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

Stols-Witlox, M.J.N.

von sehr wechselnder Zusammensetzung, indessen scheint erwähnenswert, dass der Genannte in demselben Kaliumphosphate, in durch Wasser nicht ausziehbarer Bindung beobachtete, was darauf hinzudeuten scheint, dass das Chromphosphat Doppelsalze zu bilden vermag, die möglicher Weise von solcher Beschaffenheit sind, dass sie als Pigmente marktfähig wären. Der Preis dürfte in dieser Hinsicht nicht im Wege stehen.

Von erheblichen technischen Interesse scheinen indessen die Chromkieselphosphate und deren Doppelsalze mit den Phosphaten der alkalischen Erden. Unter Bedingungen, deren genaue Feststellung mir zur Zeit noch nicht möglich war, gelingt es Pigmente darzustellen, die von ganz ausserordentlicher Schönheit und Ächtheit sind. Da die technische Darstellung der Kieselphosphorsäure weit leichter ist, als die Darstellung dieses Körpers im Laboratorium, so wären die technischen Schwierigkeiten in der Herstellung wohl zu überwinden. Soweit meine Versuche über diesen Gegenstand reichen, ist aber die Bildung dieser Pigmente ein Vorgang von ziemlich complicirter chemischer Natur, da dieselben nur entstehen, wenn Bichromat in Gegenwart von Kieselphosphorsäure und Kalk- oder Bariumphosphaten durch Zucker reducirt wird. Fällung von Chromoxydsalzen mit Lösungen von Silicophosphaten führen zu keinen brauchbaren Resultaten.

Bolusjammer!

Das Durchwachsen des Bolusgrundes.

Originalmitteilung von Josef Schönbrunner, Inspektor in Wien.

In Nummer 125 der „Technischen Mitteilungen für Malerei" etc. findet sich unter obigem Titel eine Erscheinung besprochen und erklärt, mit welcher Auseinandersetzung Jedermann, der nur einigermassen imstande ist Dinge zu beurteilen und zu beobachten, sich gerne einverstanden erklären wird, und welche fürs Erste und insbesondere inbezug auf Rahmenvergoldung, welche mittelst rother Polimentvergoldung hergestellt ist, ihre volle Richtigkeit hat. Es wäre wohl hiernach kein Wort weiter über diese Sache zu verlieren, zumal es sich gewiss nur um „mechanische" Abscheuerungen handelt.

Was nun ferner über das sogenannte Durchwachsen des Bolus durch Ölgemälde hindurch ausgesprochen wird, ist gleichfalls unanfechtbar, weil meiner Erfahrung konform, gewiss nur die zu geringe Impastirung, welche, wenn einmal zersprungen (enaquelé), die Ursache des Rothwerdens ist, und den Bolus durchschimmern, aber auch durchquellen (durchwachsen) lässt, was des Nähern zu begründen, ich im Begriffe stehe.

Von hier an aber geht meine Ansicht nicht mehr paralel mit jener des Verfassers des in Rede stehenden Artikels, lediglich darum nicht, weil er Bolus- und Kreidegrund als gleichartig, d. h. als ganz neutral inbezug auf die Wirkung ansieht, von der eben sein Artikel handelt!

Das Bolus-Übel, wenn man diesen Ausdruck so gelten lassen will, kommt ja, und darin wird mir der gewiss scharfsinnige Verfasser (d. obig. Art.) auch Recht geben, nicht blos nur auf dünn gemalten (impastirten) Bildern vor, sondern es macht sich der böse Bolus*) sehr häufig auch auf stark impastirter Rücken nur zu sehr geltend, indem er dort oft die ganz alleinige Veranlassung zum fast gänzlichen Herabfallen der Farben ist.

Dieses Herunterbröckeln der Pigmente ereignet sich indess nur sehr selten bei gut gearbeiteten weissen Kreidegründen. (Bei Bolusgründen aber ohne Ausnahme immer.) Diese Erscheinung hat schon viele viele Restauratoren zur Verzweiflung gebracht, da man diesem Degenerierungsprozesse ganz hülflos gegenüber steht. Ich kenne wertvolle Bilder, die schon zur Hälfte auf neuen Grund gemalt resp. übermalt sind und noch ist das Übel des Abfallens nicht zum gänzlichen Stillstande gebracht worden, obgleich mehrere — insbesondere sehr grosse Bilder, fast ganz in Asphalt gebadet wurden etc. und man daher meines Erachtens dem sehr verdienstvollen Bouvier inbezug auf seine Klage über den Bolus durchaus beipflichten sollte, wenngleich ich auch kein Schwärmer für die stets gewaltthätigen Bentoilierungsprozesse bin. Der Bolus ist nun allerdings eine Thongattung, die aber leider eine als Malgrund böse Eigenschaft hat, fort und fort Feuchtigkeit aus der Atmosphäre aufzunehmen, wodurch auch noch das Bischen Bindemittel, das ihm beigemengt wurde, nach und nach degeneriert, so dass mit der Zeit der Bolus allen Halt verliert und zu Staub wird, und zwar merkwürdigerweise stets nur auf seiner der Lufteinwirkung ausgesetzten Oberfläche und dergestalt

*) Ich kann den Bolus nicht schlecht genug schildern, besonders als Malgrund, was wohl alle Restauratoren etc. gerne bezeugen werden.

Figure 10.1 *In an article in the* Technische Mitteilungen, *Josef Schönbrunner discusses the effects of reddish grounds in aged paintings.*

Technische Mitteilungen, *nr. 134, (1891): 194*

Photograph courtsey of the Netherlands Cultural Heritage Agency

Chapter 10 The ageing of preparatory layers

The subject of grounds is of the greatest importance to the future of the picture. Many of our finest works are suffering from want of due care in their preparation

Richard and Samuel Redgrave 1866[1]

As will be seen, the influence of preparatory layers on the stability and the degradation of an aged painting is acknowledged throughout the period investigated. This chapter explores the types of degradation described in historical recipe books, and establishes the causes that are identified by their authors. It aims to create a comprehensive understanding of artists' assessments and considerations regarding the ageing of their grounds as well as their views on the influence of specific ground materials.

10.1 The influence of the size layer

Comments about the effect of the size layer on the stability of the painting focus mainly on the hygroscopity of traditional animal glue size layers. Both for panel and canvas grounds, concerns are expressed about flaking or delamination due to swelling of the size layer in a humid environment.

Historical authors from the seventeenth century relate flaking both to the thickness of the layer and to the type of glue employed. Symonds (1650-2) advises to leave as little of the animal glue size layer as possible, 'because if you leave it, it will burst'.[2] The De Mayerne manuscript (1620-44) contains a number of warnings against the use of strong glue, said to result in delamination. Both the De Mayerne manuscript and the Volpato manuscript (c. 1670) also relate the use of strong glue to canvas shrinkage.[3]

Solutions that are offered in the sources include advice to apply only a thin size layer is issued both for animal glue size layers[4] and for flour or starch paste size layers.[5] Also the addition of plasticizers to animal glue and flour paste size layers is mentioned (honey,[6] glycerin,[7] oil[8]).

[1] Redgrave 1866, vol. 2: 591-2
[2] Symonds c. 1650-52 (edition Beal 1984: 219): 4v.
[3] De Mayerne 1620-1644: 7v, 87. Volpato c. 1670 (transcribed in Merrifield 1849 (1999): 729).
[4] For instance Pacheco 1649: 68; Symonds c. 1650-2 (edition Beal 1984: 219): 4v; *Complete Guide* 1841: 41.
[5] Volpato c. 1670 (transcribed in Merrifield 1849: 729); Palomino 1715, 1724, vol. 2 1724: 32.
[6] Examples of honey additions: de Mayerne 1620-44: 7v; Ms. Sloane 1990, 1623-44: 78-9; Bate 1633 (1654): 167; De Montabert 1829: 174. According to Palomino (1715, 1724), honey and linseed oil will in addition prevent flour paste from becoming mouldy. Palomino 1715, 1724, vol. 2 1724: 32.
[7] Church 1890: 72.
[8] Wiltschut manuscript 1726-9: 78

Alternatively, the size layer may be omitted[9] or replaced with oil,[10] casein,[11] shellac in ammonia[12] or with egg. Finally, reverse side protections or the use of a lined canvas are advised in nineteenth century sources. (*See* Paragraph 10.6)
Paradoxically, for canvas animal glue size layers are also said to have a degradation-prevention function. They provide a barrier that protects canvas from the corrosive effect of the oil from subsequent layers.[13]

10.2 The influence of ground ingredients

10.2.1 Seventeenth century advice against the use of specific pigments

Some seventeenth century sources issue warnings against the use of specific pigments in grounds, since they are thought to damage the colours applied on top. As discussed in Chapter 5, both the Ms. BnF Ms.FR 840 (1580-1600) and De Mayerne (1620-44) are afraid that verdigris in ground layers will lead to 'corrosion' resulting in sinking in of subsequent layers[14] or describe that the verdigris will 'kill'[15] colours applied on top. De Mayerne includes umber, minium and lamp black in the list of colours that should be avoided in preparatory layers as they will affect the colours applied on top.[16] Lebrun (1635) advises against umber and Félibien (1676) against minium, both for similar reasons.[17]

10.2.2 Problems related to the use of siccatives

Mérimée (1830) describes how the use of poorly ground litharge (lead II oxide) in earth-based oil grounds will lead to the formation of little 'grains' on the surface of a painting.[18] Lead acetate is criticized in a number of nineteenth century historical sources as it is said to induce colour change in the paints. Efflorescence on the surface of paints mixed with lead acetate is also mentioned in later nineteenth century British sources.[19]

10.2.3 Nineteenth century concerns about the effect of lead white

German author Leuchs (1825) as well as several later nineteenth century British sources discuss the influence of air pollution[20] on the stability of lead white: Leuchs writes that

[9] Pernety 1756: lxcij.
[10] Dossie 1758: 202-3. Dossie's reasons are discussed in more detail in Paragraph 5.2
[11] Vergnaud 1831: 138-9.
[12] W&N manuscript 'Omnm Gath No 12', 1836-50: 12P039L17. Shellac in ammonia is suggested as an addition to animal size in recipe 2P012L18 of the same manuscript, where the author wonders if it is a successful method to make the sizing insoluble in water.
[13] In Chapters 6 and 11, comments to this effect from the Volpato manuscript, W&N recipe book 'Omnm Gathm 03' 1809-44: 03P043L13; Sully 1809-71: 046 and Vibert 1892: 100-103 are quoted.
[14] BnF Ms.Fr 640 c. 1580-1600: perso 8.
[15] De Mayerne 1620-44: 98v.
[16] De Mayerne 1620-44: 28; 98v.
[17] Lebrun 1635 (transcribed in Merrifield 1849 (1999): 812); Félibien 1676: 410-1.
[18] Mérimée 1830: 242-3.
[19] Carlyle 1991, vol. 1: 62-8; Carlyle 2001: 42-6.
[20] Although air pollution does not draw the same amount of attention in contemporary continental sources as in British manuals, environmental issues associated with the pollution of the air are also described in Germany. According to the review of historical and modern literature on pollution in Germany by Cioc (1998), air pollution due to the use of coal is reported on in central Germany in the second half of the

lead white will react to form a black compound in rooms with sulphur containing gasses.[21] Late nineteenth century English authors warn that chemical reactions induced by polluted air can have an effect on the colour of a ground. Carlyle in her study of British Nineteenth Century manuals discusses this topic in detail.[22]
The reaction authors are referring to is the transformation of lead white to black lead sulphide through a reaction with sulphur from the air. Some authors suggest introducing other white pigments in preparatory layers; apparently a move to differently coloured grounds is not considered opportunous.

