 1987: 48 either English red or rust found in a kettle. Stettler quotes Kühn, who believes that 'Keselbraun' can be identified as Kassels brown.
[163] Smith 1756: 58. Also an Italian and an American eighteenth century author describe a preparatory system for canvas that contains an animal glue bound layer: Orlandi (1719) advises a layer of animal glue and gesso, with a glue isolation layer followed by a layer of pigments (earths) in oil. Orlandi 1719: 480. Chalk and glue with a little honey is described as a single ground in a 1793 recipe in the American *Golden Cabinet*, which advises the application of this layer to the animal glue sized canvas. *Golden Cabinet* 1793: 112. The *Golden cabinet* also repeats Félibien's recipe. *Golden Cabinet* 1793: 112.
[164] *Technische Mitteilungen*, nr. 9 (1897): 2
[165] As these comments do not appear as recipes, but as suggestions, they are not counted in Figures 5.2 and 5.3. W&N manuscript 'Omnm Gath No 12', 1836-50: 12P039L17, 2P012L18.

For instance, Félibien's method is repeated by as many as five nineteenth century sources, the most recent of which is Vergnaud (1831).[166] However the role of recipes for oil-bound grounds seems to diminish in favour of aqueous binders, emulsion binders and double grounds with an aqueous lower layer. Figure 5.3 shows this move away from the preparatory systems that are advised during the seventeenth and eighteenth centuries and towards other combinations of materials and layers.

Several nineteenth century recipes include materials or procedures that are not mentioned in earlier sources. These are the 'new' materials: milk, egg, wax, caoutchouc or 'India Rubber' and casein in size and ground layers and the practice of dusting flour on the surface of the wet ground (*see* Appendices 6e and 15). These innovations fit within the general trend of experimenting with alternatives to and modifications of oil-, varnish- and glue-based layers.This interest in innovation was in keeping with the era of the industrial revolution.[167]

A combination of materials that is not encountered in earlier recipes is the mixture of chalk and oil as a preparatory layer. It is described by Simis (1801), a Dutch author writing mainly about decorative finishes for housepainters. Simis's recipe for canvas preparation calls for a first layer of chalk ground in oil and applied thinly to fill the canvas interstices. The layer is subsequently rubbed down with a pumice stone and covered with a second layer of 'a light colour, onto which one then paints and lays in, whatever one wishes'.[168]

As mentioned in the section on panel grounds, the earliest flour paste ground recipe in a nineteenth century source appears in 1806. Grandi (1806) advises to prepare both panels and canvas with a paste made by heating flour in water, with calcined and crushed bones of sheep's trotters as filler. Grandi's method is advertised as being the same as the one employed by 'the Venetians'.[169] For canvas, the mixture is applied in two coats, pumiced, and covered with a second layer to which pigments can be added. Before painting, a coat of raw linseed or poppy oil is brushed on.[170]

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[166] Vergnaud 1831: 137-8.

[167] Carlyle's overview of developments in British nineteenth century manuals for oil painting demonstrates that experimentation does not limit itself to preparatory layers. Sometimes fuelled by ideas about the painting methods practiced by earlier painters (in particular the Venetians, but also Antique painting methods), at other times by the invention or introduction of new materials from industry (caoutchouc can be considered one of these), a number of new methods are introduced. Carlyle 1991, 2001.

[168] Simis 1801: 158. The ground layer build-up described by Simis somewhat resembles the one that American artist Neagle makes notes about on the stretcher bar of his *Portrait of Reverend John Ryan*, probably painted in 1829. Neagle writes here that he has applied a preparation consisting of a starch size and three coats of whiting (chalk) in oil. After wetting the surface with a sponge to prevent the following layer from sinking in, he has finished the preparation with a thin layer of lead white paint, thinned with turpentine oil. Katz 1999: no page nrs.

[169] So far, no Venetian recipes including crushed bones have been located. The use of flour paste is documented however in sixteenth century recipes for canvas preparation supplied by Vasari (1550) and Armenini (1584). *See* paragraph 5.4

[170] *Transactions* 1806: 85-9. For panel preparation Grandi advises three coats of the first mixture, covered with a single coat of the pigment-containing second layer. Grandi's recipe is repeated by Cawse 1822: 9-11. Carlyle et al. 2008 describes a reconstruction of this recipe.

During the third decade of the century, three French treatises are published that are very informative about canvas preparation, those written by Bouvier (1827),[171] De Montabert (1829) and Mérimée (1830). All three treatises provide detailed information on preparatory layers for different supports, but with an emphasis on canvas preparation. All authors include several options for different types of grounds and De Montabert includes binders whose use in preparatory layers has not been described previously.

Bouvier's treatise (1827) is characterized by the high level of detail of his descriptions of procedures and it provides unique insight into early nineteenth century academic painting. Bouvier includes such detailed descriptions as he intends to provide concise practical instructions for oil painting students.[172] He provides recipes both for a single-layer oil-bound preparatory layers and for an aqueous ground bound with starch or flour: 'this last one is the best'.[173] His recipe for a single oil ground, applied to a canvas sized with animal glue, even contains information on the size of the brushes and spatulas.[174] In his recipe for a flour or starch paste ground, Bouvier writes that the flour paste should have the consistency of a 'slightly thick cream' ('crème un peu épaisse') and be mixed with pipe clay, light yellow ochre and a little red ochre.[175]
Bouvier (1827) draws attention to the practical advantage that aqueous, absorbent or semi-absorbent grounds provide to the painter who is in a hurry: paints will dry very quickly because their binder is absorbed by the ground. This will make it possible to lay in the composition ('ébauche') and apply the finishing retouches ('rétouche') on the same day, very convenient if the sitter can only sit for a portrait once.[176]

De Montabert (1829), a French painter who was a pupil of David, advises a flour-paste ground made from the powder of burnt bones, pumice powder and wheat flour. The paste is applied to a canvas first rubbed with a concoction of absinth and garlic or a sliced onion, the purpose of which De Montabert does not explain. Possibly this treatment increases adhesion between ground and canvas, since elsewhere De Montabert advises to rub a panel with a similar concoction in order to 'make the first ground layer adhere well to the panel'.[177] The flour-paste layer is brushed with the same 'decoction of black liquorice sugar' that De Montabert advises to isolate chalk and glue grounds on panel.[178]

Flour paste grounds are only one of the many options for preparatory layers that De Montabert (1829) describes. He also discusses single-layer oil-and-varnish-based grounds with 'white or ochre' as filler,[179] glue-bound grounds with calcined bones, chalk, lead white or a combination of chalk and lead white as filler[180] and covered with a 'frottis

[171] Bouvier was a Swiss painter, but also traveled to France and Germany. His treatise was published in Paris.
[172] Bouvier 1827: v.
[173] Bouvier 1827: 577.
[174] Bouvier 1827: 571-2.
[175] Bouvier 1827: 577-80. (Arsenne and Denis 1833: 335-7) repeat Bouvier's recipe.
[176] Bouvier 1827: 575-7
[177] Montabert 1829, vol. 9: 169.
[178] In a section on isolation layers, quoted earlier in relation to panel grounds, De Montabert states that this liquid is ideal to reduce ground absorbency while providing a brownish tone to stark white preparatory layers. De Montabert 1829, vol. 9: 166-9.
[179] Bound in a mixture of poppy oil and spike oil varnish containing copal and elemi resin. De Montabert 1829, vol. 9: 163.
[180] De Montabert 1829, vol. 9: 166-9.

d'huile' ('rubbing with oil') to prevent sinking in of the oil paint applied on top.[181] It is interesting to note that apparently De Montabert considers lead white a suitable pigment for aqueous ground layers, while late nineteenth century sources are concerned about the possible reaction between lead white and sulphides in the air to form lead sulphide, a blackish material.[182]

De Montabert is critical of the much-repeated preparatory system that was originally described by Félibien (1676). He considers a first layer of earth pigments particularly problematic. Such a layer, according to De Montabert, will not 'penetrate' the canvas, which is sealed for access by the animal glue size layer. Because superimposed layers are much more strongly bound than the reddish earth layer, flaking will occur. De Montabert believes that part of the problem is the turpentine oil, which he believes is frequently added to reduce the oil content of the first layers, but results in an underbound ground.[183] However he does not believe that substituting turpentine with additional drying oil would solve the problem, as, according to De Montabert, this excess oil will cause the reddish ground to 'move up' through the paint layers.[184] De Montabert advises to use other, more absorbent ground types instead.[185]

Like De Montabert, Mérimée (1830) is critical of the first brown-red layer in double grounds of the type advised by Félibien (1676). He warns that the siccatives in such grounds result in a surface covered with little grains.[186] Mérimée includes recipes for different types of grounds, ranging from more saturated oil-bound to absorbent aqueous systems. He describes how to prepare a single-layer oil-bound ground with lead white[187] and makes a case for casein-bound grounds.[188] Mérimée considers the moisture resistance of casein a great advantage in comparison to other aqueous binders, since it allows the painter who wishes to set up his composition in watercolour to erase mistakes with a moist sponge without disturbing the underlying ground. In his recipe for a casein-bound ground, Mérimée advises to add a little oil or an 'oily emulsion' to the casein and to use as little binder as possible to make sure that the oil of subsequent layers will be well absorbed.[189]

Mérimée also describes a double canvas ground consisting of a first layer bound in an aqueous medium covered by an oil-bound second ground layer. The first layer is applied over a size layer to which, interestingly enough, some oil and 'linseed grain mucilage' are added. Mérimée points out the fact that by using an aqueous medium for the first layers,

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[181] De Montabert 1829, vol. 9: 158. *See* Paragraph 10.5.5 about isolation layers to modify ground absorbency.

