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English summaries

The research presented in this volume is focussed on paintings Cuno Amiet (1868–1961) created early in his output, between 1883 and the end of 1914. The findings are discussed in context with general information on painting materials and techniques used in Switzerland in the late 19th and early 20th centuries.

1. Materials for painting and their availability around 1900

Materials for painting were readily available around 1900. Few references indicate where Cuno Amiet purchased his materials, but those we've found contribute to the overall impression of an excellent supply situation, not only in the cities of Munich and Paris (where Amiet studied between 1886 and 1892) and the Breton artists' colony of Pont-Aven (where he continued his studies until the summer of 1893), but also in his home country Switzerland. There was a rich supply of ready-made products, and Amiet was clearly interested in trying them. At the same time a growing number of painters, including Amiet, were buying raw materials (pigments, fillers, binding media and additives) and making their own grounds, paints, vehicles and varnishes. Because of this, the material composition of many of the paintings created around the turn of the 20th century is much more complex than might be expected. Thanks to new study of written sources and thanks to continual progress in binding media analysis this complexity is increasingly recognised by art technical research.

2. Some notes on Cuno Amiet's supports

Amiet created over 80 % of his oil and tempera paintings on textile supports. The remainder are on wood, Eternit (asbestos cement panels), artists' board, cardboard, or paper pasted on cardboard or plywood. This chapter discusses briefly his textile supports and stretchers, and his use of Eternit.

Most of Amiet's textile supports are of pure flax in plain weave. Amongst the few exceptions is a group of at least ten supports from between 1909 and 1911 that are in Panama weave. The weave density of all these supports is somewhere between 15 and 20 threads per cm (in both directions). Amiet usually mounted his textile supports himself, using stretchers keyable in all directions. With the exception of a

small number of large formats amongst them no crossbars are fitted. The stretchers he used between 1908 and 1912 often display stamps indicating the length of the individual stretcher member, and the name of the supplier Gebrüder Scholl in Zürich.

Amiet's use of Eternit brand asbestos cement panels was principally limited to the period between 1904 and 1908, when he created 21 paintings on this type of support. Eternit was produced for the building sector. When the company Schweizerische Eternitwerke AG began its production in Niederurnen (in canton Glaris) in 1904, it quickly became popular amongst Swiss artists because of their high expectations for its durability. However, as Amiet and his friend Giovanni Giacometti were to learn, ground and paint layers applied on Eternit panels often evidenced poor adhesion.

3. Painting grounds around 1900: between academicism and the avant-garde

In academic painting, the question of how to prepare a ground layer for an easel painting was treated as a complex problem with many variables. One aspect discussed at great length in the technical literature of the 19th and early 20th centuries was the absorption capacity of the ground. The preparation of the support, the choice of ground ingredients, the (sometimes multi-layered) build-up and final treatment of the ground were rightly considered as critical steps that predetermined the elasticity, adhesion, sensitivity to humidity and therefore durability of a painting. Nevertheless, artists very often did not prepare their grounds themselves; the range of pre-primed ready-to-use canvases and artists' boards on offer was huge compared to today, and they were widely used.

In the 1880s, the French avant-garde, the successors of the impressionists – starting with Paul Gauguin and his pupil Paul Sérusier – completely broke with this tradition and began to paint on unprepared canvasses, or prepared their canvasses themselves. Their grounds were predominantly bound with animal glue, were generally weakly bound and were therefore extremely absorbent.

4. The grounds of Cuno Amiet's early paintings

During his years as an apprentice and student, and until shortly after his arrival in Pont-Aven, Amiet painted on commercially applied, oil-rich and therefore not absorbent grounds. Given their widespread use and the fact that they were recommended to beginners, his choice is hardly surprising. However, when he arrived in Pont-Aven in 1892, Amiet became familiar with the unorthodox practice of the anti-academic French avant-garde and soon adopted it as his own; he prepared and applied most of his grounds himself. The grounds he used in the 1890s (during and immediately after his time in Pont-Aven) contain chalk as the filler and a proteinaceous binder, almost certainly animal glue; only from 1899 were additional constituents found as binders in his grounds. During the 1890s Amiet aimed for coarse, rough surface textures, but just before the turn of the century – when for a while he tried to paint like the old German masters – he smoothed his grounds by abrading them. Although there are exceptions, self-prepared and applied grounds remained his preferred option. He used them both for his tempera and his oil painting.