Carlyle mentions Scott Taylor (1890), who criticizes the use of lead white in grounds. In a discussion of the use of gesso and the excellent ageing characteristics of this material, Scott Taylor expresses doubts about the suitability of lead white for grounds, writing that 'it will seize every available opportunity of deteriorating in colour, and will utilize to this end every possible influence both from the back and front of the picture'.[23] Church (1890) also writes about the discolouration of lead white grounds, 'especially in the dark',[24] and Carlyle quotes Standage (1892), who explains that 'the lead base is liable to react chemically on paints spread over it, and also because it absorbs sulphurous fumes and darkens thereby, which darkening cannot fail to dim the brilliancy of light colours and delicate hues'.[25]

One of the few alternatives for lead white in an oil ground is zinc white, a pigment which did not compare favourably with lead white with regard to its hiding power.[26] Carlyle notes the introduction of zinc white with a 'greater density' by Winsor & Newton (as a watercolour pigment) in 1834 and introduces Martel (1859), who describes the use of zinc white in oil paint.[27] Carlyle writes, 'zinc white grounds as an alternative were not suggested until well near the end of the century'.[28] She quotes recipes including zinc white, which are provided by amongst others Church (1890), Vibert (1892) and Standage (1892). In these recipes the zinc white is sometimes applied on top of a lead white ground, a practice described by both Church and Standage,[29] alternatively it is 'dusted' over a wet lead white ground,[30] or used in a mixture with lead white, as discussed by Standage.[31] Standage suggests other pigments to replace lead white in grounds, such as barium sulphate, silica, or zinc sulphide in an oleoresinous medium. Alternatively he considers the

---

nineteenth century. Cioc 1998: 105-124. Pollution is mentioned as one of the major causes of sulphur in the air in British nineteenth century manuals, as discussed by Carlyle 1991, vol. 1: 350 or Carlyle 2001: 260. Carlyle writes that bituminous coal was burned in London. This has a high sulphur content. Cioc's review demonstrates that pollution was a concern not only in Britain, although the industrial revolution started earlier there than in some continental countries, therefore problems may have been more severe.

[21] Leuchs 1825: 42

[22] Carlyle 1991, vol. 1: 350-3; Carlyle 2001: 172-3.

[23] Scott Taylor 1890: 40-1.

[24] Church 1890: 26.

[25] Standage 1892: 73.

[26] Although some tests by artists may have been carried out during the nineteenth century, titanium white is introduced as a white pigment for artists paints only after 1916. Eastaugh et al. 2008: 370.

[27] Carlyle 1991, vol. 2: 274-5; Carlyle 2001: 516-7.

[28] Carlyle 1991, vol. 1: 241; Carlyle 2001: 172-3.

[29] Church 1890: 26; Standage 1892: 73-4.

[30] Also Church 1890: 26. This probably refers to the yellowing of an oil binder in the dark. *See* Carlyle et al. 2002.

[31] Standage 1892: 28.

use of a drying oil of a neutral acidity, to prevent or slow down the degradation of the lead white. However Standage does not provide any detailed preparation instructions for the use of these compositions.[32] Vibert (1892) advises to employ zinc white in casein and in resin varnish.[33]

Recipes from the Winsor & Newton archive show that this company first considers the suitability of zinc white for oil grounds much earlier in the century, before 1850. A manuscript dated 1836-50 contains a note about a zinc white that is available from Brown in London, the 'agent for the french Manuf. of zinc Wte'. The last line of the note reads: 'if ground in oil … this might probably be useful in Canvass priming'.[34] Indeed, a recipe dated 1854 lists zinc white as a ground ingredient.[35] There are two additional occasions where zinc white is mentioned in Winsor & Newton recipes, one is a recipe titled: 'Canvas Prepd for Oil Painting without the use of Oil or Lead' in a manuscript dated 1844-93 (with the main entries dated 1844),[36] and the other is a recipe for canvas priming that appears in a manuscript dated between 1850 and 1853.[37]

10.3 The influence of ground colour

The influence of ground colour on changes in the tonal balance of a painting during its ageing, is an important and recurring topic in historical recipe sources. Discussions mostly focus on the difference between whitish and dark grounds. De Piles, firmly rooted in the Academic tradition in France and author of several more theoretical discourses on painting besides his *Elémens de la peinture pratique* (1684), draws attention to the merits of white preparatory layers in his comments accompanying the 1673 translation from Latin into French of Du Fresnoy's art theoretical treatise *l'Art de peinture*. In his comments, De Piles states that all great colourists, like Rubens, painted on white grounds:

> All those who have coloured well, had another method to keep their colours fresh, alive & bright;[38] this was the use of white grounds, upon which they painted, & often even in one go, without retouching anything, & without using new colours. Rubens always employed them; & I have seen paintings from the hand of this great man that were made in one go, which had a wonderful liveliness. The reason why these excellent colourists used these

[32] Standage 1892: 78-9.
[33] Vibert 1892: 186-8, 193.
[34] W&N manuscript 'Omnm Gath No 12' 1836-50: 12P031L04, 12P031L07.
[35] W&N manuscript 'P.09' 1846-54: 9PP015.
[36] W&N manuscript 'P.09'1846-1854 1844-93: 9PP015. In this recipe for canvas preparation zinc white and megilp (beeswax, turpentine, double mastic varnish) are mixed into a paste, which is troweled over the sized cloth.
[37] W&N manuscript '16' 1850-53: 16P029L23. This is a recipe for a 'miniature ground', made of collodium with zinc oxide.
[38] The French words used in the original recipe are 'fraiches, vives & fleurie'. Although 'fleurie' literally translates as 'full of flowers', this term is not used in English.

types of grounds, is that the white always conserves a brightness below the transparent colours[39]

On such grounds, De Piles writes, transparent glazes remain more lively because they will protect the white ground from alteration by the air, while the white ground in turn will 'repair' the damage that the air causes to the glazes themselves.[40]
De Piles has noticed that around his time of writing, white grounds have fallen out of use and he wonders why. He offers several possible explanations: maybe painters have lost interest in 'bien colorier' ('colouring well')? Or they dislike the fact that a sketch applied to a white ground requires more working up before it presents a three dimensional effect or a unified image. Maybe painters do not have the patience to wait until they have covered up the white ground, which would, by its brightness, overpower the other colours. 'Maybe this requires a patience greater than that of the French', De Piles writes.[41] It is certain that De Piles is much in favour of light ground colours, although not necessarily stark white. In his *Elémens* (1684), De Piles advises beginning painters to start painting on a soft middle tone because on this base colour a three dimensional effect is quickly created. He considers a middle tone easier to paint on than a cooler ground tone. But De Piles advises a lighter greyish colour for the more advanced painter, since 'the colours are conserved more freshly on those'.[42] De Piles does not explain why he does not advise white.

In order to fully understand De Piles's advice, one has to consider its context, the dispute between art critics and artists who place most emphasis on *disegno*, a term that may translated as the conception, outline or composition, and those who consider *colore*, a focus on the qualities of the artist as a colourist, the most important criterium for brilliancy in painting. The fire of this dispute, which had started in sixteenth century Italy, is rekindled in Paris during the second half of the seventeenth century.[43] De Piles belongs to the *colorists* and in his essays supports the importance of *colore*. This is very clear in his

[39] De Piles 1673 (comments on Du Fresnoy): 215-8. The 'another method', referred to in the recipe, is the advice not to 'torment' the paints once applied by touching them after application, since otherwise 'the freshnesh of the colours dies & loses strength'.
[40] 'le blanc conserve toujours un éclat sous le transparant des couleurs, lesquelles empeschent que l'air n'altere la blancheur du fonds,de même que cette blancheur repare le dommage qu'elles reçoivēt de l'air; de maniere que le fonds & les couleurs se prestent un mutuel secours, & se conservent l'un l'autre'. De Piles and Du Fresnoy1673: 215. An interesting theory; although glazes could possibly have an effect on the degradation of a white ground layer by the air, De Piles' theory that the ground would counteract or repair the effects of ageing on the glazes is not supported by modern research on paint degradation.
[41] De Piles in fact writes: 'ou que l'ébauche commencée sur le blanc ne se montre pas assez viste, & qu'il faut avoir une patience plus que Françoise, pour attendre qu'elle soit achevée, & que le fond qui ternit par sa blancheur l'éclat des autres couleurs, soit entierement couvert, pour faire paroître agreablement tout l'ouvrage.' De Piles and Du Fresnoy 1673: 215. By this De Piles means that on a white ground, three dimensionality is more difficult to create than on a ground with a middle tone, where by simply sketching in dark lines and adding some highlights, a convincing three dimensionality is quickly created.
[42] De Piles 1684: 62-3.
Several modern authors have noted a transition to lighter, whitish or light grey grounds. Noble noted such a transition in Dutch paintings in an investigation of paintings in the collection of the Mauritshuis, The Hague, although ochre or reddish coloured grounds do not disappear completely (Noble 2004: 331). Also an investigation of the work of Van Huysum shows a transition from dark to lighter coloured grounds (Dik and Wallert 1998: 391-414). Carlyle notices a transition to lighter ground colours during the first half of the nineteenth century in British sources (Carlyle 1991, vol. 1: 247-9; Carlyle 2001: 177).
[43] Gage 1993: 117 e.v.; Morizot 2008.

writings, which are an obvious attack on *disegno*-supporters, and may have influenced his preference for whitish grounds.

Also other seventeenth century French authors mentioned in this thesis (Lebun, Félibien, Dupuy du Grez) take sides in this dispute and express their opinions on the relative importance of both design and colour. In the treatises of Félibien and De Piles, special note is made of the absorbent qualities of white distemper grounds, which due to their absorbency are said to be able to draw out superfluous oil from the oil paints applied on top, thus preventing yellowing. Through continued copying of these recipes in later sources, the dispute between design and colour appears to influence writing on preparatory layers for oil painting well into the eighteenth century. It is conceivable that although not an immediate effect of the writings of De Piles, Félibien and others who are of the same mind, the reappearing comments on the merits of light grounds may have influenced the gradual change that took place in ground colour during the seond half of the eighteenth century. (*See* Chapter 8 on ground colour)

In the second half of the eighteenth century a number of authors express concerns about the effect of strongly coloured ground on the tonality of aged paintings. French painter Jean Baptiste Oudry (1686-1755) complains that on brown-red grounds halftones disappear and shadows lose all detail.[44] Oudry does not believe that white grounds are the solution. In his view, white grounds also cause problems when the paint ages and becomes more transparent. On a white ground, the shadows will disappear completely, Oudry explains, because they are usuallly painted more thinly than the lighter areas. 'This would leave no other solution than to repaint them completely'.[45] Unfortunately Oudry remains rather vague about the most suitable ground colour, describing it as 'a half tone composed from soft and pleasing colours' ('demie-teinte compose de couleurs moelleuses et liantes').[46]

Apparently by Oudry's time it has become clear that the reddish or brown grounds used during the seventeenth century, in particular by Italian and Spanish painters, do not age well. The 1777 *Nieuwen verlichter* complains how 'the colour of the ground always appears and deafens … the colours which are put on top, especially when there are different ones and if they are not laid on too thick'.[47]

The increased impact of the ground colour in an aged oil painting is discussed by several authors, which shows that it is considered a real concern. The *Practical treatise* (1795) explains that:

> When the cloth is of a dark or bad colour, there must be a strong body of colour laid all over the shadows, such as will not sink into the ground, but appear warm, and a little

[44] Oudry 1752: 108. This problem did not stop eighteenth century Italians like Canaletto and early eighteenth century Dutch artists from using strongly coloured grounds (Plesters 1968: 264; Groen 1996: 361)
[45] Oudry 1752: 108.
[46] Oudry 1752: 108. Instrumental analysis shows that Oudry often uses a pale, yellowish brown layer (lead white, calcium carbonate, yellow iron oxide earth, charcoal), applied thinly over a brown-red first ground in his paintings. This layer acts as a middle tone in the final painting. Phenix et al 2009: 98.
[47] *Nieuwen verlichter* 1777: 167-68.