[182] For instance: Standage 1892: 73. *See* Carlyle 1991, vol. 1: 350-2 and Carlyle 2001: 258-260 for information about British nineteenth century artists on this topic. *See* also Chapter 10 on the influence of preparatory layers on the ageing of a painting.

[183] There are no indications in the historical recipes gathered for this treatise that turpentine was indeed introduced in these grounds. Additions of spike oil to the paint layer, not the ground layers, were described by Félibien 1676: 408.

[184] *See* Chapter 10 on the topic of the influence of ground colour in aged paintings.

[185] De Montabert 1829, vol. 9: 161-2.

[186] Mérimée 1830: 242-3. Possibly, the little grains that Mérimée is seeing are a paint defect known as 'protrusions', agglomerates of lead soaps that push through the surface. *See* for example Van der Weerd et al. 2002 or Noble, Boon and Wadum 2002 for a description of this phenomenon.

[187] Mérimée 1830: 242.

[188] Suited to those artists who wish to apply their sketch in watercolour. Mérimée 1830: 249-50.

[189] Mérimée 1830: 249-50. After setting up the composition in watercolour and before continuing to paint with oil paint, Mérimée advises the painter to apply a layer of white drying oil or a layer of viscous varnish. Around the same time, (Vergnaud 1831: 138-9) describes the use of casein as an alternative to animal glue size layers for panel and gives a recipe for its preparation.

the drying time such grounds is much reduced. The last layer should be very liquid, in order to make it penetrate the first aqueous layer, which makes the preparation more supple. For this layer, preferably air-exposed oil should be used.[190] The English translation of Mérimée's treatise (1839) describes the second oil-bound ground layer as 'merely oil, become viscous by exposure to the air'.[191] Whether this is a misinterpretation or a deliberate modification of the original French recipe is not clear.
Because oil paints applied onto absorbent canvases will dry quickly to the touch, this makes these grounds well suited to sketching and outdoor-painting.[192]

Mérimée also gives advice for those artists who wish to use an oil ground but do not have time to wait until it has dried properly. In that case, Mérimée advises to apply a layer of chalk bound in weak glue to the reverse of the canvas to draw out the oil. However Mérimée does advise artists to employ an aqueous ground instead.[193]

The recipes provided by Bouvier, De Montabert and Mérimée demonstrate the variation in materials that nineteenth century authors consider suitable for canvas preparation. Nearly all the types of grounds these authors mention, reappear in later sources. Later authors however do not necessarily give as wide a range of options as Bouvier, De Montabert and Mérimée do. For instance, 1830s authors Arsenne & Denis (1833) only discuss single lead white based grounds, bound in oil.[194] German author Fernbach (1834) advises a mixture of lead white and 'Thon Erde' ('pipe clay') in linseed oil.[195] His fellow countryman Bickes (1834) provides a recipe for a single ground on canvas that is prepared from 'glue water' and chalk, applied over a 'glue water' size layer.[196]
British author Cawse (1840) provides two ground recipes, one for a single-layer oil-bound ground, and one for a two layer preparatory system with a glue-bound and an oil-bound layer. Fillers and pigments for the single ground are tobacco-pipe clay, Spanish white, drying oil and pigments.[197] As a double ground he advises a first layer of chalk in animal glue and a second layer of unspecified pigments bound in oil. Cawse writes that 'plaster of Paris' (gypsum) can be added to the first layer.[198] A recipe in the 1841 *Complete Guide* advises a two-layered oil-bound ground with a first layer of lead white and a little red lead in linseed oil and turpentine oil and a second pigmented layer in which the red lead is

[190] Air exposure results in a more highly oxidized oil, which dries faster and may have a different viscocity and therefore other film-forming properties. As explained earlier, the aqueous layers should only contain a very weak glue, the oil ground binder will penetrate these aqueous layers and will render the whole preparatory system supple, the suppleness remaining until the oil has fully dried. To ensure suppleness, additions of a small amount of oil and much linseed mucilage to the aqueous layers are advised. Mérimée 1830: 244-5; recipe repeated by Vergnaud 1831: 138.
[191] Merimee 1839: 220-1.
[192] Some sources describe the use of aqueous grounds for decorative paintings, used for instance as theatre backdrops. Such paintings are often also executed in in aqueous binding media. Their preparatory layers show many similarities with aqueous grounds advised for oil-based painting. Examples of such preparations for decorative paintings are found in Vergnaud 1831: 136-7 and in Bersch 1894: 476.
[193] Mérimée 1830: 245.
[194] Arsenne and Denis 1833: 335-7.
[195] Fernbach 1834: 4-5. The linseed oil is first 'boiled'.
[196] Bickes 1834: 133-4.
[197] Cawse 1840: 20-1, 26.
[198] Cawse 1840: 20-1, 26.

substituted with 'sugar of lead' (lead acetate). 'It is not particular what tint it is of, provided it is rather light than dark'.[199]

An experiment with a single ground for canvas that is based on caoutchouc or 'India Rubber', is recorded in the archive of British colourman Roberson (1830s-early 1840s). The layer is prepared from linseed oil, small pieces of natural rubber, 'rosin' [colophony], litharge and copperas.[200] Whether this ground was ever sold by Roberson is uncertain, however Indian rubber based grounds were sold commercially for a limited time period in Britain.[201]

While grounds pigmented with light-coloured pigments seem to dominate the nineteenth century recipes, if we discard those authors repeating Félibien, a double ground with a first layer of a reddish tone is described by German author Hampel in 1846. According to Hampel, canvas in the German city of Dresden is prepared commercially with a rye flour size layer, followed by a layer of red bole or light English red in linseed oil varnish and a final layer consisting of two coats of lead white to which a little ochre and black are added. Hampel praises the quality of this commercial product highly.[202]

Hundertpfund (1847), a German author contemporary to Hampel, advises a mixture of flour and pipe clay: three to four applications of flour paste with a consistency of 'slightly fluid honey' are covered by a second ground, which consists of lead white oil colour and some turpentine oil. This layer is pumiced and again a coat of lead white in oil is applied, without the turpentine oil this time. Flour is sprinkled over the last ground layer while it is still wet and loose flour is removed by knocking the upright canvas against the floor.[203]

A wax addition for grounds[204] is described for the first time in the 1850s in a recipe for a single ground for canvas in a Winsor & Newton Archive manuscript (1854). It is one of the ingredients of the 'meguilp' consisting of beeswax, turpentine and 'double mastic varnish', which, mixed with zinc white oil paint, is applied as a canvas ground.[205] Wax also appears in a recipe provided by Dutch Hopman (1856), in a manual written primarily for decorative painters which includes a recipe for the preparation of canvas for paintings. Hopman's recipe for a double oil-bound ground for paintings starts with a layer for which wax is melted in turpentine and stirred into a paste with lead white and boiled oil. No mention is

[199] *Complete Guide* 1841: 41.
[200] Roberson (1831-c. 1840): last page. The exact date of this recipe is uncertain. On the page preceding the recipe for an India Rubber ground, the date '1 feb 1840' appears, written in red ink on a page filled in brown ink. This observation on the subject of the date of the recipe is provided by Carlyle in her database on nineteenth century British sources. *See* Chapter 5 for more information on the composition of copperas and the other materials described in this recipe.
[201] Carlyle 1991, 2001, Labreuche 2011.
[202] Hampel 1846: 22-3.
[203] Hundertpfund 1847: 125-7. An English translation of Hundertpfund appears in 1849 and repeats the recipe, with the slight variation that the prepared canvas is shaken to remove superfluous flour. (Hundertpfund 1849: 105-9). Hundertpfund's recipe is taken up by Knowlton as well. (Knowlton 1879: 30-1). Hundertpfund's recipe is reconstructed by Carlyle (Carlyle et al. 2008: 123-131).
[204] British nineteenth century manuals describe wax additions oil paint binding media. Carlyle writes that wax is added to oil paint binding media for a number of reasons: to increase the firmness of the paint and to prevent it from running. Carlyle 1991, vol. 1: 158; Carlyle 2001: 111.
[205] W&N manuscript 'P.09', 1846-54: 9PP014; 9PP015. Meguilp as a binding medium is described in Chapter 6.

made of a size layer. The layer is covered with a second ground, which contains yellow ochre, white and black in oil, without a wax addition. Both layers are applied twice. For large sized canvases, such as wall hangings, a different first ground is advised: pipe clay soaked in water and a larger proportion of yellow wax.[206] Hopman does not explain why he suggests a modified preparation for large canvases, but considering the lower price of pipe clay, economic motives may have been behind this advice. Since other nineteenth century authors advise wax as a sealing layer for the reverse of canvas hanging against moist walls,[207] possibly the wish for higher moisture resistance may be an alternative motive for Hopman to advise a larger proportion of wax.