Striking exceptions to this rule occurred during the five years between 1908 and 1912, when Amiet returned to the use of commercially applied oil grounds. It's very likely that this was not motivated by technical considerations, rather by a temporary lack of working space; he'd had to give up his studio and work at home. However, as soon as he'd set up a new spacious studio, he returned to his self-prepared, highly absorbent grounds. The use of this type of ground had in the meantime spread, and had been adopted by the German expressionists. However they, unlike Amiet, appear to have never used oil-free mixtures.

There is some evidence of attempts by Amiet to reduce the absorbency of his grounds: From entries in a notebook from 1902 we know that he sometimes applied a glue coating over his chalk and glue grounds. Oil coatings on chalk and glue grounds were found on two works from 1907 and 1913 through materials analysis. Materials analysis, notes by Amiet and inscriptions on the versos of two stretchers evidence that he sometimes added oily components such as oil or egg yolk to his grounds.

5. The use of tempera around 1900 in Switzerland

Interest in the type of artists' paint called tempera is already evident in the literature of the 18th century. During the 19th century its use became increasingly popular. By the time young Cuno Amiet's enthusiasm for it developed, it had become fashionable all over Europe.

Tempera as it was understood around 1900 was soluble in water. It was made with the same pigments as oil paint, but with different and usually much more complex binding media; resins, balsams, waxes, oils, animal glues, casein, gums, egg, starch, honey, sugar, glycerine and other substances could be part of its binding medium. Tempera had some qualities that were highly valued by artists, such as fast drying, high luminosity of colour and (reputedly) good resistance against ageing, and it had some draw-backs. For example, its hue changed after application in ways that could never quite be foreseen; it changed when the paint dried and then again when it was varnished. Unlike oil paint, due to its initially aqueous nature tempera did not adhere well to many types of ground. It remained unpredictable even for the experienced user.

There were many reasons for the interest in tempera around 1900: It was a welcome alternative to oil paints, the quality of which had sunk dramatically as a result of both the paint industry's new mass production methods and the unfair business practices of some distributors. Tempera was considered to be the paint of the old masters; their technique was explored by studying historical treatises and old master paintings. It was also the paint used by Arnold Böcklin, who was widely admired as a great artist and a successor to the old masters. Tempera was beginning to be mass produced and therefore easily available. It could also be used by painters who were trained in easel painting, but were entrusted with the execution of large format mural and decorative painting in newly-built public buildings.

Based on a range of written sources (memoirs, correspondence, notes, and diaries) this chapter draws a picture of the use of tempera in easel painting in Switzerland

around 1900. Among the Swiss painters who used it besides Cuno Amiet – either briefly or over many years – were Hans Sandreuter, Filippo Franzoni, Edoardo Berta, Ernest Biéler, Charles Giron, Albert Welti, Giovanni Giacometti, Fritz Widmann, Abraham Hermanjat, Paul Klee, and Ernst Würtenberger. There is substantial evidence of the many difficulties they encountered with the capricious technique. Hans Sandreuter and later Ernst Würtenberger were considered authorities on all tempera related matters and were often approached for advice.

When looking at paintings created in tempera around 1900, the versatility of this paint type becomes very apparent. Depending on its composition it was suitable for quite opposite purposes: for a stippled graphic style or a solid opaque application, for a fast, direct working method or a slow, layered build-up, for a finish with a varnish or a finish without a varnish.

6. Tempera in Cuno Amiet's early paintings

Amiet probably became aware of the then fashionable and much discussed paint type tempera during his two years studying at the Munich Academy of Fine Arts (1886–1888), although he was only enrolled there as a drawing student. Its use was also spreading in Paris – where Amiet continued his studies at the Académie Julian (1888–1892) – especially after 1891 when the Austrian Baron Alfons von Pereira-Arnstein presented his new product "Pereira'sche Tempera" to the Société des Artistes Français. Amiet probably used tempera for the first time during his sojourn in Pont-Aven, but continued to paint mostly in oil until just before the turn of the 20th century. At that time – as evidenced by his two record books "Sold Paintings" and "Catalogued Paintings", by his correspondence with Giovanni Giacometti, by other contemporary sources, and by the results of our materials analyses – tempera became his favourite painting medium.