> lighter than life, so that is may be of the same forwardness to finish, as if it had been a light ground.[48]

Cawse (1822) considers dark grounds most destructive for *light* colours. He feels that the 'whitest and light colours sink into the grounds upon which they are laid'.[49]
As noted by Carlyle (1991, 2001), the influence of dark ground colours is also alluded to by several nineteenth century authors, who claim that this type of degradation had destroyed many wonderful paintings.[50] The paintings of the Italian and Spanish Baroque artists and by French artists Poussin and Lebrun are often mentioned as examples of this type of degradation.[51] In 1827 Bouvier writes:

> I do not intend to ignore that many old painters have painted on grounds, made with pure red ochre, because it is was a pigment, which was much more innocent than lead white; but with what result? After a half or whole century their paintings have become brown; for because the ground made of pure red ochre was too dark, it has bit by bit moved through the colours of the painting: an effect, which always presents itself after some time has elapsed, this is what has taken away the brilliance and freshness that the painters Lebrun, Poussin, and many other artists had given to their beautiful works.[52]

Osborn (1845) describes the problem as follows:

> Many of the most celebrated painters, both Italians and Flemings, in avoiding the coldness of a white or a grayish ground for their subjectiles, have gone into the other extreme by choosing one of light or of deep red ochre. Hence their pictures have darkened. There are several examples of this effect in the productions of two celebrated French painters who adopted the same usage, Poussin and Lebrun: their works, especially those of the former, are almost entirely disfigured by this brown tint, which has made its way through their carnations and even all the rest.[53]

By advising lighter colours or cooler tones, authors hope to prevent the problems associated with dark grounds. A study of artists' manuals shows that opinions on the best alternative to dark toned grounds differ. A number of late eighteenth and early nineteenth century authors advise the use of white grounds.[54]

---

[48] *Practical Treatise* 1795: 92-3.
[49] Cawse 1822: 11.
[50] Carlyle 1991 vol. 1: 249; Carlyle 2001: 178.
[51] *See* for instance Bouvier 1827: 571-2; De Montabert 129, vol. 9: 161-2; Mogford 1851: 33-4; Gullick and Timbs 1859: 219; Muckley 1882: 65-6; Vibert 1892: 109.
[52] Bouvier 1827: 571-2.
[53] Osborn and Bouvier 1845: 277.
[54] Pernety 1756: 295-6; Dutens 1779: 62; *Golden Cabinet* 1793: 112; Van Leen c. 1800: 18; *Compendium* 1808: 216; Jahn 1803: 46; Fokke Simonsz 1803-4: 84-5; etc.

Sarsfield Taylor's 1839 introduction to his English translation of Mérimée's 1830 treatise applauds the transition to lighter colours that he notices has taken place. The author sounds relieved that 'white or cream-coloured grounds, slightly absorbent, either on panel or cloth, have lately come much into use', as 'these grounds never devour the colour, as the dark grounds do in time, but aid the brilliancy of the tint, by taking off the redundant oil, &c. and give an evenness of tone by time'.[55] Blockx (1881) in Belgium writes that he would 'not even advise the addition of a small amount of ochre' to lead white tinted grounds, since the effect of a yellowish ground in an aged canvas can be disfiguring.[56]

Irish painter Barry (1848) states in a lecture read to the Royal Academy in London:

> The best mode of practice, then, is that of employing stiff body colour on a white ground, or on one nearly approaching it, as was the custom of Titian, Rubens, Vandyck, and the other good colourists. From this you work down, proceeding darker and darker, and reserving your transparent colours and darkest touches and tints for the last. By this method, if you do not otherwise prevent it, the effects of time upon your work will be rather for its advantage and its greater brilliancy, than the contrary.[57]

Other nineteenth century authors include descriptions of the painting technique of Italian masters like Titan and Raphael in their discussions about ground colour. Gullick and Timbs (1859) write how Raphael worked on grounds composed of pipe-clay and chalk and how Claude Lorrain painted on similar grounds, with the effect 'that we find the skies, distances, and delicate passages as clear as the day they were painted'. The authors conclude: 'Nothing, indeed, is better established than that white grounds are in every way preferable'. This strong statement is tempered somewhat, however, when they continue to say that it does not matter whether the brightness is produced by the ground itself or in later stages of painting. To illustrate, they give the example of Titian. They state that Titian used white opaque paints over dark or red grounds, which he then covered with glazes. This they consider an alternative method to produce the effect of 'light within' ('luce di dentro').[58]

Interpretations of historical painting techniques differ. While Gullick and Timbs quote Titian as an example of a painter who employs dark or reddish grounds, other authors were quoted above who are convinced that Titian and other famous colourists painted on white grounds.[59] Yet other nineteenth century authors believe that Titian employed slightly coloured preparatory layers. Montabert (1829) writes that artists like Titian never painted on an 'absolutely uncoloured and cold' white. This information he uses to support his own advice to paint on grounds with the colour of 'dirty ivory'.[60] He prefers this colour to white, since he fears that a white ground will dull the vividness of some colours applied

[55] Sarsfield Taylor in Mérimée 1839: 345-346.
[56] Blockx 1881: 4.
[57] Barry 1848: 214-5.
[58] Gullick and Timbs 1859: 219.
[59] Also Sully (1809-71) is convinced that Titian painted on white grounds. (Sully 1809-71: 104).
[60] De Montabert 1829, vol. 9: 181.

on top.[61] Standage (1892) quotes Merrifield (1849) on the subject of ground colours employed by 'the ancients'. He writes that she states that ancient paintings are executed on yellow or white grounds.[62]

The fact that even during the last decades of the nineteenth century the effects of red earths in grounds still stir the emotions is demonstrated by a series of articles on the topic of the degradation of red bole grounds in the German periodical on painting techniques *Technische Mitteilungen*.[63] This series of articles discusses the precise reasons why red bole grounds would obscure paintings. The first article on red bole ground appears in 1885. It is actually mild about reddish grounds, the anonymous author stating that the reputation of red bole grounds is worse than the material deserves.[64] A second article, by Mathes (1891), a restorer, agrees with this opinion and hypothesizes that the 'rising through to the surface' of a bole ground is caused by increased transparency of the paint; the bole is not the cause of the problem.[65] According to Josef Schönbrunner, who writes an article in issue 134 (1891), this theory is entirely wrong.[66] He states in his article titled 'Bole lamentation!' ('Bolusjammer!'), that the hygroscopicity of the bole attracts moisture from the air. This moisture subsequently destroys the oil binder, which causes the ground layer to pulverise, and this results in bubbles forming below the paint layers.[67] In 1892, Mathes responds to Schönbrunner's article. Mathes again stresses that the bole is innocent and blames insensitive restorations with aqueous cleaning agents for the bad state of preservation of a number of paintings executed on bole grounds.[68] In 1895, Dr. Büttner, owner of a salt factory ('Pfänner' is his profession), again shifts the balance against bole grounds in his article called 'the 'evil' bole ground' ('Der 'böse' Bolusgrund'). Büttner agrees with Schönbrunner on the hygroscopicity of the bole. He reports on a series of tests: he made bole grounds and exposed them to humid air in the washing house. From these experiments Bütther concludes that the degeneration of the binder changes the colour of the bole ground into a 'cold, dull but more intense red', a colour which completely destroys the tonal balance of a painting. Büttner reports on his attempts

[61] De Montabert starts his exposé on ground colours by saying that the ground colour always influences the final effect of a passage and that it will for that reason differ depending on the subject. Considering this, he wonders whether it would not be better to vary the colour of the ground locally. However, he says that he acknowledges that earlier painters always painted on a uniformly coloured ground because the tone of the ground creates harmony. Because this monochrome underlayer needs to fit with all colours of the painting, a strong tone is avoided, with the result that out of the fear of the effects of coloured grounds, painters now generally prefer very white ('très-blanche') grounds. Although De Montabert does not think this is a bad idea, he does believe that the white underlayer has severe drawbacks: its whiteness can overpower the liveliness of some colours applied on top or may result in 'mistakes'. Therefore De Montabert prefers a middle tone, which he describes as the tone of a slightly dirty ivory spatula. De Montabert 1829, vol. 9: 180-1.

[62] Standage 1892: 74-6.

[63] 'Bole' is interpreted in a rather wide sense by the *Technische Mitteilungen*. A description of 'Bolus' in issue 6, 1885: 20, shows that the group of materials described as 'bole' included siena and umber, as well as other earth pigments.

[64] An anonymous author in the *Technische Mitteilungen*, nr. 6 (1885): 20, writes: 'Wir halten denselben jedoch für nicht so bedenklich' ('We consider it [=the red bole] however not as doubtful'). The article refers to an earlier article by F. Tolmei in 1884, issue 1. In this article, Tolmei advised against the use of bole in ground preparation.

[65] N. Mathes in *Technische Mitteilungen*, nr. 125 (1891): 106-9.

[66] The header of the article identifies Schönbrunner as 'inspector in Vienna'. Unfortunately no additional information on Schönbrunner could be found. It is not certain of what he was the 'inspector'.

[67] Schönbrunner in *Technische Mitteilungen*, nr. 134 (1891): 194-5.

[68] Mathes in *Technische Mitteilungen*, nr. 144 (1892): 78.

to restore the original more subdued reddish tone of the bole ground with copaïva balsam and by exposing his paint-outs to alcohol vapours, following the methods of Max von Pettenkofer.[69] He declares these experiments to be successful.[70] Büttner seems to be the last voice heard in the discussion on bole grounds, as no subsequent articles appear. Together these articles show that late nineteenth century art professionals are still interested in the problems associated with the use of red grounds and try to find explanations, and cures.

There is one other German writer whose comments about reddish 'bole grounds' should be mentioned. In his book on the technique of oil painting, Ludwig (1893) discusses the problem in detail.[71] His comments reveal that apparently the binding medium of reddish grounds has also been the topic of debate, as he starts by explaining that contrary to what had been suggested recently by others, reddish bole grounds do not have an aqueous binder.[72] This he claims to know for certain based on his observations of painting techniques, observations that do not fit with the use of an aqueous ground. In particular the fluid underpaintings he sees in these paintings would not be possible on an absorbent ground. Ludwig explains that while both on light and dark grounds the paints become more transparent, this results in paintings on a dark ground becoming darker and paintings on a light ground become lighter. The degradation of paintings on a light ground he perceives as less disturbing. Ludwig adds that the degradation on dark grounds is aggravated because of the different painting technique required on a dark ground: on a dark ground, paints must be applied in thicker layers to cover. As result more oil is used. It is the oil that darkens and results in a more muddy appearance. That is why, according to Ludwig, thick paint layers on a dark ground change more than thin layers on a light ground. The only solution, according to Ludwig, is that: 'straight from the beginning, no excess of oil or of oil paint must be applied to the painting surface!'[73]

10.4 The influence of ground absorbency

10.4.1 The stability of aqueous grounds and their role in preventing paint discolouration

As early as the sixteenth century, recipes discuss the effect of the binders of preparatory layers on the stability of paintings. As will be seen, sixteenth century comments focus on the delamination and flaking of aqueous ground layers, in particular of chalk and glue layers. From the seventeenth century onwards, recipes also focus on the influence of ground layer absorbency on colour changes in aged paintings (*see* Fig. 2.2b).