While in the first half of the nineteenth century single-layer grounds form the majority in the recipes, in the second half of the century, double grounds count for approximately half of the recipes (*See* Fig. 5.3). The percentage of purely oil-based grounds is smaller than in the first half of the century, while relatively more recipes appear for double grounds with an aqueous lower layer covered by an oil-bound second ground layer.
Flour or starch paste is mentioned less frequently than in the first half of the century, notwithstanding the fact that Danish author Greve (1855), lists flour paste amongst the 'usual' binding media for grounds. He writes: 'on this [= the support] lies the ground, which is very different; usually it is made of gypsum, chalk, pipe clay and then glue or paste is the binder, or it consists of oil colour often mixed with bole'.[208] Animal glue is indeed employed in single chalk and glue ground in a recipe provided by Dietrich (1871), which calls for slaked chalk, glue water and a little honey, applied until no more 'hole' is visible.[209]

American artist Sully (1809-1871) describes the use of starch in his manuscript. It is mixed with linseed oil to form an emulsion and contains lead white as the main pigment.[210] In his manuscript (1809-71) as well as in the posthumous publication of his notes (1873), he describes many experiments with different types of grounds. Sully praises the qualities of skimmed milk as a binder for lead white grounds,[211] describes a single ground consisting of chalk, glue and a little honey[212] and gives a recipe for an emulsion ground that consists of yellow soap, water, drying oil, yellow ochre or chalk and lamp black. This recipe contains the interesting comment that the soap 'neutralises' the oil, as a result of which no size layer is required to protect the canvas against corrosion.[213] Slightly later, English

[206] Hopman 1856: 135-6.
[207] Paragraph 10.7 discusses wax in reverse side applications in more detail. Carlyle (1991 and 2001) provides an overview of British nineteenth century recipes that discuss reverse applications, for which many more materials are advised.
[208] Greve 1855: 8 Translation provided by by Cecil Krarup Andersen and Troels Filtenborg. Chapter 12 discusses flour or starch paste ground in detail.
[209] Dietrich 1871: 21-2. Dietrich advises a size layer consisting of rye flour before application of this single ground.
[210] Sully 1809-71: 134-5: starch, lead white, linseed oil. Sully also includes a recipe that he received from artist Delonprey, which calls for paste, lead white, oil and litharge. Sully 1809-71: 036. The availability and use of litharge in nineteenth century British manuals for oil painting is discussed in Carlyle 1991, vol. 1: 60-2; Carlyle 2001: 41-2.
[211] Sully 1809-71: 156. This recipe calls for a single layer of lead white in skimmed milk. No size layer is mentioned. Skimmed milk is milk from which the cream has been removed. *See* also: Sully 1873: 024, 034-5; Sully 1809-71: 130; Sully 1809-71: 155; Sully 1809-71: 176.
[212] Sully 1809-1871, recipe date 1840: 106-7.
[213] Sully 1809-71: 046.

author Knowlton (1879) also advises yellow soap, but here in a mixture with glue, water and chalk, so without any apparent link to the degradation of canvas by an oil ingredient inside the layer itself. The soap-containing first ground layer is covered with an oil-bound layer, however, consisting of lead white in oil and thinned with 'spirits of turpentine'.[214]

The Winsor & Newton archive contains an exceptional recipe, dated 1871, which describes the application of a three layer oil-bound ground. This recipe, with a rather complicated nature, was analysed and reconstructed by Carlyle et al. (2008).[215] Its complex instructions set it apart from contemporary recipes in artists' handbooks. In fact it can be seen as the most complicated of the fifty seven ground recipes and workshop notes on ground preparation in the Winsor & Newton archive.[216] As a first preparatory step, a mixture is made of raw linseed oil and chalk, with 'patent dryers'.[217] This mixture, called '1st colour oil' or 'putty', is used in all layers of the preparatory system.[218] It is kept six to twelve months before use, to acquire 'a glutinous quality, necessary to prevent oil of the 1st colour from running through to the reverse of the canvass & causing it to have a stained appearance'.[219] After the 'glutinous quality' is achieved, a first layer of this mixture is applied to the canvas. The second layer consists of the same 'putty' with the addition of lead white and patent drier. A third layer containing a higher proportion of lead white to the 'putty' completes the preparation.[220]

Spon (1879) provides a recipe for a double oil-ground on canvas that uses lead white and chalk in both layers and is also rather complicated, like the Winsor & Newton recipe described above. The recipe is discussed in detail as it provides interesting information on the procedures that may be part of ground preparation, providing a level of information that is not often present in other contemporary recipes. The binder of the first layer is described as a mixture of raw oil and boiled oil. Lead white and chalk are ground in five parts raw oil and one part boiled oil and applied twice to an un-sized canvas. After pumicing, the second layer is applied, which contains two parts lead white, two parts chalk, one part burnt ochre and a little bit of ground pumice stone. All these pigments and fillers are ground separately and incorporated into a paint with a little 'gold size', raw

[214] Knowlton 1879: 29-30.
[215] Carlyle et al. 2008a:113-6
[216] The recipe gives interesting insight into nineteenth century commercial canvas preparation, which is placed in the context of commercial preparation is the topic of Chapter 9.
[217] By 'patent dryers' a mixture of different siccatives is meant. The exact composition of the siccatives involved in this mixture may have varied. *See* Chapter 6 on the topic of siccatives for ground binders.
[218] The composition of 'first colour oil' is described in other recipes in the Winsor and Newton manuscripts and may have varied, since recipes describe slightly different processes and use different ingredients. In principle first colour oil consists of the deposits found at the bottom of varnish preparation vats, mixed and heated with linseed oil and with additions of driers. For a complete discussion of the processes involved in the manufacture of preparatory layers for oil painting by Winsor and Newton and for references to recipes that describe '1st colour oil', see Chapter 9 in this dissertation. Appendix 16 contains transcriptions of the recipes from the Winsor and Newton Archive.
[219] In the recipe in manuscript 'P8', another description is provided to explain this step: 'it may become viscid' and so not stain 'the backs of the cloths'. 'It also improves in its drying properties'.
[220] W&N manuscript 'P.04 1836- Private Copy of Processes. Vol 1st' 1834-93, recipe date 1871: P4P140L01. The recipe also appears in another Winsor & Newton manuscript: 'P8' 1840-78, recipe date 1871: P8P018AL01.

linseed oil and turpentine. This mixture is applied one to three times, smoothed with a pumice stone and water 'until smooth enough for painting upon'.[221]

Spon's recipe is the last nineteenth century recipe in the dataset that prescribes double oil-based grounds for canvas preparation. Recipes for canvas preparation that appear during the 1880s and 1890s all advise either single aqueous or oil-based preparations or combinations of aqueous and oil-bound layers. For instance Grace (1881) provides a recipe for a ground consisting of a layer of glue and chalk covered by a mixture of lead white, chalk and linseed oil, thinned with turpentine oil if it is too thick,[222] while the Susse brothers (1845) give a recipe for a single oil ground with lead white.[223]
The second recipe from Grace (1881) is rather exceptional. While it also results in a double ground, the first layer in this case contains lead white in 'well-beaten egg', thinned with 'French white vinegar and water' if necessary. After two coats of this composition, a second ground is applied that consists of tube paint diluted with 'benzoline' or a thin layer of 'prepared water-colour paints'.[224]

This and other recips demonstrate that experiments with ingredients for grounds continue during the last decades of the nineteenth century. In particular the German periodical *Technische Mitteilungen* (1885-92) and Church (1890) discuss innovative ideas for the preparation of canvas, often driven by concerns about the degradation of the materials used by their predecessors and contemporaries.

British chemist Church (1890) writes about the conversion of lead white into black lead sulphide. He discusses a number of methods to prevent this reaction and advises to cover lead white preparatory layers with zinc white, as he believes that the zinc white layer can prevent this type of degradation. The canvas ground he advises consists of a layer of chalk in glue, a layer of lead white in linseed oil and a final layer of zinc white oil-paint or zinc white powder dusted on.[225]

The *Technische Mitteilungen*, published by and written for artists and paint professionals in Germany, devotes a number of articles to different aspects of ground preparation. Its authors discuss the merits and downsides of several traditional methods for canvas preparation and introduce novel preparatory systems.

An 1886 article provides insight into contemporary preparation methods of aqueous grounds. It's description of the different ratios between binder and pigment is particularly interesting as the detailed instructions demonstrate how, through varying the ratios of pigment to filler, the properties of the applications with similar constitutents are slightly modified. In this way, they are adapted to the role of each coat within the layer

[221] Spon 1879: 113. *See* Chapter 6 for more information about and recipes for 'gold size'.
[222] Grace 1881: 87.
[223] Susse 1845: 22.
[224] Grace 1881: 87-8. *See* Chapter 6 for background information on the nature of volatile coal distillates.
[225] Church 1890: 26. *See* Paragraph 10.3.3 for a discussion of comments on the change of lead white into lead sulphide.

structure.[226] This recipe is described in detail in the context of ground application in Paragraph 7.2.1.
The recipe includes the advice that before use, the ground should be covered either with a thin layer of oil paint or with shellac, since due to absorption of paint binder by the ground, the paint applied on top would be underbound.[227]

Ar 'new' ground is described in an 1891 volume of the *Technische Mitteilungen*, by Ernst Friedlein.[228] This ground for canvas, patented by the author, is supposed to allow the artist to execute the first paint stages in watercolour. This fact is introduced as an important asset, as it is said to reduce the amount of oil and thus the yellowing of the painting. The ground, which can be pigmented as pleased, is bound with an emulsion of gelatine and Tung oil. The ratio between both binding media determines its elasticity. Instead of brushing the ground mixture onto the canvas or palette knife application, the canvas is placed in horizontal position over a flat (stone or marble) surface and the ground mixture is poured over the canvas. According to Friedlein, the mixture penetrates the canvas and a thin layer will remain on the surface. After the mass has gelled, the canvas is lifted and dried in upright position. Friedlein writes that this ground will never develop cracks or tears, that it is suited both to watercolour and oil painting, that the canvas can be rolled and that every desired surface texture can be created, depending on the canvas type and the thickness of the layer.[229]

A volume dated 1892 discusses a patent by Alfons Freiherr von Pereira[230] for a ground consisting of well beaten egg white mixed with animal glue, applied to a canvas sized with animal glue and honey. This ground is intended primarily for tempera and 'majolica' painting, for which it is said to provide a very good and adhesive surface, but the author also considers it suited to oil painting.[231]
Although no other nineteenth century authors provide detailed instructions on the use of egg binders in preparatory layers, the use of egg in grounds is mentioned before briefly by two earlier authors, De Montabert (1829) and Field (1835). De Montabert writes: 'Others take, instead of parchment glue [as binder for preparatory layers], the liquid of an egg; and after having beaten well together the yellow, the white and the membranes that

[226] The artist is advised to employ either slaked chalk, clay (identified as 'white bole') or a mixture of chalk and China clay, mixed with warm glue.
[227] *Technische Mitteilungen*, nr 25 (1886): 39. The issue of overly absorbent grounds surfaces also in an 1895 article in the *Technische Mitteilungen*, where painter Ch. Mangold discusses the difficulties of painting on chalk and glue grounds and advises to cover such grounds with boiled linseed oil before painting. *Technische Mitteilungen*, nr. 20 (1895): 1-2.
[228] Ernst Friedlein is listed as the author of the 1906 book *Tempera und Tempera-Technik*, Munich: Callwey, 1906.
[229] Friedlein in *Technische Mitteilungen*, nr. 97 (1890): 105-6. Underpainting over this ground should be executed with the same binder, mixed with watercolour. Friedlein in *Technisch Mitteilungen* 1891 nr. 123: 94-5.
[230] http://www.worldcat.org lists a number of publications by Alfons Freiherr von Pereira-Arnstein, all on the subject of tempera techniques of the old masters: *Erleben wir noch eine Renaissance in der Malerei?: Die Temperatechnik der Meister der Renaissance und deren Anwendung zum Zwecke der Herstellung von dauerhaften Gemälden nach ihrer Malweise*, Stuttgart: n.p. 1891; *Vortrag gehalten zu Berlin im Verein Berliner Künstler von Alfons Freiherr von Pereira-Arnstein über seine Tempera-Technik: am 2. Mai 1893*, Stuttgart: Bonz, 1893; *An die Künstler: 'Tempera rediviva'*, Leipzig: Haberland, 1909. http://www.worldcat.org, accessed 4-9-2012.
[231] *Technische Mitteilungen*, nr. 162 (1893): 238. The recipe is patented by Alfons Freiherr von Pereira in December 1891.

serve to divide the white, they use this binder'. De Montabert also suggests that an emulsion of egg white and linseed oil or a mixture of egg white and quicklime may be a suitable binding medium for preparatory layers, but does not provide further details.[232] In his 1835 *Chromatography*, Field mentions the addition of albumen (= egg white) as a plasticizer to aqueous grounds: 'To preserve the elasticity of grounds, some drying oil should be introduced into the glue or size with which they are prepared; for the same purpose bees'-wax, sugar, treacle, albumen, &c. have been added with various degrees of eligiblity and success'.[233]

In the late nineteenth century casein reappears, both in a recipe published by Vibert (1892) and in a recipe in the *Technische Mitteilungen* (1897). Vibert (1892) advises using casein with zinc white. The artist can either buy casein powder or prepare his own casein from cheese, water, ammonia and glycerine. After a layer of the casein bound zinc white is applied, the canvas is 'rubbed with glass paper'. It then receives a layer of 'retouching varnish' and two or three applications of zinc white and casein.[234] A 'new painting ground' with casein, developed by painter J. Ludwig Schudt in Frankfurt am Mainz for the reason that he is not satisfied with traditional grounds of chalk, glue or oil, which either crack or result in yellowing paint, is prepared as follows: burnt chalk and water are heated, beeswax and linseed oil are added, then to this composition about 1 ¼ to 1 ½ times its weight is added of white cheese, and the mixture is ground on a paint mill. The resulting paste is spread onto the canvas or pasteboard previously wetted with milk. This ground, the article claims, offers everything required to obtain the same luminosity that we see in the paintings of Van Eyck, Rembrandt, Rubens, etc. The author describes how it is suited to oil painting, tempera, watercolour as well as to casein. He states that when using oil, wet-in-wet painting is possible for approximately one hour before the oil slowly sinks into the ground, all the way down to the canvas, and forms a close connection with the canvas. He promises that glazes applied over this ground retain their clarity and fiery tone.[235]

5.4 Chronology of preparatory layers on copper, board and paper

Although lower in number than recipes for panel or canvas preparation, recipes for the preparation of metals, stone, paper and cardboard feature in historical sources from North West Europe. The late sixteenth century witnesses the introduction of 'new' supports for oil painting, such as copper and lapidary surfaces,[236] and their preparation requires a different approach than the preparation of canvas or panel.

[232] De Montabert 1829, vol. 9: 167-8. On pages 169-70, De Montabert lists a number of binding media for canvas grounds that he had read about in different sources: quicklime in pigs blood, calcined oister shells and fermented milk ('partie butieuse et calseuse du lait'), a mixture of egg white and quicklime and of egg white and linseed oil.
[233] Field 1835: 213.
[234] Vibert 1892: 186-8, 107-8. In Chapter 6, more information is provided about 'retouching varnishes'.
[235] *Technische Mitteilungen*, nr. 9 (1897): 2.
[236] *See* for more information on paintings executed on these supports: Van de Graaf 1976; Koller 1984; Horovitz 1986; Komanecky, Horovitz and Eastaugh 1998; Dunkerton et al. 1998; Reifsnyder 1999; Scaillierez et al. 2007; Horovitz and Reifsnyder 2012.

Instructions for the treatment of stone and copper before ground application have been discussed in Paragraph 5.1.2. The present section focuses on the preparatory layers applied to these supports.

5.4.1 Preparatory layers for stone

The fact that stone supports were at times used without a preparatory layer, in particular when the colour or the pattern of the stone was used as part of the composition, has been mentioned earlier.
Recipes for preparatory layers on stone are not provided frequently in the sources collected in the present study; only eleven recipes have been located, four of which are Italian, three French, one British and two German (*see* Appendix 7). The information is limited further by the fact that the recipes of Barrow (1735, 1754), *École* (1759), Griselini & Fassadoni (1772), Le Pileur d'Apligny (1779) and the American *Golden Cabinet* (1793) are all later versions of a recipe first published by Félibien in 1676.