[69] *See* Schmidt 1990: 30-76 for more information on the regeneration methods introduced by Von Pettenkofer.
[70] Büttner in *Technische Mitteilungen*, nr. 18 (1895): 1-2.
[71] Ludwig points out that a reddish bole ground in a painting do not necessarily contain Armenian bole, but that also reddish earth based grounds are sometimes called 'bole grounds'. Ludwig 1893, vol. 2: 210.
[72] No nineteenth century sources have been found during this PhD research that suggested the use of aqueous binders for bole grounds. The only recipe found is dated much earlier. It appears in the anonymous recipe book, Frans Hals Museum, 1650-1700: 5.
[73] Ludwig 1893, vol. 2: 214: 'Summa summarum, gegen das Nachdunkeln und Trübwerden durch Oelüberschluss git es nur ein Mittel, welches der gesunde Menschenverstand schon den Alten lehrte und heute noch jedem Vernuftigen lehrt: Man bringe gleich von Anfang an und überhaupt keinen Oel- und Oelfarbenüberschluss auf den Bild!'

While a thick glue-based preparation is generally considered to be relatively stable on panel, the same layer applied to canvas is thought to lead to adhesion problems due to the incompatibility of a relatively brittle preparation with the more flexible canvas support.[74]
Throughout the period under investigation, a number of alternatives to chalk and glue are suggested: either the glue binder is replaced by a mixture containing flour paste or starch paste,[75] or the layer thickness of the chalk and glue layer can be reduced. For example the Volpato manucript (c. 1670-1712) advises a thin layer of gesso for canvas preparation[76] and Palomino (1724) indicates the importance of a thin priming to prevent flaking.[77]

Considering the fact that many authors quoted in this thesis warn of flaking of aqueous preparatory layers when applied to canvas or discuss methods to prevent flaking, it may seem strange that sources would continue to provide recipes for the use of aqueous binding media in grounds for canvas. There must have been a more important argument in their defence. Possibly this is the absorbent nature of aqueous grounds. The hypothesis that their absorbent qualities are the main reason why authors tolerate ground preparations that come with the risk of flaking, is supported by a number of seventeenth century sources who indeed mention the beneficial effect that an aqueous preparatory layer can have on the brightness of the colours of oil paint applied on top. Symonds (c. 1650-2) is the first author within the period to introduce this idea. He writes that a glue-based ground on canvas will result in colours that remain extremely fresh with age, as 'Those clothes that have gesso in the impr. [=imprimatura] the gesso makes the colour keep fresher & does drinke up the malitia of the oyle'. Symonds also mentions their main drawback: 'they crack sooner & that is the worst of the gesso'.[78]

Félibien (1676) goes even further than Symonds and claims that if painting were possible *without* a ground, the colours would remain even more beautiful. Félibien is convinced that Titian and Veronese, whose colours he admires greatly, painted on canvas prepared with aqueous grounds ('distemper'). The reason for the excellent state of the colours in these paintings is, according to Félibien, the fact that their distemper grounds have attracted and absorbed the oil present in the paint. This has allowed the colours to remain

[74] Possibly the higher moisture response of canvas also plays a role. This argument is however not seen in historical recipes. More recent recipes for the use of protective layers applied to the reverse of canvas supports (*see* Paragraph 10.7) do mention the damaging effect of moisture penetrating the canvas through the back. Although in a comparison of the use of chalk and glue layers on canvas and panel authors often point to the greater chance of flaking of such layers on canvas, a relatively small number of authors also associate the use of aqueous layers on panel with flaking. De Mayerne (1620-44: 99) writes that he prefers an oil-based ground for panel to a preparation with animal glue and chalk. Dossie (1758: 203-4) condemns all hygroscopic preparatory layers, both for panel and canvas, and suggests the use of drying oil and oil paint instead. He fears both for the adhesion between support and ground and between ground and paint layers. Dossie 1758: 201. As noted in Chapter 5, Hampel (1846: 26) advises oil varnish, Blockx (1881: 31) oil.
[75] Flour or starch paste in canvas preparation is mentioned in a considerable number of recipes for the preparation of canvas, *see* Appendix 6c to 6e. The next paragraphs describe advice by Italian and German sixteenth century sources on the use of flour or starch paste in canvas preparation.
[76] Volpato manucript c. 1670 (transcribed in Merrifield 1849 (1999): 731).
[77] Palomino 1715, 1724 vol. 2 1724: 34-5 (translated in Veliz 1986: 152)
[78] Symonds c. 1650-52: f4 (transcribed in Beal 1984: 219). On folio 10, Symonds makes another note about a painting: 'painted on a cloth that was imprimed, wth nothing but the colla & restano freschissimi i colori.' Symonds c. 1650-52: f10 (transcribed by Beal 1984: 218). However in this quote it is not clear whether Symonds is discussing a canvas that is only sized with animal glue, or whether he intends to describe a ground layer that was bound with animal glue.

more beautiful because it is the oil that 'kills their liveliness'.[79] Félibien expresses his disappointment that first ground layers of distemper are by his time of writing hardly used, he believes this is because of their tendency to flake and the fact that canvas thus prepared cannot be rolled.[80]

Chapter 5 demonstrated that notwithstanding Félibien's claim that aqueous grounds are hardly used, seventeenth century recipes do describe chalk and glue layers for canvas preparation, sometimes in combination with a second oil-bound ground layer. Although in these recipes no reference is made to a possible effect on colour preservation, their composition makes them relevant in the present context.

To briefly recollect these seventeenth century recipes: chalk and glue first ground layers are advised by the anonymous author of the manuscript Sloane 1990 (c. 1623-44) in two recipes for canvas preparation,[81] in a recipe by Salmon (1672),[82] and an anonymous Dutch recipe book, dated in the second half of the seventeenth century, advises the use of a layer of glue and red bole as a canvas preparation.[83]

Two of the three South European seventeenth century sources that discuss aqueous layers are critical of their use. Pacheco (1649) writes: 'But experience has taught me that all preparations of gesso, flour, or ash get moist and rot the linen in time, and what was painted there flakes off'. Instead he advises an oil-bound clay ground.[84] The Volpato manuscript (c. 1670-1712) is even stronger in its condemnation: the anonymous author writes that to use gesso on canvas is to tempt fortune. In his opinion, only very thin layers of gesso can be used, since thick layers would without doubt lead to flaking.[85]

During the second half of the eighteenth century, aqueous layers are advised for canvas preparation in a number of sources, alongside the more frequently mentioned oil-bound preparatory systems (*see* Appendices 6c and 6d, Fig. 5.3). Dossie (1758) is rather exceptional in his strong condemnation of aqueous binders for all preparatory layers, both for canvas and panel preparation. He explains that absorbent grounds will remove too much oil from the paint binder, leading to paints that are 'destitute in a great degree of what is necessary for their proper temperament'.[86]

---

[79] Félibien 1676: 407-8. Félibien also advises painters to add spike oil to their paint in order to use as little oil as possible. The thought that Early Venetian painters used absorbent ground prepared with aqueous binding media is carried into the nineteenth century.

[80] Félibien 1676: 409-10.

[81] Manuscript Sloane 1990, 1623-44: 79v (both recipes on the same page). In both recipes, an animal glue size layer is applied, after which one or two coats of an unidentified white pigment ground in glue, in the first recipe with an addition of honey to prevent cracking, and a final layer of lead white and a little minium, ground in oil. The first recipe adds an additional layer of burnt sheeps' bones mixed with lead white and massicot, ground in oil. Since in contemporary recipes for aqueous grounds, chalk is advised as a white pigment it seems likely that the unidentified white in this recipe would be a chalk.

[82] Salmon 1672: 141. The chalk and glue layer is scraped smooth and covered with lead white in oil.

[83] 'Recipe book'. Manuscript, Frans Hals Museum, c. 1650-1700: 5.

[84] Pacheco 1649: 384-5 (translated in Veliz 1986: 68)

[85] Volpato c. 1670 (transcribed in Merrifield 1849: 731).

[86] Dossie 1758: 201-2. Dossie warns against the use of commercially prepared grounds on account of 'the under coat, which is formed of size and whiting; and is both too brittle, and too little adhesive, either to the cloth or upper coat, to answer well the purpose'. Dossie's warnings are opposite to the worries first expressed by (Félibien 1676: 407-8) and repeated by a number of later authors. Félibien underlines the importance of

From the early nineteenth century onwards, the darkening effect that excess oil can have on the aged paint layers is a recurring topic in discussions on preparatory layers, often a relation is established with the techniques of the 'Venetians'.[87] It is in this context that recipes for aqueous ground layers again gain importance in historical recipe books. [88]

It is not surprising that authors who worry about excess oil warm to the idea of an oil-absorbing, aqueous ground.[89] A number of nineteenth century sources literally repeat Félibien's claim that absorbent grounds are an important factor in ensuring the freshness of the much admired paintings of the Venetians. Some authors are able to add evidence to such claims: Sully (1809-71) writes about his examination of the ground of a panel painting by Titian, from which he concluded: 'this ground was composed of plaster of Paris, with starch and paste, but no glue or size, flour paste being used instead of gelatin'.[90] Jay (1817) had seen Veronese's *Feast in the house of Levi* during a marouflage treatment,[91] and had the opportunity to examine the borders of the canvas. He noticed that the ground was still supple and sees that as proof of the fact that Veronese used an aqueous ground. He describes its advantages: the colours remain luminous and vibrant, it only needs to dry a single day before painting, it is extremely durable, surface dirt can be removed without any damage and it reacts very well to varnishing. Jay writes that he has used tempera grounds on canvas himself and with very satisfactory results. To the argument that paintings would not be as 'lustrous' as paintings on an oil ground he replies that 'simplicity does not require this very fatiguing lustre' and adds that matte paintings have the advantage that they can be seen from all sides, like fresco's and distemper paintings.[92]

The amount of attention paid to absorbent and semi-absorbent ground during the nineteenth century is evident from the recipes discussed in Chapter 5. Authors discuss a number of methods to create absorbency: gesso (*Compendium*, 1808), chalk and/or plaster of Paris in animal glue (De Montabert 129, Cawse 1840, Sully 1809-71, *Technische*

---

using as little oil in the preparation as possible, to prevent darkening of the painting due to excess oil. Later in the nineteenth century, Grace (1881) also gives advice to refrain from using too much oil, in a recipe for canvas preparation: 'you must guard against using too much oil, as this frustrates the whole intention of the ground. The oil rising to the surface dries in a hard glaze, and thus renders the ground non-absorbent for the after-painting.' Grace 1881: 87.

[87] Simultaneously warnings about the bad effect of pronounced ground colours are issued. These warnings are discussed in Chapter 10.

[88] Carlyle (1991, 2001) finds references until the 1840s to the theory that the Venetians employed absorbent grounds. Although she finds no later references to the 'Venetians', she does find recipes for absorbent grounds in later nineteenth century sources. Carlyle 1991, vol. 1: 231-233 and Carlyle 2001: 168-9.