Félibien (1676) writes that on stone no size layer is required, only a 'light layer of colour', unless the artist wishes to use the colour of the stone as base tone.[237] Two recipes provide indications for a suitable pigmentation for a preparatory layer on stone: De la Fontaine's (1679) advises a mixture of lead white, umber and carbon black, a mixture similar to contemporary oil-bound ground layers on panel and canvas. It is applied twice, the first coat very light in colour ('fort claire') and scraped with a knife to smooth the surface. The second coat is required, since otherwise the colour will sink in ('s'emboiroit incontinent').[238] Nineteenth century German author Hampel (1846) describes a rather similar preparation, bound in linseed oil varnish.[239] It contains lead white and a little dark ochre, the same mixture he advises as a ground for copper, zinc and iron plates.[240] For painting on alabaster, Hampel (1846) advises to apply several layers of white glue boiled in white beer, with gum Arabic or with starch paste. This ground is applied only to the areas that are to be painted upon.[241]

5.4.2 Preparatory layers for copper

A slightly larger number of recipes have been found for the preparation of copper plates for painting, although also here a substantial number are in fact repetitions (*see* Appendix 8). Possibly the number of recipes reflect the frequency with which the support is employed. Robert Dossie (1758) writes: 'such plates are seldom employed but for delicate and elaborate paintings'[242] and Mérimée (1830) states: 'since a very long time one does not paint on copper anymore'. This fact Mérimée seems to regret, since he continues by saying that the preparation of copper is not at all difficult.[243]

[237] Félibien 1676: 410.
[238] De la Fontaine 1679: 28-9.
[239] *See* paragraph 5.3.3 for more information about oil varnishes.
[240] Hampel 1846: 29-30.
[241] Hampel 1846: 29.
[242] Dossie 1758: 204.
[243] Mérimée 1830: 246-7.

Félibien (1676) is the earliest North European author within the period to discuss the preparation of copper plates for painting but he does this only briefly, saying that metal supports can be prepared in the same way as stones.[244]

A ground for copper is required only if the natural tone of the copper is considered unfit for use, three eighteenth century authors explain.[245] No aqueous grounds are advised, in all likelihood because of the corrosive effect water has on the copper.[246] Instead, oil-based grounds are described, often with a lead white base and tinted with pigments. As with other supports, recipes frequently call for the use of lead white with earth pigments, such as the lead white, ochre, umber and black mentioned by Félibien (1676)[247] or lead white, brown red and carbon black described by Jombert (1766).[248] De la Fontaine (1679) provides precise application instructions: after the paint is brushed onto the support, the oil paint is dabbed with a linen and cotton tampon to create an even surface.[249] After drying, the layer is scraped with a knife and a second coat is applied, using the same application method.[250]
Eikelenberg (1679-1704) advises no lead white base, but a ground consisting of white or green ashes,[251] vermilion and yellow ochre.[252]

Sometimes a single coat, sometimes as many as three coats are called for, for instance by De la Hire (1730).[253] Mérimée (1830) advises copal varnish as a binder for copper grounds; he writes that the copal renders the layer more 'solid' ('solide').[254] Arsenne & Denis (1833) write that addition of copal varnish raises the adhesive qualities of the ground.[255]

Recipes provide evidence that authors have different preferences regarding the texture of their preparatory layers on copper. Although the linen tampon described by De la Fontaine (1679) creates an even surface, depending on the coarseness of the fabric it may also leave a more or less visible weave pattern in the surface of the ground. Application methods that result in a slight pattern are also described in the contemporary Spanish treatise by Pacheco (1649), who advises spreading the oil-bound ground with the fingers,

[244] Félibien 1676: 410.
[245] Jombert 1766: 137-8; *Nieuwen verlichter* 1777: 170; Dutens 1779: 62.
[246] The formation on verdigris on copper is discussed by Hampel 1846, who explains that it will form when moisture or acid are present. Hampel 1846: 26-7.
[247] Félibien 1676: 410. Such mixtures are mentioned as well by De la Hire 1730: 709. The actual use of similar pigment mixtures in paintings on copper is confirmed in Horowitz 1986: 44-8.
[248] Jombert 1766: 137-8. The only south European author describing the pigmentation of grounds on copper is Pacheco (1649). He advises a single oil-bound lead white-based ground with umber. Pacheco 1649 (transalted in Veliz 1986: 69.)
[249] De la Fontaine is not very clear in his description of the linen and cotton tampon. Probably he is referring here to a tampon made of cotton wool inside a linen bag. Van Eikema Hommes: 2004: 72 quotes descriptions for such tampons by Armenini (1587) and Felipe Nuñes (1615).
[250] De la Fontaine 1679: seconde partie, 28-9.
[251] Eikelenberg 1679-1704: 159. *See* Chapter 6 for more information about green ashes.
[252] Eikelenberg 1679-1704: 159.
[253] De la Hire 1730: 709.
[254] Mérimée 1830: 246-7. Mérimée does not advise copal varnish for the preparation of other supports, only for copper. Carlyle 1991, vol. 1: 178-185 and Carlyle 2001: 411-7 discusses the advice in a number of British nineteenth century manuals to add copal varnish to the oil paint binder, alternatively to use copal varnish by itself as a paint binder. Copal is considered a hard and durable material by these sources, although for some, the speed of drying seems to be more important.
[255] Arsenne and Denis 1833: 337-8.

not by brush as for other supports.[256] Application by hand is also mentioned in North European recipes: De la Hire (1730) advises the use of the palms the hand. He writes that the resulting small grain will help the paint adhere to the otherwise very smooth surface.[257] Hallen (1761) advises the same procedure. He explains that the paint will easily 'enter' the grooves created by the hand.[258]

While these authors all aim at a slightly textured surface, eighteenth century British author Robert Dossie (1758) does not seem at all worried by the smoothness of copper plates and states that 'the surface of the priming ought to be made smooth as the plate itself by rubbing with pumice stone, or glazing with the callender stone'. His recipes are indeed aimed at creating a smooth surface. Next to his instructions to apply a single layer of oil-based ground with lead white or ochre, Dossie includes a second recipe that he praises for the resulting 'perfectly smooth' surface. In this recipe he uses fat oil and flake white, applied to the copper plate while in a horizontal position. He writes that the layer will level out and will 'polish itself very highly, by the running of the oil'.[259]

Dossie is the only author to specifically aim for a perfectly smooth and closed surface for copper. Nineteenth century sources again advise measures to increase the ground's adhesive properties, according to Vergnaud (1831) because otherwise, colours will 'slide' ('glisser') over the smooth surface of the copper. He advises to mix some turpentine in the first preparatory layers, which will render the ground slightly absorbent, in order to 'make the oil penetrate'.[260] Hampel (1846) writes that the copper ground should be pumiced with pumice stone or sepia bone to create a roughened but velvety surface ('zart rauh und sammtartig').[261] He further discusses a problem specifically associated with metal supports, that of corrosion. Hampel warns that both copper and iron will corrode. He considers zinc a more stable support, but writes that paint applied to zinc supports is prone to crack. Considering the fact that Hampel provides a detailed description for the preparation of copper for painting, his objections to this support can apparently be overcome by a proper pre-treatment.[262]

5.4.3 Preparatory layers for paper

Prior to the nineteenth century, paper supports are mentioned infrequently in recipe sources (*see* Appendix 9). A single layer of oil paint is considered enough for their preparation in the anonymous Spanish 'Reglas para pintar' (c. 1575-1600) and the contemporary south French manuscript BnF Ms. Fr 640 (c. 1580-1600) mentions the use of 'oiled paper'.[263] In the 'Art of painting in oyle by the life' (1664), thick paper primed with

[256] Pacheco 1649: 385.
[257] De la Hire 1730: 709.
[258] Hallen 1761: 322.
[259] Dossie 1758: 204. A similar layer of fat oil and lead white is advised as part of the preparation of panels and canvas. Dossie 1758: 203.
[260] (Vergnaud 1831: 119-20) writes that the 'polish'('poli') of the copper opposes adhesion of subsequent layers by 'making the colours on top slip ('glisser'). The turpentine added helps the oil 'penetrate'('cette essence fait penétrer l'huile').
[261] Hampel 1846: 28.
[262] Hampel 1849: 26-8.
[263]' Reglas para pintar' c. 1575-1600 (transcribed in Bruquetas-Galán 1998: 37); BnF Ms. Fr 640 (c. 1580-1600): perso 8.

oil colour to 'practise to paint upon', is described as 'not so durable as board or cloth'. When pasted onto a smooth board, however 'it will last a long time'.[264]

Cröker's recipes, published in German in 1729, show three different varieties of paper preparation. A size layer of animal glue can be introduced as a barrier between the paper and subsequent oil-bound layers, and covered by a varnish-bound pigmented ground layer. Alternatively, the paper is soaked in oil from the brush rinsing jar or in common varnish before covering it with a pigmented ground bound with varnish. But Cröker adds that simply brushing a mixture of linseed oil and varnish onto the paper stretched on a board, is also possible.[265]

Nineteenth century recipes for paper preparation describe both oil-based ground layers applied to the sized paper, and layers bound with aqueous binding media. In those recipes where aqueous binding media are used, size layers are not included in the layer build-up, as is the case with the aqueous ground on paper prescribed by Fokke Simonsz (1803-4). It consists of several layers of glove-leather glue and chalk and is smoothed with a piece of linen or shaved grass.[266] Sully (1809-71) writes how he prepares paper with white lead ground in skimmed milk, 'much to my satisfaction'.[267]

Bouvier (1827) advises using the same flour paste or starch paste ground that he has described as a canvas ground, both for paper and for cardboard intended for oil painting. For board and paper supports, only one or two layers are required, as too many layers will lead to cracks in the preparation. Bouvier describes gluing paper with adhesive strips to a board during the application of the preparatory layer. After the preparation has dried, the paper is cut loose.[268]
Also Cawse (1822) describes supporting sketches with auxiliary supports. He mentions the practice of 'pasting paper over canvas or book muslin over primed cloth or pannel' and writes that such supports have been 'lately introduced into practice'.[269]

De Montabert (1829) dismisses oil grounds for paper as dangerous. He prefers grounds made with starch and pumice powder,[270] or varnished paper, attached with modelling wax to cardboard or to a wooden board, and subsequently covered with paint or a piece of paper of the appropriate colour. As varnishes applied by manufacturers tend to yellow, De Montabert considers it safer to prepare one's own varnished paper, either with several coats of copaiva balsam, dried by the fire, or with elemi resin. Alternatively, he advises a mixture of copal, spermaceti wax[271] and a little caoutchouc, dissolved in spike oil.[272] Also Field (1850) warns of the corrosive effect of oil on paper and advises to only use size to prepare papers.[273]

[264] 'Art of painting in oyle by the life' 1664: 93.
[265] Cröker 1729: 73-4.
[266] Fokke Simonsz 1803-4: 84-5
[267] Sully 1809-71: 113.
[268] Bouvier 1827: 580-3.
[269] Cawse 1822: 11
[270] Unfortunately De Montabert does not specify the nature of the danger.
[271] *See* Chapter 6 for information about the nature of spermaceti wax.
[272] De Montabert 1829, vol. 9: 135
[273] Field 1850: 134.

Kingston (1835) is the only author who describes the application of ground (oil paint) to the *reverse* of the paper as well. This he considers necessary 'to prevent it being affected by the air'.[274]

'Oil sketching paper' or 'prepared sketching paper' is described in a number of nineteenth century sources. This type of paper is sold by colourmen as loose sheets and as blocks of sheets glued together at the edges.[275] *Reeves and sons' amateurs' and artists' companion* (1852) writes that sketching paper is 'portable and cheap' and for 'early practice answers exceedingly well'.[276] Clint (1855) explains his fondness of prepared sketching paper by its convenience: 'it has the advantage of lightness, and the studies when dry may be kept in folios'.[277] Edwards (1856), writing for an audience of young artists and amateurs, describes the characteristics and uses of oil sketching paper: 'It is made of drawing paper, covered with two or three thin coats of oil colour, so as to furnish a ground similar to that of prepared canvas. It is cheap and portable, and serves very well for early attempts and for preparatory sketches; for trying the effects of any work previous to its commencement, as well as during its progress'.[278] If artists wish to preserve their sketch, it can be glued with glue or with paste to a canvas which is stretched onto a frame.[279]
Scott Taylor (1890) writes of the availability of sketching paper with a canvas imprint and calls this a 'capital substitute for beginners and outdoor sketching'.[280]

5.4.4 Preparatory layers for board

Convenience is an important asset also of the commercially prepared fibre or cardboard supports, introduced in the nineteenth century. Sketching on fibreboard or paper becomes an established method for nineteenth century painters, as shown by the number of works on these boards that have survived in public collections. Historical descriptions mention in particular their affordability and easy transportability (*see* below).

In 1829, De Montabert exclaims that if 'the ancients' had been able to employ cardboard supports made from old scraps of paper, they would certainly have chosen to use them for their paintings: 'Well made cardboard is a very suitable support for a painting'.[281] He describes the advantages as follows: 'They [= cardboards supports] are available in different formats, are not very water sensitive, do not tear easily. The edges may be protected with parchment or thin iron sheets, which makes them even more durable.

[274] Kingston 1835: 5.
[275] Clint 1855: 6. Carlyle 1991, vol. 1: 261-263 and Carlyle 2001: 190-1 give an overview of the use and availability of sketching paper and blocks of sketching paper according to nineteenth century British sources. Callen (2000) explains that nineteenth century Paris merchants sell two varieties of prepared paper: just brushed with a primer or with a canvas grain pressed into the wet ground. From 1850 on, paper is also prepared with a bubbly texture and an impressed canvas texture in yellow or grey. Callen 2000: 25-26.
[276] *Reeves and sons' amateurs' and artists' companion* 1852: 51-52.
[277] Clint 1855: 6.
[278] Edwards 1856: 15-6.
[279] Edwards 1856: 15-16.
[280] Scott Taylor 1890: 33. Such canvas-textured papers are also available glued to board and are then called 'oil sketching tablet'. Carlyle 1991, vol. 1: 262; Carlyle 2001: 190.
[281] De Montabert 1829, vol. 9: 132-3.

They are either covered with fine canvas, glue or a bitumen layer and a ground is applied on top'.[282]

In contrast to De Montabert, the 1845 *Handbook,* Osborn's translation of Bouvier to which his own advice is added, considers paper and pasteboard fit only for more restricted purposes and explains how they are either used mainly for sketches and experiments, or for studies from nature on account of their transportability. The author furthermore warns that pasteboard tends to warp and will require an auxiliary support.[283]

Fibre boards come in standard sizes, of different thickness and are prepared with grounds similar to those on panel or, as other authors write, to canvas. Sometimes a granulated texture is given to the ground.[284] Different qualities are available, Academy boards and millboards are those mentioned most often.

Reeves and sons' amateurs' and artists' companion (1852) explains that Academy boards are generally larger and thinner than millboards. Also he considers them suited only to sketching.[285] Edwards (1856) describes the types of fibreboards available: 'millboard' and 'Academy board' are mentioned most commonly in British recipes. Millboards are of a higher quality than Academy boards, Academy boards being thinner and less carefully prepared.[286]

At the end of the Nineteenth century, the *Technische Mitteilungen* reports on a new kind of support, patented by a Mr. Del Moro, who calls it 'plant parchment' ('Pflanzenperkament'). From its description it seems to hold a place between paper and board, depending on its thickness.[287] In the *Technische Mitteilungen* it is described as consisting 'mainly of hemp, probably made by compression'. This support is presented as a versatile and stable base, both for oil, pastel and watercolour painting. It supposedly resists moisture and temperature changes without deformations, has a suitable base colour and can be used without a ground. At the time of writing of the article, in 1893, the material was commercially available in Munich.[288]

Although prepared fibreboards can be bought ready prepared rather cheaply, the following authors do provide their own recipes for their preparation (*see* Appendix 10).

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[282] De Montabert 1929, vol. 9: 132-3. Although De Montabert mentions cardboards covered with fine canvas, Callen provides a later date, writing that canvas boards are available for certain from 1878 on, possibly earlier, in the 1840s. Callen 2000: 28.
[283] Bouvier and Osborn 1845: 113.
[284] Carlyle 1991, vol. 1: 260-1, Carlyle 2001: 187-189. According to Gettens and Stout, one of the methods for creating a texture is to apply a sheet of paper to the wet ground and pull it off while the ground is still wet. Gettens and Stout 1966: 221.
[285] *Reeves and sons' amateurs' and artists' companion* 1852: 51-52.
[286] Edwards 1856: 15-16. In addition to 'millboards' and 'Academy boards', Carlyle 1991, vol. 1: 259-265 and Carlyle 2001: 187-90 provides a detailed description of the characteristics of the boards available in nineteenth century Britain. Carlyle mentions 'Etty boards', prepared with an absorbent ground. (*see* also Callen 2000: 27)
[287] To summarize the information provided about this new support: It is available in thicknesses similar to that of board, however also thin like paper for sketching and can be stretched on a strainer and used instead of canvas, to which it is considered superior on the basis of its strength and the fact that it does not sag. *Technische Mitteilungen*, nr. 166 (1893): 310.
[288] *Technische Mitteilungen*, nr. 166 (1893): 310.