[89] Bouvier mentioned that he and his colleagues had used starch for over fifteen years for his paintings. Bouvier 1827: 575-7.

[90] Sully 1809-71: 104. We do not know exactly how Sully knows the composition of this layer, it may have been nothing more than a guess. In the context of this quote it should be said that Sully is wary of animal glue, since he believes that it changes the colours. He favoures starch or paste, considering it 'one of the most indestructible things in nature'. Sully 1809-71: 098.

[91] 'Marouflage' is a restoration treatment that involves either the attachment of a canvas painting onto a rigid support (modern meaning), or the transfer of a panel painting to a canvas (nineteenth century meaning). The old support is removed from the reverse and a canvas is adhered to the ground layers, possibly after additional layers have been applied to the reverse of the original ground (Nicolaus no date: 131-2). Marouflage treatments are nowadays hardly ever executed because of the danger they pose for the painting and because we now consider the support and preparatory layers an important part of the material identity and integrity of the work of art.

[92] Jay 1817: 558-9.

Mitteilungen 1885), flour paste or starch with fillers such as pipe clay (Grandi 1806, Bouvier 1827) and lead white ground in skimmed milk (Sully 1809-71).[93]
Bone ash from sheep's trotters is introduced by Sebastian Grandi in 1806 for a ground containing layers of flour paste.[94] This ground is supposed to be similar to the grounds used by the Venetians, and attracts attention from a number of later sources.[95] Ground sheep's trotters are also mentioned by Standage in 1892, who claims that Old Master paintings were executed on grounds consisting of ground calcined sheeps' trotters in animal glue.[96]

As previously noted, two seventeenth century sources connect flaking of aqueous grounds on canvas to layer thickness. Also in nineteenth century sources, layer thickness receives attention: Bouvier (1827) explains that if flour paste grounds are too thickly applied, the preparation will crack. He does not consider the presence of small irregularities resulting from thin grounds that only partially cover the canvas threads problematic. If intended for very detailed pictures, however, the artist should take care to apply the flour paste very evenly and with a little more body. Flour paste is rather water-resistant, according to Bouvier. He believes that it will resist water for a number of days, if well prepared.[97]
Also De Montabert (1829) emphasizes that flour paste grounds are supple enough as long as they are applied thinly. He claims that a light layer of white and glue, enough to cover the interstices and barely covering the raised points in the canvas, will not crack. Suppleness depends on the kind of glue chosen, de Montabert writes, parchment and fine skin glue being the best. According to De Montabert, additions of certain 'mucilages'[98] will raise the suppleness of the ground.[99] When evaluating De Montabert's comments, one has to remember that he advises the use of a lined canvas, which makes a relatively rigid support. He also mentions the fact that ironing is required to attach both canvases. This would smooth and flatten the canvas support to a considerable degree.[100]

Notwithstanding the seemingly sound advice to use aqueous grounds as thin layers, German author Bickes (1834) describes a very thick ground for canvas which, if we believe Bouvier and De Montabert, would not have been entirely safe. It consists of a layer of

[93] *Compendium* 1808: 215-6, Cawse 1840: 20-1, *Technische Mitteilungen*, nr. 25 (1886): 39; Sully 1809-71: 006, 019, 134.
[94] This recipe was reconstructed by Carlyle. Carlyle et al. 2008: 123-131.
[95] *Transactions* 1806: 85-9, Cawse 1822: 9-11; Smith 1825: 357-8; Fielding 1839: 79-80.
[96] Standage 1892: 73.
[97] Bouvier 1827: 573, 577-80. As discussed earlier, Bouvier advises to hold the prepared canvas against the light to check if light can still travel through the ground layers.
[98] De Montabert frequently employs the term 'mucilage'. He uses it in a wide sense, in which it seems to refer to liquids with a viscocity higher than water, but also to more porridge-like materials. This becomes clear from instances where he further specifies the 'mucilage, for instance as 'mucilage of linseed' ('mucilage de la graine de lin'), 'mucilage of oil' ('mucilage de l'huile'), or the 'light mucilage' ('mucilage légère') which is a decoction of liquorice. These quotes are all from De Montabert 1829, vol. 9, and appear on pages 177, 162, 169.
[99] Montabert 1829, vol. 9: 166-9. His recipe for an absorbent ground on canvas that combines parchment glue with chalk, lead white, pipe clay or a mixture of these whites, to which ochre and some other pigments can be added to modify the colour; an addition of honey will raise the flexibility. Before application, the canvas can be rubbed with a decoction of absinth and some cloves of garlic, alternatively rubbed with a slice of onion. After drying, it should be pumiced with very cold water, and loosened ground material quickly removed with a humid sponge. De Montabert writes that others would use whole egg as a binder, or ground bones, pumice powder and wheat flour paste.
[100] De Montabert 1829, vol. 9: 167.

gelled glue, covered with eight to ten (!) thin layers of chalk in glue, pumiced after drying.[101] Thirty-two years later, the late nineteenth century German periodical *Technische Mitteilungen* (1886) again draws attention to the importance of thin layers of aqueous preparations on canvas. This periodical furthermore contains further advice that chalk and glue prepared canvas should not be (re-)stretched onto a stretcher after preparation, 'because of forth and back pulling of the threads also the best ground jumps off and flakes'.[102]

Vibert (1892) strongly believes in the good qualities of absorbent canvas prepared with 'pastes'.[103] In contrast to an oil-based priming:

> Paste should be incorruptible, supple, perfectly neutral, and not susceptible to damp. In this condition it isolates the colours from all chemical reaction liable to result from the support; neither contracting nor expanding, it occasions no cracks, and its suppleness enables it to follow the movements of wood and canvas.[104]

10.4.2 Doubts about the absorbent qualities of chalk and glue grounds

Although the sources quoted above believe that a chalk and glue ground will absorb part of the paint binder and that this property explains the relatively good state of preservation of paintings on aqueous grounds, the absorbency of chalk and glue grounds is doubted by a number of nineteenth century authors.

De Montabert (1829) is the first author who publishes his doubts about the ability of aqueous grounds to absorb some of the oil paint binder. He believes that absorption of excess binder does not always take place and writes that absorption depends on the amount of glue used in the preparatory layer. Actually, in his view a high degree of absorption is not necessary to safeguard the preservation of a painting. De Montabert writes:

> There is a remarkable difference between the state of preservation of an oil painting executed on a glue preparation and the state of preservation of a similar painting executed or placed on an oil ground. This difference does not result from, as has often been repeated, the oil of the colours placed on this glue preparation absorbing into and discharching into this preparation; because this difference is even seen when such absorption does not take place. All the same it is rather likely that, when a ground is not very charged with glue, a part of the oil, with which the painter has thinned his paints, penetrates into the ground and somewhat lowers the quantity of oil employed to liquefy

[101] Bickes 1834: 54, 133-4.
[102] *Technische Mitteilungen*, nr. 25 (1886): 39 .
[103] In Vibert's vocabulary the term 'paste' does not necessarily indicate flour paste, but aqueous ground in general.
[104] Vibert 1892:100-3.

> and give body to the colouring matter. One sometimes encounters very fresh [looking] paintings, in which some raised and flaked areas have been detached from the ground that has been prepared with glue, and the whiteness of this basis, which the oil would have yellowed, proves enough that it has never penetrated.[105]

De Montabert advises to use glue-bound grounds that are 'moderately well bound', which he considers by far preferable to the 'sad routine' of canvases charged with oil, litharge and 'lead oxide'.[106] He warns against the use of too absorbent grounds. In his opinion, they are not required in order to preserve colour freshness and the use of very absorbent grounds will result in the use of *more* oil in subsequent layers, required to feed the paints sufficiently to restore their lustre.[107]
De Montabert considers absorbent grounds a *must* in particular for those painters employing oil paints mixed with resins dissolved in volatile oils (following De Montabert's recipe this would be a combination of copal and elemi dissolved in spike oil or 'wax oil').[108] He writes that such binding media have lower adhesive properties and will require the more absorbent, therefore more adhesive canvases instead of saturated oil grounds.[109]

Also later in the nineteenth century authors question the supposed absorbency of gesso or chalk and glue grounds. Pöckh in an article entitled 'about grounds for oil painting' in the 1891 *Technische Mitteilungen,* compares a text in a prospectus of German colourmen Schmincke & Co., which draws attention to the absorbent qualities of chalk and glue grounds, with Eastlake's opinion on this subject. Eastlake (1847) questions the absorbency of chalk and glue grounds. He believes that painters 'purposely prevented this absorption of the oil'. As proof he uses the same argument as De Montabert: that flaked panel paintings always display a 'perfectly white' ground, not a ground tinted yellow by absorption of the oil from the paint binder. During transfer treatments,[110] Eastlake has observed the whiteness of chalk or gypsum grounds himself. He has seen yellow areas in chalk and glue grounds, but believes that yellowing is restricted to those areas where a varnish is able to penetrate the ground through cracks. While this proves, according to Eastlake, that the ground itself is absorbent, it equally proves that the absorbent ground must have been sealed with an isolation layer before paint application: if an isolation layer is present, varnish cannot penetrate the ground from the surface, it can penetrate through the age cracks that expose the absorbent ground itself. Eastlake believes that the isolation layer must have been a layer of glue, brushed on before an oil-priming was applied. Eastlake supports his theory that an animal glue isolation layer was applied to

[105] De Montabert 1829, vol. 9: 164-5. De Montabert does not write here what is the cause of the better state of preservation of paintings executed on an aqueous ground. While he elsewhere (on page 165-6) talks negatively about oil grounds with a large amount of siccative, it seems likely that he believes that the absence of those ingredients in aqueous grounds is beneficial for the preservation of the paintings.
[106] Litharge is a lead oxide. Apparently De Montabert is referring to another lead oxide. However he does not specify which one.
[107] De Montabert 1829, vol. 9: 165-6.
[108] Yellow wax is dissolved with quicklime, cooled and formed into balls. These balls are then distilled with water to create 'huile de cire'. De Montabert 1829-51, vol. 8: 601.
[109] De Montabert 1829, vol. 9: 409.
[110] During a transfer treatment, the original support is removed from the reverse of the painting and replaced with a new support.

chalk and glue grounds to render them non-absorbent with quotes from Cennini, Vasari, Van Mander and Palomino.[111] Pöckh is not certain who is right, Eastlake or Schmincke & Co. He asks: 'who should we then believe? Which authority is right?... it is wished, that no more doubt remains on this important issue: whether the Old Masters used their ground absorbent or not, and if by the use of an absorbing ground an increased liveliness and luminosity of the paints can be achieved'.[112]

Ludwig (1893), another German author, also doubts if the absorbency of chalk or gypsum grounds is the cause of the luminosity of Old Master paintings. He believes that a second ground layer, an imprimatura of pigments in oil, must have been applied, as chalk and glue grounds lose their whiteness when they absorb oil from subsequent paint layers and would than not form a white basis anymore. Actually, Ludwig does not feel that the absorption of oil from subsequent paint layers is a benefit at all. Although opaque colours benefit from this type of oil absorption, it will destroy the richness of more transparent colours.[113] In addition, Ludwig fears for the cohesion and adhesion of the paint when some of the oil binder is taken away: 'One of the most curious and mindless modern painting mistakes is the theory, that oil paints hold on better to an absorbent gypsum or chalk ground than to an oil ground. But what makes them adhere, the pigment powder or the oil? Clearly the latter; and when it is sucked out of the pigment powder through the ground, one lowers the adhesive properties'.[114]

10.4.3 The absorbency of grounds available commercially in the nineteenth century

Prior to the nineteenth century, no comments are provided in historical artists' treatises on the absorbency of commercially prepared canvas. It is only in nineteenth century colourmen catalogues that evidence is found of the availability of supports prepared with grounds of differing absorbency.