Bouvier (1827) describes, as stated earlier, a single preparatory layer consisting of flour or starch paste. In order to prevent the board from deforming, Bouvier advises to nail it to a wooden board either before application of the paste or immediately after its application. This last order of working will result in a more flat and straight support.[289] Dietrich (1871) advises covering cardboard with a hot glue size layer, which is pumiced after drying. Then a layer of chalk and glue is applied, which is also pumiced. Finally a layer of oil paint completes the preparatory system. To protect the reverse of the cardboard against moisture, Dietrich advises a layer of asphalt varnish.[290]
The Winsor & Newton archive contains a number of recipes for the preparation of ground mixtures for millboards (*see* Appendices 10 and 16). Most of these recipes describe the use of animal glue 'size'[291] as a binder, mixed with a selection of fillers. One recipe describes the animal glue size layer: it is applied in six or seven coats to the front and in five to the reverse.[292] In another recipe the fillers of the ground layer are described: six parts chalk and one part 'powdered Bath brick', a light coloured aluminium and silicate containing clay which is called 'gritt' in another recipe from the archive.[293] The number of coats are not specified in this recipe, but another recipe in the archive hints that multiple coats may have been applied.[294] Yet another entry in the manuscripts shows that the ratio of 'gritt' to other ingredients may differ between layers: 'more .rit. [gritt] is put to the last two coats than to the first ones'.[295] At least in some cases the preparatory system is finished with an isolation layer, as in a recipe from the 'relic of old times 1833 P.01' recipe book, which describes the application of a 'thin coat of fine clear parcht [=parchment] size' to the millboard ground 'to bind it'.[296]

The fact that Winsor & Newton make economical use of their materials is evident from entries regarding millboards: 'never use size the least stale for the fronts and use all the bottoms of the mixtures for the backs',[297] and from a reference about using the 'returns' of the first coats of ground in later coats.[298]

[289] Bouvier 1827: 580-3.
[290] Dietrich 1871: 20.
[291] 'Size' in the Winsor and Newton recipes seems to refer solely to animal glue. *See* for instance W&N manuscript '13': 13P030 and 13P029L13: 'glue made into stiff size'; also W&N manuscript 13P039L01: 'sour glue made into size by boiling with Aq.'; W&N manuscript '7': 7PP239L01: 'glue made into size'; W&N manuscript '6': 06P009L10: 'single size', 'double size'.
[292] W&N manuscript 'A relic of old times 1833 . P.01', 183?-1876: REP032L16.
[293] *See* Paragraph 6.2 for more information on the nature and colour of Bath brick according to nineteenth century sources. A number of recipes in the Winsor and Newton Archive specify the use of 'gritt' without explaining its nature. However in this recipe, for a 1st preparation of millboards, the list of ingredients contains chalk ('whiting') and 'powderd Bath', while the procedure description reads: 'then the whitg & the gritt is added'. This demonstates that the terms 'gritt' and 'Bath brick' are both used for the same material. W&N manuscript 'A relic of old times 1833 . P.01', 183?-1876: REP024L03. *See* Chapter 6 for information about the nature of 'Bath brick'.
[294] W&N manuscript 'Omm Gathm No 6' 1833-46: 06P009L10 described a first and second layer.
[295] W&N manuscript 'A relic of old times 1833 . P.01', 183?-1876: REP043L08.
[296] W&N manuscript 'A relic of old times 1833 . P.01', 183?-1876: REP043L08.
[297] W&N manuscript 'A relic of Old times 1833 P.01', 183?-1876: REP029L15.
[298] W&N manuscript 'A relic of old times 1833 . P.01', 183?-1876: REP043L08.

5.5 The relation between the support and the preparatory system

Descriptions of the grounds advised for different supports in earlier paragraphs demonstrate that their preparatory systems differ. In Chapter 4, in the overview of preparatory layers during the preceding period, it was shown that then as well, depending on the nature of the support, different methods for its preparation were advised. This is by no means surprising, as the characteristics of the different supports will influence the preparatory system.

Dossie (1758) clearly demonstrates his awareness of the link between the nature of the support and the layers most suited to its preparation: **'**The substance or matter on which oil paintings are made, unless in very particular cases, are canvas, wood or copperplate. The preparation or covering of these, in order to their receiving the proper colouring, must be therefore different according to the different substance in question'.[299] But which differences are evident in the preparatory system and do they remain the same throughout the period under investigation?

The fact that stone and copper are described as sometimes being used without a preparatory layer is the most extreme example of the influence of the support. But differences are also found in the frequency with which size layers are advised and in the materials described for use as a size layer.

As has been noted before, prior to the nineteenth century size layers are described nearly always for canvas preparation but are absent from a large percentage of the panel preparation recipes. They are not described at all for the preparation of copper for painting, likely because aqueous or hygroscopic layers lead to corrosion of the copper metal. The frequency with which size layers are described for panel and canvas changes in the nineteenth century, when they are described less frequently for canvas than before. Differences are also found with regard to the materials advised for sizing: prior to the nineteenth century flour paste is not mentioned at all for panel sizing, while it features regularly in recipes for canvas size layers in North West Europe. Oil size layers appear more frequently in panel preparation recipes than in those for the preparation of canvas (*See* Figs. 6.2a and 6.2b).

Size layers are also described for paper and board preparation. In recipes for board preparation only aqueous size layers are described. For paper, both oleous and aqueous size layers are advised. While aqueous layers seem slightly more frequent, the low number of recipes prevents firm conclusions about the relative frequency of both types of size layers for this support.

A comparison between Figures 5.2 and 5.3 demonstrates clearly that differences also exist in materials employed for ground layers on canvas and panel. The most frequently described preparatory system for panel in pre-nineteenth century recipes is the double ground consisting of a layer of chalk and glue and a second oil-bound layer.

[299] Dossie 1758: 201.

Although this type of ground also features in canvas preparation recipes, its role is much smaller. For canvas preparation, no single type of ground clearly stands out as the most common type. Both recipes for single oil-bound grounds based on lead white, earth or clay are frequently described, while also double grounds consisting of two oil-bound layers, the first layer with earth pigments, the second based on lead white, often appear in the sources. It should be noted that while both these types of grounds also appear in recipes for panel preparation, for panel they play a smaller role.

The materials advised for canvas and for panel preparation change dramatically during the nineteenth century. Not only does the role of the 'typical' ground preparations advised by seventeenth and eighteenth century authors diminish, but the variety in preparatory methods increases enormously. New solutions are offered, some authors introducing previously unknown materials, others utilizing existing materials that have not been mentioned in recipes for preparatory layers before.[300]
While both for canvas and panel new materials are introduced, differences between both supports remain evident.[301]

If the information on fillers is eliminated from figures 5.2 and 5.3, and replaced with information on the type of binder, the roles played by oleous, aqueous and emulsion binders is more evident, whereas double grounds with an aqueous first layer are more frequent for panel preparation. Figures 5.4 and 5.5 are based on the same data as figures 5.2 and 5.3, but only show which type of binder is advised, oleous (yellow) or aqueous (blue). If the ground consists of two or more layers that are all oil-bound, it is also indicated as oleous, if all layers are aqueous the ground is grouped with the aqueous grounds. If the recipe advises a two layer build-up with a first aqueous layer and a second oleous layer, it is represented in horizontal stripes in yellow and blue in bar graphs 5.4 and 5.5.
Emulsions of oleous and aqueous binders appear as a blue and yellow checked pattern.
Comparison between the bar graphs for panel and canvas demonstrates that in general, the role of oleous binders (in yellow) is larger for canvas preparation than for panel preparation. Emulsion grounds (yellow/blue blocks) are described only in recipes for canvas preparation. Figure 5.3 demonstrates that for canvas preparation, single oil-bound grounds are important throughout the period, while double grounds with a lower layer of earth pigments in oil, covered by a lead white based top layer, are also regularly mentioned. During the nineteenth century, these grounds lose importance in favour of newly introduced materials and aqueous or emulsion-based grounds. In general, the role of oleous grounds for canvas seems to decease slightly during this time period.

While a double ground of chalk and glue followed with an oil-based layer is frequently advised for panel preparation, this type of preparation loses importance in nineteenth century recipes, where purely oleous or aqueous layers are also regularly advised (*See* Figs. 5.2 and 5.4).