The first record of an advertisement for an absorbent ground for canvas, is by the colourman Rey in Paris. Callen (2000) quotes an advertisement for Rey's ground in the 1821 *Bazaar Parisien*. The ground consists of an aqueous layer covered with an oil bound layer.[115]
The London colourman Brown sold canvas prepared with an absorbent (or 'half prepared') ground. It was used not only by British artists, but also by American artists Thomas Sully and Gilbert Stuart.[116] Sully started using Brown's absorbent canvas during one of his visits to London and made a note to bring it back to Philadelphia as well. Documentary evidence as well as canvas stamps show that Sully also ordered canvases prepared by Brown from America, and that he employed Brown's canvases between 1843 and 1853, next to canvases that he prepared according to his own recipes.[117]

[111] Eastlake 1847, vol. 1: 382.
[112] *Technische Mitteilungen*, nr. 112 (1891): 5-6, 7.
[113] Ludwig 1893: 180-2.
[114] Ludwig 1893: 183.
[115] Callen 2000: 53 and footnote 29.
[116] Mayer and Myers 2011: 48-49, 101.
[117] Mayer and Myers 2011: 101.

In a letter written in 1892 to the wife of G.F. Watts, Winsor & Newton provide details of a recipe for an absorbent type of ground composed of a layer of flour paste, plaster of Paris [hydrated calcium sulphate] and glue, covered by a layer of chalk, glue, honey, some drying oil and pigmented with a small amount of yellow.[118] It is interesting to note that no such recipe for canvas is found in the recipe books in the Winsor & Newton archive.[119] However another canvas ground recipe from Winsor & Newton, (described in Chapter 5), does result in an absorbent ground. It is called 'absorbent canvas Nov 1847 (Gale's)'. Gale's recipe calls for a layer of 'very weak size', followed by four layers of equal quantities of chalk and white lead, with a little umber, the binder consisting of raw linseed oil, glue and treacle.[120]
The archive contains several recipes for grounds on millboard that due to the glue binder have an absorbent nature: for instance the recipes for millboard grounds dated in 1833 and 1850 that contain respectively chalk and powdered Bath brick or chalk, 'Grecian powder', pumice powder and animal glue.[121] A recipe in the manuscript 'Relic of old times 1833 P.01' (183?-76) actually employs the term absorbent ground.[122]

Because of the availability of the archive, the level of information on the Winsor & Newton grounds is much higher than that of other colourmen, whose views and methods can only be gleaned through scraps of information. An example of this is the article of Pöckh in the *Technische Mitteilungen* (1891), discussed above, which includes information on a prospectus of the German colourmen firm Schmincke & Co. which draws attention to the excellency of canvas prepared with chalk and glue, recommended on account of its oil-absorbing qualities.[123] Although this article suggests a commercial interest in this type of ground from Schmincke, unfortunately no information on their nineteenth century production is available.

10.4.4 The influence of ground absorbency on painting technique

Discussions by historical authors demonstrate that although absorbent grounds were considered beneficial for the long-term stability of a painting by many authors, the choice for absorbent grounds can mean that execution of the painting could be more challenging.

De Piles (1684) is one of the earlier authors who describes paint application over absorbent grounds. He explains that colours are difficult to spread and look different after drying than on the palette. For De Piles, these problems are reason enough to advise leaving aqueous grounds to more experienced painters.[124] This shows that, while De Piles prefers aqueous grounds on account of their supposed beneficial effect on the ageing of a painting, the technicalities of painting are also allowed to play a role in the choice of a preparatory system.

---

[118] Ridge 1998: 224.
[119] Most of the recipes in the recipe books that are currently accessable date from earlier in the nineteenth century. *See* Appendix 2
[120] W&N manuscript 'P.07'1842-48: 7PP239L01.
[121] W&N manuscript 'Omnm Gathm No 6'1833-46, recipe date 1833: 06P009L10; W&N manuscript '13'1824-50, recipe date 1850: 13P030.
[122] W&N manuscript 'A Relic of Old Times 1833 P.01'(183?-76): REP043L01
[123] *Technische Mitteilungen*, nr 112 (1891): 5-6.
[124] De Piles 1684: 64-5.

Like De Piles (1684), Bouvier (1827) describes the difficulties that painters may experience while laying-in a composition on top of an absorbent ground. However in contrast to De Piles, Bouvier dismisses this effect as a minor problem; he assures painters that the execution of the following stages is just the same as painting on an oil ground.[125] Bouvier therefore urges the painter attempting to use flour paste grounds for the first time not to give up too easily.[126] For him, the advantages of absorbent grounds are apparently more important. He mentions in particular that they can be made without lead white; instead very 'harmless' fillers can be used that will not react with paints applied on top. The fact that aqueous grounds are quickly prepared is an added benefit.[127]
De Montabert (1829), Dietrich (1871) and Mangold (1895, in the *Technische Mitteilungen*) all remark upon the difficulties of painting on absorbent grounds. De Montabert explains that as soon as applied, paints lose their liquidity.[128] Mangold writes that: 'the paints quickly become stiff and do not let themselves be handled further'.[129] Dietrich (1871) advises to thin the first paint layer applied to flour paste grounds with turpentine oil to facilitate spreading. This first paint layer will sink in completely, but this should not frighten the artist, since only the first layer will sink in in this manner, Dietrich promises.[130]

10.4.5 Modifying ground absorbency: isolation layers, combinations of absorbent and non-absorbent layers and relatively absorbent emulsions

The above paragraphs pinpoint two problems associated with absorbent grounds: cracking or flaking and difficulties with paint application.[131] Redgrave (1866) adds to these the problem that ground that are too absorbent can also make a painting 'heavy in the darks' because in dark areas the paint will sink in.[132] Both De Montabert (1829) and Fielding (1839) wonder whether a very absorbent ground will not lead artists to employ more oil than less oil, as painting on an absorbent underground would require more oil than they would otherwise use. This would lead to an increase in the amount of oil used instead of the intended decrease.[133]
Naturally also in the case of aqueous grounds, absorbency depends on the ratio of binder to filler or pigment. As described in Chapter 6, some authors described varying proportions, depending on the layer of the preparatory system. However, as water evaporation takes place during the drying stage of aqueous binders, such grounds on average tend to be more absorbent than oil-bound grounds.

[125] Bouvier 1827: 577.
[126] Bouvier 1827: 573.
[127] Bouvier 1827: 575-7
[128] *See* Paragraph 10.5.5 for a discussion of the use of additional layers over absorbent grounds.
[129] *Technische Mitteilungen*, nr. 20 (1895): 1-2.
[130] Dietrich 1871: 21-2.
[131] According to Jirat-Wasiutynski (1998), staining of the ground by the medium drawn out of the oil paint is another problem artists face when painting on very absorbent grounds. Both Paul Signac and Georges Seurat reportedly tried and condemned the absorbent 'toiles à plâtre' ('plaster grounds') for this reason. Jirat-Wasiutynski 1998: 236. Zucker (1999) mentions that also in North America, problems occurred with overly absorbent grounds. Zucker 1999: 3. Reconstructions by Carlyle et al. 2008 show this type of staining. It is also described in Chapter 12.
[132] Redgrave 1866, vol. 2: 591.
[133] De Montabert 1829, vol. 9: 165; Fielding 1839: 74-6.

As discussed in Carlyle (1991, 2001), nineteenth century British authors mention a number of methods to regulate the absorption of preparatory layers. This research expands on her information and shows that the concern to reduce absorbency was also prevalent in the additional periods and geographical areas studied.

First of all, absorbency can be lowered by adding an isolation layer or a second, pigmented oil-bound ground layer. Layered systems consisting of aqueous and oil-bound layers appear in recipes throughout the period under consideration, in particular chalk and glue grounds with a second oil-bound ground on top.[134] The 'typical' layer build-up of North European seventeenth century panel grounds, described in Chapter 5, actually consists of a layer of chalk and glue covered with an oil-based second ground layer. Similar preparatory systems are described regularly in seventeenth to nineteenth century recipes for canvas preparation. Whether these ground are of a relatively absorbent type is however not at all certain, as the oil content of the second layer and its thickness can vary considerably.

The application of additional unpigmented layers of glue, varnish or oil to modify absorbency is described in Chapter 5. Instructions for the use of unpigmented isolation layers are found from the sixteenth century onwards and still appear in nineteenth century sources.[135] It is however only in more recent recipes that the use of such isolation layers is linked to their absorption-reducing effects. Earlier recipes do not make this connection. For instance De Montabert (1829) writes that a slight 'embibing'('imbibition') will help spreading of the colours. He prefers the application of such a thin isolating layer to painting straight on top of a very absorbent aqueous ground, since it will avoid the use of extra binder in the paint layers, required in particular to restore the saturation of brown areas.[136] In an article in the *Technische Mitteilungen* (1886), an anonymous author describes the use of thin oil paint or a solution of shellac to isolate an aqueous ground. The author explains that if the painting were executed directly on the absorbent (chalk and glue) ground, its oil binder would immediately be pulled into this ground. This would result in a paint without any adhesion.[137] In 1895, Chr. Mangold in the *Technische Mitteilungen* advises a layer (of boiled linseed oil) to decrease ground absorbency.[138]

A second method to regulate absorption is to use emulsions of aqueous and oily binders instead of purely oleous or aqueous layers. Absorption can be regulated with emulsion binders because it will vary depending on the proportion of oil to aqueous binder. Early recipes for the use of emulsion grounds on canvas are provided by Vasari (1550), Borghini (1584) and Lebrun (1635).[139] Sully (1809-71) describes Mr. Delonpery's recipe for a canvas ground, which combines a cup of [flour] paste (in water) with a cup of white lead ground in oil.[140]

[134] *See* Chapter 6.
[135] *See* Appendices 5 to 12.
[136] De Montabert 1829, vol. 9: 165.
[137] *Technische Mitteilungen*, nr. 25 (1886): 39.
[138] *Technische Mitteilungen*, nr. 20 (1895): 1-2.
[139] Vasari 1550 (edition 1568): 53; Borghini 1584 (edition 1730): 138; Lebrun 1635 (transcribed in Merrifield 1849 (1999): 772).
[140] Sully 1809-71: 036.