[300] *See* Chapter 6 for a discussion on the introduction of new materials.
[301] The present research reaches a different conclusion here than Carlyle, who in her 1991 study of British handbooks wrote that generally the same materials are chosen for panel preparation as for canvas preparation. Carlyle 1991, vol. 1: 253; Carlyle 2001: 180.

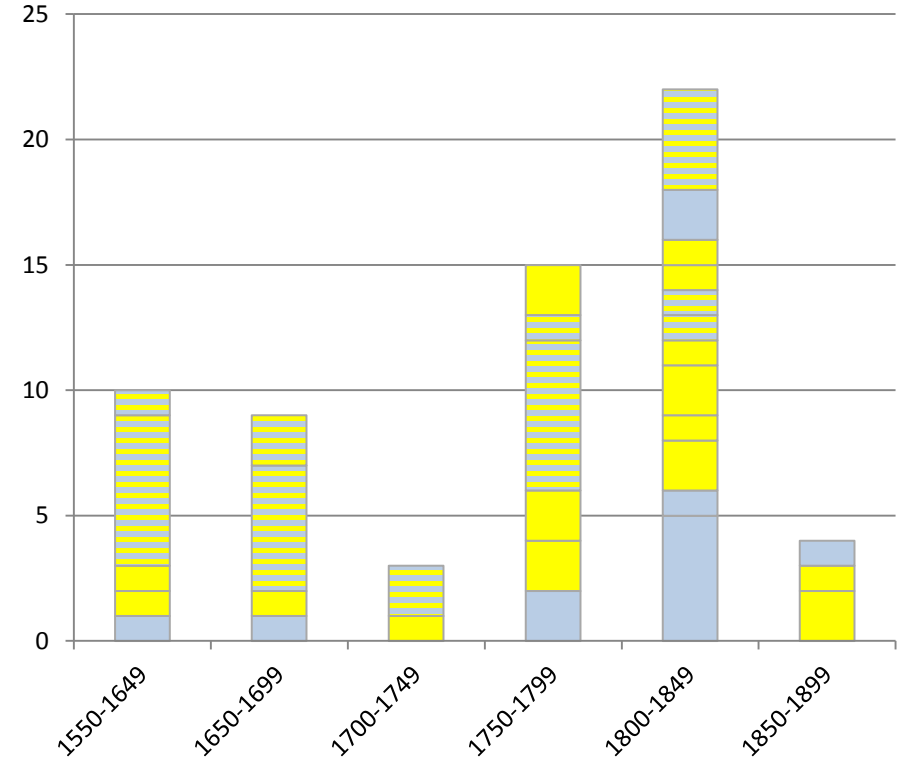

Figure 5.4 Binder categories in panel ground recipes

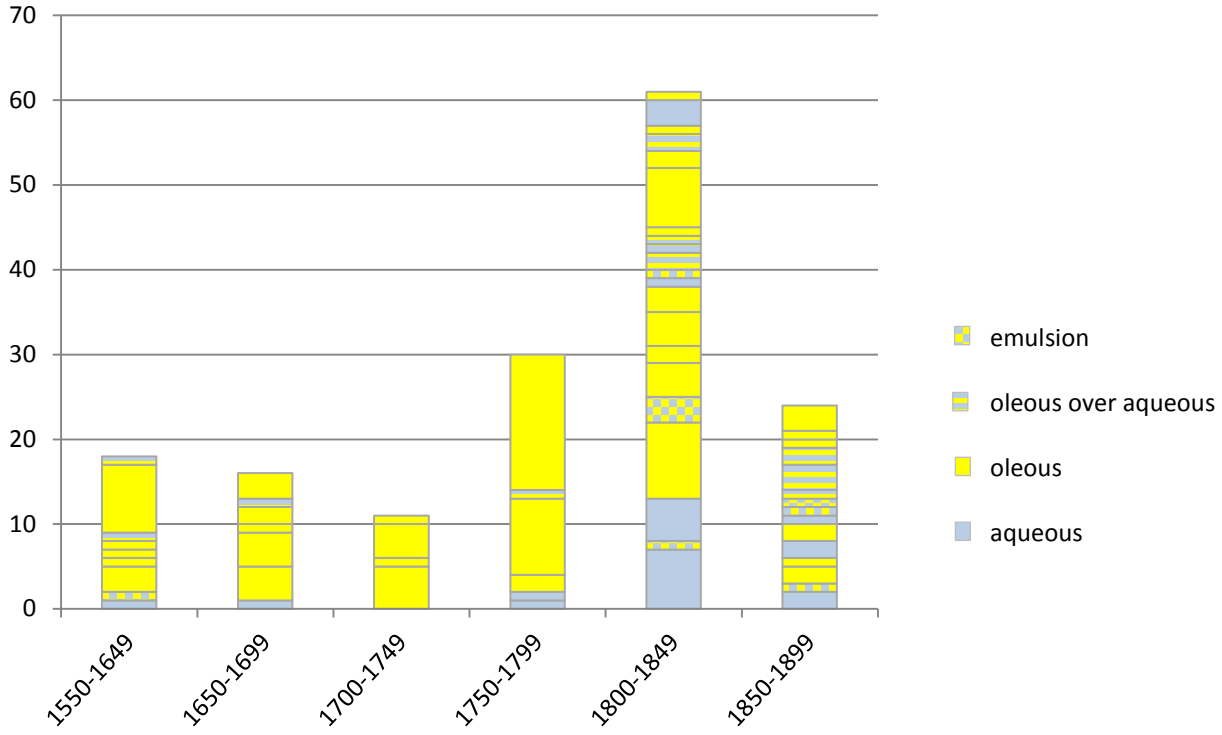

Figure 5.5 Binder categories in canvas ground recipes

These graphs are based on the data in Figures 5.2 and 5.3. For Figures 5.4 and 5.5, information on pigmentation and layer build-up has been omitted and replaced with information on the general binder category: aqueous, oleous, oleous over aqueous

Next to traditional materials, megilp, skimmed milk, casein, yellow soap, burnt (sheep) bones and zinc white are described in nineteenth century recipes. While casein and zinc feature both in recipes for panel and canvas preparation, megilp, skimmed milk and yellow soap are not described for panel preparation. Milk and soap also appear in recipes for board preparation.

Besides differences in materials, the layer build-up also differs, depending on the support. Throughout the period under investigation, single and double grounds both account for roughly half of the recipes for canvas and for panel, although the number of recipes for double grounds for panel seems to be slightly larger than for canvas preparation (*See* Figs. 5.2 and 5.3). In contrast, recipes for the preparation of copper, board and paper for painting usually advised a single layer. For copper, only single-layer oil- or varnish-based grounds are advised (sometimes consisting of more than one application, but of the same formulation).

In Chapter 6, the role of binders for different supports will be investigated further based on the role of the individual ingredients in canvas and panel preparation. Chapter 7 analyses comments on differences in the surface texture between canvas, panel and copper, and the possible reasons for authors to prefer each type of support. In this chapter attention is also given to a number of authors who state that on panel a more thickly applied ground is possible than on canvas. A ground on canvas would have to match the more flexible, bendable support, while a rigid panel does not require a similar flexibility from the preparatory layers.

Some authors draw attention to the smoothness of copper supports, however as demonstrated earlier, a number of recipes for preparatory layers on copper include advice to add a texture to the ground in order to raise its adhesive properties.

5.6 Concluding remarks

This chapter has placed the materials and the layer buid-up of preparatory layers in chronological order which allows us to investigate developments and identify trends. The resulting overview provides a wider context for previous research, both for recipe-based research and for data obtained by instrumental analysis. By including selected Italian and Spanish recipes, developments in North West Europe have been compared to contemporary currents in South Europe; differences (e.g. in the use of flour paste-based grounds) and similarities have been found.

A comparison between preparatory systems for different supports creates a deeper level of knowledge about the support-dependency of preparatory systems. While a difference was found between the frequency with which certain combinations of materials and layer build-up were advised, this comparison demonstrated that a certain overlap is also present.

This chapter furthermore demonstrated that recipes are a valuable source of information on additives, which are present in such small quantities that they might be overlooked or misunderstood in instrumental analysis. Recipe descriptions demonstrate that some minor additives are nonetheless considered important for the quality of the preparatory system. Authors' motives for the addition of certain materials offer unique information about the (intended) function of such ingredients in the preparatory system. Chapter 6 will explore the role of additives further, looking at the function of ingredients such as honey, garlic, treacle beeswax, turpentine, etc.

As introduced at the start of Chapter 5, its focus is chronology, and only little information about the material characteristics of the different ingredients and about application methods is included. Both these subjects are too substantial to include in a chapter on chronology, as their presence would obscure chronological developments. They require focused attention and are the topic of the next two chapters.