Although most authors describe modifications of absorbent grounds in relation to their handling properties, Mérimée (1830) advises modifying an aqueous ground for an entirely different reason: in order to raise the water-resistancy of the ground. In a recipe discussed in Chapter 5, he explains that water resistance would be required if the painter wishes to execute his sketch ('ébauche') in watercolour.[141]

Nineteenth century authors suggest other methods to create semi-absorbent preparatory systems. Fielding (1839) discusses the belief that Titian applied a layer of wax to the reverse of his absorbent canvases. He writes that although such applications are generally interpreted as measurements against moisture penetration from the reverse, he wonders whether Titian employed such layers also because he wanted to prevent 'his colours from falling through the ground into the cloth'.[142] Wax is included as an ingredient in Roberson's recipe for an absorbent ground (1840). The wax is melted in linseed oil, mixed with treacle, glue, chalk and lead white.[143]

Hundertpfund's recipe (1847) describes the application of a first layer consisting of three to four coats of pipe clay in flour paste, followed by two coats of lead white in oil, the first coat diluted with turpentine oil. While the last layer is wet, flour is dusted on top. Superfluous flour is carefully removed and the ground left to dry. Hundertpfund writes that such grounds will be absorbent enough to draw out some of the oil from the paints and will allow for the evaporation of binder from both the front and reverse of the support, which will prevent darkening of the colours.[144]
Dusting a layer of dry pigment or filler into a wet semi-absorbent ground is also described by Church (1890), who advises a canvas preparation that consists of a glue size layer, a layer of chalk and glue, covered by a layer of lead white in linseed oil, dusted with zinc white. The zinc white layer will prevent the yellowish discolouration associated with lead white in oil.[145]

The casein-containing emulsion ground described as a 'new painting ground' in the *Technische Mitteilungen* (1897) is also devised because traditional grounds are said to either crack or yellow.[146]

10.5 The degradation of oil-based ground layers

Concerns about the discolouration of oil-based grounds due to yellowing of the binder not only leads to advice to employ aqueous binders or emulsion-bound grounds, but also results in ideas to reduce the oil content of oil-bound grounds themselves.

Fears about darkening associated with the use of too much oil binder stand at the centre of the introduction of volatile oils such as turpentine oil or spike oil to oil-bound ground

[141] Watercolour with a little size, to which a small portion of oil or an emulsion of nuts or poppy seeds could be added. Mérimée 1830: 249-50.
[142] Fielding 1839: 80.
[143] Roberson 1840: A.
[144] Hundertpfund 1847: 127-9.
[145] Church 1890: 26.
[146] Burnt chalk is mixed with water, after heating, beeswax and linseed oil are added, as well as white cheese. *Technische Mitteilungen*, nr 9 (1897): 2.

mixtures,[147] as does advice to replace part of the oil with varnish. Also adding water during preparation of an oil-ground is suggested in recipes and will lead to a relatively leanly bound oil ground. De Mayerne (1620-44) gives a recipe for an ochre-based ground bound with an 'unguent' oil prepared by heating oil, siccatives and water.[148] Bouvier (1827) mentions the use of a mixture of oil and water, beaten into a 'pomade' and mixed with the paint. Although he has not tested this method, Bouvier is sympathetic to the idea of reducing the oil content of the ground in this manner. He does wonder whether the cohesion of the ground will suffer.[149] Mérimée (1830) describes a similar mixture three years later.[150]
A small number of authors relate layer thickness of oil-grounds to flaking, and advise to apply oil-bound grounds as thin layers to prevent flaking from occurring.[151]

Discussions on methods to increase the adhesive properties of oil bound grounds signify that delamination is considered a problem not only for absorbent grounds, but also with the more saturated ground types. In contrast to recipes to prevent delamination of aqueous ground layers, recipes for the delamination of oleous grounds not only focus on the cohesion of the layer itself, but also on adhesion between the preparatory layer and subsequent paint layers:
Some authors ascribe insufficient adhesion between ground and subsequent paint layers to the smoothness of oil-bound grounds on a smooth support (wood, copper) and advise to provide a more adhesive surface for the paint layers by slightly roughening up the ground or by the introduction of solvents in the oil-bound layer, which is thought to result in a more 'open' and absorbent oil ground.[152]
Advice to prepare the oil-ground for painting by removing a 'greasy' layer from the ground, as discussed in Paragraph 7.5, is also given to improve the adhesive properties of the preparatory system. Some nineteenth century recipes that prescribe sprinkling powder into the wet ground explain that this practice is a means to create better adhesion between grounds and paint layers.[153]

The thickness of oil layers is considered a factor that influences discolouration: Volpato (c. 1670),[154] Lana (1670) and Félibien (1676) relate the thickness of oil-bound ground layers with long-term stability of the colours of the painting. Lana (1670) explains that he disapproves of applying many coats of an oil ground, since the resulting ground 'being too

[147] Thinning oil paints with spike oil as a means to reduce oil content is suggested as early as 1676 by Félibien (Félibien 1676: 407-8). However spike oil-based varnish is not mentioned in recipes for preparatory layers until 1829 (De Montabert: 163).
[148] De Mayerne 1620-44: 28 v
[149] Bouvier 1827: 570-1.
[150] Merimée 1830: 244-5.
[151] For instance *see* Symonds c. 1650-2: 98v or Bouvier 1827: 567-70. Layer thickness of aqueous grounds receives more attention.
[152] *See* for instance De Montabert 1829, vol. 9: 164. Vergnaud 1831: 119-20 advises to add turpentine to the preparatory layers applied to copper to make the layer slightly absorbent. Hampel advises pumicing grounds on copper to create a roughened but velvety surface. Hampel 1846: 28. Ellis (1883) discusses the smoothness of grounds on canvas in the light of adhesion, saying that the grounds 'should not be so smooth that the paint does not bite easily'. Ellis 1883: 42-3.
[153] For instance De Montabert 1829, vol. 9: 164, Hampel 1846: 22-3; and Sully 1809-71: 025. *See* Paragraphs 7.3.2 and 7.3.3 for descriptions of these techniques.
[154] Volpato (c. 1670) explains in his *Modo da tener nel dipinger* that if the priming is too thick, the colours will darken from the abundance of oil present. Volpato c. 1670 (transcribed in Merrifield 1849 (1999): 729).

thick, it causes the colours which are laid on it to change, for these sink into it so much, that they 'participate of the colour of the priming itself'.[155] Félibien (1676) writes: 'one applies as little colour as one can, in order that the canvas does not crack quickly and that the colours that one applies on top during painting, are better preserved'.[156] Palomino confirms Félibiens remark that heavily applied grounds crack. According to Palomino (1724) the thinner the ground, the better. Thin grounds will furthermore allow the oil to penetrate into the canvas.[157] Palomino writes that ground material detaches itself when the oil becomes brittle with age.[158] De Montabert (1829) also expresses concerns with the effect that a rich oil ground can have on the colours of the painting. In a description of contemporary methods for canvas preparation with oil-based grounds, he writes that by applying too many of those layers, the painter will create a risk for the colours.[159]

Jahn (1803) writes that he has noticed that oil paints shrink after ageing, which causes the wood grain of the panel to become visible.[160] For him this is a reason to advise against lead white oil-bound grounds and to employ a bole or chalk ground, which 'provides for ever a smooth surface, and also attracts the slimy parts of the oil, because of which, the paints applied on top as a glaze, stand higher, and more rigid'.[161]

The Redgraves (1866) advises a thin oleous ground but warns that enough binder must be used to create a plastic layer: 'If on canvas, it is essential that the ground, though firm and hard, should have due toughness and flexibility; to which end it should be thin, and have sufficient oil in its composition'.[162]

10.5.1 The importance of a well-dried oil ground for long-term stability

A number of sources draw attention to the fact that oil-based grounds require long drying times before they are fit to be painted upon. Lebrun notes in 1635: 'the longer ago canvases have been primed, the better, the colours that are applied on top afterwards become more beautiful'.[163] In 1687, Catherinot writes that primed cloth that is kept for three to four years 'is better' ('vaut mieux'), but unfortunately without being specific about the differences between aged and fresh canvas.[164]

Symonds's descriptions (1650-2) of the painting procedures followed by Italian artist Canini include how Canini found that his paint had 'dried up' ('proshiugated') the day after it had been applied. Canini then explained to Symonds that the cause of this is that the

[155] Lana 1670: 158.
[156] Félibien 1676: 407-8: 'on met le moins de couleur que l'on peut, afin que la toile ne casse pas si-tost, & que les couleurs qu'on vient ensuitte à coucher dessus en peignant, se conservent mieux'.
[157] Palomino 1715-24, vol. 2 1724: 34-5.
[158] Palomino 1715-24, vol. 2 1724: 35. Palomino claims that Ribera's thick grounds are the cause of the destruction of many of his paintings.
[159] De Montabert 1829, vol. 9: 159-160.
[160] Possibly Jahn sees the effect of saponification of the oil binder, which results in an increased visibility of the woodgrain. *See* Noble et al. 2008 for an explanation of this phenomenon.
[161] Jahn 1803: 48-50.
[162] Redgrave 1866, vol. 2: 591-2.
[163] LeBrun 1635 (transcribed in Merrifield 1849 (1999): 820-1)
[164] Catherinot 1687: 16.

canvas 'was not so thoroughly dry as it ought, clothes should be perfectly dry'.[165] Marshall Smith (1692) describes another problem that may occur. He too warns that one should always take care that the priming is thoroughly dry before painting, then writes 'or the foul priming colours incorporating with your work will also cause it to change'.[166]

More recent sources also describe how, when no attention is given to this drying time, the results can be devastating. According to Jahn (1803) the freshly applied paints will darken, spots will appear or raised paint will result, especially if vitriol or litharge has been added to the ground layers.[167] In three issues, the *Technische Mitteilungen* (issues in 1886, 1895, 1897) refers to the importance of a well-dried ground and describes flaking and adhesion problems as the consequences of the use of insufficiently dried grounds.[168]

Bouvier (1827) considers a year a suitable drying time for newly prepared canvas.[169] Grace states that he has heard that Titian allowed his first layer (in tempera) to rest six to eight months before finishing a painting. Grace writes that 'long drying seems to induce some chemical change, which helps you in finishing your pictures'.[170] Like Bouvier, American author Parkhurst (1898) advises a year of drying. Since artists can not be sure that colourmen sell aged canvas, he advises 'getting stock and keeping it on hand', for 'if you have had it in your own possession a long while, you know it is not fresh'.[171]

De Montabert (1829) describes a particular effect that occurs during ageing of the prepared support. He believes that if prepared supports have been allowed to dry in the sun, they can become underbound ('aridité'), however he considers this a benefit, since it will allow oil from the sketch to penetrate into the ground.[172]

10.6 Protecting the reverse side of the support

A number of authors who provide recipes for the preparation of supports for oil painting include descriptions of layers that are to be applied to the reverse of the support (*see* Appendix 11). There is a strong overlap between the materials advised for use as preparatory layers and those employed to coat the reverse of the support. Although a link is not always made between the reverse side application and its role in the preservation of the ground, often its stabilizing role is described. Some authors advise the simultaneous preparation of the front and reverse of the support.
The descriptions of reverse side applications that appear in the recipes studied in this dissertation focus on panel and canvas supports. In only two nineteenth century sources are references found for the preparation of the reverse side of fibreboards. Winsor and

[165] Symonds c. 1650-2 (transcribed in Beal 1984: 240: 56-57).
[166] Smith 1692: 83.
[167] Jahn 1803: 48-50.
[168] *Technische Mitteilungen*, nr 25 (1886): 39 describes how a glue-based ground should be scraped with the nail and should sound 'hard and resonating'; *Technische Mitteilungen*, nr. 20 (1895): 1-2 mentions the importance of a well-dried ground, *Technische Mitteilungen*, nr. 9 (1897): 2 discusses adhesion problems on fresh grounds and crack formation.
[169] Bouvier 1827: 563-6.
[170] Grace 1881: 86-7, 89.
[171] Parkhurst 1898: 9.
[172] De Montabert 1829, vol. 9: 162. This would prevent darkening because of yellowing of the oil binder upon ageing.

Newton manuscript 'a relic of old times 1833. P.01'(183?-76) advises animal glue to prepare the reverse of a millboard and Dietrich (1871) advises a layer of asphalt varnish.[173]

10.6.1 Applications to the reverse of the panel

Recipes for the protection of the reverse side of panel supports, appear from the second quarter of the eighteenth century onwards. De la Hire (1730) recommends to apply both size and chalk-and-glue ground to the reverse of the panel to prevent that panels 'torture themselves' ('se tourmentent').[174] Dutens' (1779) advice to size both front and reverse with glue is given to prevent warping of the panel, however in contrast to the recipe by De la Hire, the chalk and glue mixture which follows is applied only to the front.[175] Muckley (1889) draws a link between blistering and flaking and the omission of reverse side applications.[176]

While pre-nineteenth century recipes mention only the application of an animal glue size layer and/or a chalk-glue layer to the reverse of the panel, a number of nineteenth century recipes extend the advice to include coatings of oil- or varnish-based ground layers.[177] Fernbach's mixture of lead white and chalk in amber varnish is applied both to front and reverse. Fernbach (1834) explains that the reverse side application will not only prevent warping of the panel but he also believes that it is an effective measure against wood boring insects (against 'worms').[178] Blockx (1881) advises the application of several layers of lead white in oil, both to the front and reverse of the panel. In the case of supports without a preparatory layer, an application of lead white in oil or of shellac to the reverse side is advised.[179] Oughton (1890) apparently considers a reverse application optional. The simple preparatory system that he describes for the front, consisting of a layer of animal glue covered with a ground containing lead white and bright red, should be applied to the reverse of the panel as well, if there is any danger that the panel will warp.[180] Standage (1892) advises to *always* paint both front and reverse 'with an equal quantity of colour',[181] Ellis (1883) issues similar advice. The protective layer that he describes, consists of a mixture of lead white in linseed or poppy oil.[182]

Vibert (1892) advises to coat the reverse and the sides of wooden panels with 'mastic and suitable protective varnish'.[183] Later in his book, this advice is further specified. He prescribes a double reverse side application, consisting of a first layer of 'equal parts of

[173] Winsor & Newton manuscript 'a relic of old times 1833. P.01'183?-76: REP032L16, Dietrich 1871: 20.
[174] De la Hire 1730: 708-9.
[175] Dutens 1779: 62. Dutens advise a second ground layer consisting of oil, lead white and brown red.
[176] Muckley 1889: 61-2. He advises a reverse side application of oil paint or wax in turpentine.
[177] *See* also Carlyle 1991, vol. 1: 251-253, Carlyle 2001: 179-180, which contains a detailed discussion on reverse side protections for different supports described in British nineteenth century manuals.
[178] Fernbach 1834: 5-7. Fernbach is not the only author who links reverse side protections with insect attacks. Beurs (1692) advises brushing the reverse of a panel with spike oil to prevent woodboring insect damage. Beurs 1692: 17-20.
[179] Blockx 1881: 6-7.
[180] Oughton 1892: 36.
[181] Standage 1892: 76-7.
[182] Ellis 1883: 146.
[183] Vibert 1892: 96-8.

thick linseed oil and re-touching varnish without siccative, and, when this layer is dry, with another layer of picture varnish'.[184]

10.6.2 Applications to the reverse of canvas supports

Reverse side applications for canvases are advised in a number of later eighteenth century sources and in nineteenth century sources. Pernety (1756) describes the application of oil with pigment deposits from the bottom of the brush rinsing jar, with the intention to render the canvas less water sensitive. This same oil and pigment mixture can also be used to glue a second canvas onto the back of the original canvas. He guarantees that 'those [canvases] without a glue size layer that are prepared in this manner never flake, no matter to which humidity they are exposed'.[185] Hallen (1761) advises to apply 'schmierigen Wachs öle' [= pasty waxy oil] from the tray used to wash brushes in, with the intention to keep the moisture from the walls from penetrating the canvas.[186]

Fernbach (1834) describes how a thin application of flour paste will 'close the pores to the back; and prevent the penetration of the ground through the canvas'. Although Fernbach does not consider flour paste a stable material, the fact that it is very brittle does not matter in this case. With time, it can fall off the canvas 'without damage'.[187]
Wax applications to the reverse of canvases are mentioned by Fielding (1839) who believes that Titian applied wax to the reverse of his paintings to protect them against the Venice climate.[188] The use of wax reverse side applications as a restoration treatment for canvas paintings is mentioned in a number of nineteenth century sources in passages describing restoration procedures, for instance by Sully (1873) and Muckley (1882).[189] Muckley in the same passage describes a lead white coat for the reverse of the canvas. Collier (1886) advises to cover the reverse of canvas paintings subjected to damp conditions with a paste of starch and lead white.[190] Also chemist Church (1890) advises lead white in starch, applied over a layer of either mercuric chloride in methylated spirit (ethanol with a low percentage of methanol) or of tannin in methylated spirit. He explains that both solutions 'act by coagulating some of the size in the canvas: the tannin turns it into leather'. Mercuric chloride would prevent mould or mildew and 'the attack of animal organisms'.[191]

Vibert (1892) gives another reason to apply a layer to 'the wrong side' of the canvas, besides protecting the canvas against 'dampness, as it might cause it to rot'. He believes that the reverse side protection will prevent the oil of the paint layers from penetrating the ground and reaching the canvas support, where it will 'burn' the canvas. He mentions

[184] Vibert 1892: 184. The retouching varnish is a quick drying varnish, Vibert explains on page 92. On page 94-95, Vibert explains that picture varnish is employed as a final varnish. He does not describe the ingredients of these varnishes, but does say that picture varnish is petroleum based and dries in an hour, approximately. *See* Chapter 6 for more information on the composition of varnishes.
[185] Pernety 1756: lxcij.
[186] Hallen 1761: 322.
[187] Fernbach 1834: 2-3.
[188] Fielding 1839: 80.
[189] Sully 1873: 049; Muckley 1882: 63-4.
[190] Collier 1886: 112.
[191] Church 1890: 28.

a number of suitable binding media: 'water-colour fixative', wax and resin, gum lac, resin and caoutchouc in petroleum.[192]

Standage (1892) is not afraid to allow contact between the canvas and linseed oil, for he advises a reverse side protection of either a single layer of zinc white in linseed oil or a double reverse side protection which consists of a first layer of lead white with a second layer of zinc white. The binders of these layers he does not describe, but the contexts of the recipe suggests that they are also bound in oil.[193]

Canvas lining, or the application of a second canvas to the reverse of the support, is also suggested as a method to protect the reverse of the canvas, in fact both De Montabert (1829) and Osborn (1845) advise artists to choose lined canvas as their painting support.[194] According to De Montabert, a lined canvas ('toile doublée') requires an additional impregnation from the reverse with wax or resin. This, he writes, is the only type of canvas suited for use. Only for 'simple paintings' not meant for posterity can single canvas be admitted, but also then with a wax layer to protect them against humidity.[195] Osborn agrees: 'A double canvas promises of course much greater durability, in itself, and greater protection for the colors against the atmosphere'.[196] Varley (1845) believes that an impregnation from the reverse with varnish and the use of a wooden backboard coated with a mixture of wax and pitch is beneficial.[197] The Redgraves (1866) advises a to apply a painted cloth to the reverse of canvas,[198] Standage (1892) as well, although he writes that it 'cannot claim to be very effectual in preventing the darkening of the painting ground by absorption of noxious gases; but an extra backing of canvas is a precaution to be recommended against accidental damages'.[199] A recipe in the *Technische Mitteilungen* (1898) describes a very different type of backing: it advises to cover the reverse of the canvas with zinc foil, glued to the canvas with a varnish, 'the same as used to varnish paintings'. This reverse side protection not only protects against humidity, temperature changes but also against insect damage or the damaging sea air during oversea transport.[200]

10.7 Concluding remarks

The evidence from historical sources that has been presented in this chapter confirms the notion that preparatory layers were held to have a strong influence on the stability of a painting. Historical authors indeed consider the choice of ground pigments, the ground colour, the binder, the layer thickness and build-up in this light.

[192] Vibert 1892: 107-8. Vibert does not describe the ingredients of the 'water-colour fixative'. He writes that the reverse side application should be applied 'when the sizing has been executed'.
[193] Standage 1892: 73-4.
[194] Montabert 1829, vol. 9: 137-8, 149-50; Osborn and Bouvier 1845: 116.
[195] Montabert 1829, vol. 9: 137-8.
[196] Osborn and Bouvier 1845: 116.
[197] Varley 1845: 60 in Carlyle 1991, vol. 1: 252 or in Carlyle 2001: 179-80.
[198] Redgrave 1866, vol. 2: 601 in Carlyle 1991, vol. 1: 252 or in Carlyle 2001: 179-180.
[199] Standage 1892: 73-4.
[200] *Technische Mitteilungen*, nr. 5 (1898): 3.

While historical texts demonstrate concern regarding the influence of the size layer, of specific pigments as well as ground layer thickness on the stability of an aged painting, it is evident that two other causes for degradation attracted even more attention in historical recipe books: ground colour and ground absorbency.
The fascination with both topics was described by Carlyle (1991, 2001), who concluded that nineteenth century British recipe books emphasize these two aspects when discussing ground degradation.[201] The present chapter has demonstrated that this interest started much earlier. The sources quoted by Carlyle are part of a continuous stream of discussions on these topics, which was already alive in the sixteenth and seventeenth centuries. Both subjects remain the most important discussion points throughout the period and all geographical areas investigated. Ground colour is linked to discolouration of the paint layers. Ground absorbency is thought to have an effect both on the discolouration or yellowing of the aged painting and, in some cases, to influence delamination or flaking.

The descriptions of the options available have demonstrated that difficult choices needed to be made and that compromises were unavoidable. Artists needed to consider working properties, aesthetics and practicalities such as the drying time. When choosing a fast-drying aqueous preparatory system, there was a higher risk of flaking, in particular if the artists wished for a canvas with a smooth finish that could only be achieved with a thick ground. If the artist sought to avoid these problems and chose a smooth oil-based ground, there was discolouration to fear and the preparatory system required a long drying time. By replacing part of the oil binder with a volatile solvent like turpentine oil, a lower oil content was possible, however the risk of flaking due to poorly bound layers would increase.
The analysis of historical comments on the ageing of preparatory layers have shown that many authors were very aware of the difficult balance faced by artists in designing or choosing their preparatory systems.
To support their explanations of the factors that influence ground stability, authors included examples of paintings that have survived in either a poor or magnificent state. They looked at examples from earlier times (Titan, Rubens, Veronese, Poussin) or discuss the techniques employed by their contemporaries; they want to learn from these examples.

Authors did more than discuss the problems, they also offered advice to prevent delamination or colour change. Certain additives were thought to increase the stability or protective value of specific layers in the preparatory system (e.g. the addition of soap to prevent canvas degradation due to the oil binder), and many of the descriptions of treatments such as degreasing and pumicing can be seen in this light, as a result of a wish to create a more strongly adhered layer system. A final measure that was discussed, was the introduction of a reverse side protection. Advice to apply a layer to the reverse of the support, or even to work on a lined support, is present in recipes from the eighteenth century onwards.

[201] Carlyle noted in her 1991 dissertation and 2001 publication on nineteenth century British manuals and instruction books for oil painting: 'throughout the century authors concentrated on only two aspects of grounds: their colour and absorbency'. Carlyle 1991, vol. 1: 229; Carlyle 2001: 165.

Discussions about degradation have revealed what aspects were perceived as disturbing during which time periods. This makes Chapter 10 relevant for investigations into conservation history. Which degradation phenomena discussed, when and why this was the case, may help clarify why certain conservation and restoration interventions took place, and what present-day conservation treatments may aim for if they attempt to stay as close as possible to the intentions of an artist.