The first unambiguous evidence of Amiet's use of a specific tempera type is a reference from 1899 referring to the product "Pereira'sche Tempera", which had become widely available. In the same year he painted with a tempera he mixed himself, using a ready-made egg/linseed oil emulsion called "Lompeck'sche Tempera" he'd ordered from the Berlin based painter and decorator August Wilhelm König (owner or part owner of the Berlin paint factory F. Herz & Co.). A third tempera Amiet used in 1902 and 1903 was another "Pereira" product, "Pereira'sche Medium-Temperafarbe", a linseed oil/gum emulsion that had been added to the Pereira range in the mid-1890s.

In the early summer of 1902 Amiet came into possession of a compilation of recipes for tempera binders developed by the Munich based painter Hermann Urban. The recipes contained, in various combinations: two types of gum arabic (Senegalgummi and Gummi arabicum), casein, egg yolk, cherry gum, copaiba balsam, mastic varnish (mastic in turpentine), amber and copal varnish (amber or copal cooked with oil), sugar solution, and wax, with additions of sodium borate, potash or vinegar. Making paints based on Urban's recipes was the focus of two meetings of Amiet and Giacometti at Amiet's home in Oschwand (in canton Bern) in the summers of 1902 and 1903, each of which lasted several days. During the second meeting they also experimented with

a tempera binder Arnold Böcklin had used containing cherry gum, that had just been published in a book.

Amiet must have known of and had access to other commercial tempera types, and many more recipes for making tempera. For some of Amiet's works, specific tempera types referred to in sources could be confirmed through binding medium analyses (FTIR, FTIR-FPA, GC-MS, and DT-MS).

Sources show that despite his great enthusiasm for tempera, Amiet battled with serious technical problems with it. Again and again his tempera paint layers came away from the ground and partially flaked off not long after their completion. Because of this, the collector Oscar Miller, on whose support Amiet depended, had developed a clear aversion to tempera as early as 1900. Following a dispute with Miller, Amiet gave up using tempera in 1904 or 1905, and painted from then on with oil colours. In the course of the following years he explored new artistic and technical ground; he became a member of the "Brücke" group of artists and intensively studied (on some occasions copied) Vincent van Gogh's work. His brushwork became more generous, he used increasingly medium-rich paint with a glossier surface, worked faster, applied paint wet-into-wet, and used impasto. This development was possible basically because he now worked in oil.

7. Painting process and effect

A conspicuous characteristic of Amiet's painted work is its immense stylistic diversity. As the technical study of approximately 60 paintings has shown, the diversity of his styles corresponds to the richness and heterogeneity of the working techniques he chose.

The examples given in this chapter illustrate a number of aspects of Amiet's painting process and thereby supplement the findings presented in earlier chapters that were gained from written sources and through materials analyses. Without claiming to be exhaustive, they represent what we know today about his initial sketches and underdrawings, about his occasional use of transfer techniques, about his use of overall or local underpainting and about his methods of paint application. To illustrate the early stages of his working process, works are used that remained unfinished. The chapter ends with a few remarks on his painting en pleinair, on his (rare) pentimenti, his varnishing practice and his occasional use of "recycled" supports.

8. Ageing phenomena

Amiet was by no means indifferent to the question of the durability of his works. He owned a number of technical reference books, in which the chemical structure and durability of pigments used in artists' paints at the time were discussed in detail. However, the inconsistent advice given in these books reflects that pigments on the market with the same name had different stability characteristics, due to the relatively unsophisticated manufacturing processes of the fledgling paint industry. There were also issues with pigment contamination by manufacturing residues, the destructive implications of which were not foreseen. Another problem was that pigments known for their instability, were knowingly, deceptively not identified

on paint tube labels. As a result of these factors, paintings created in this early period of industrial paint manufacture often exhibit tints that are not as chosen by their creators, but the result of changes the pigments in their paints have undergone.

Such changes have been observed in Amiet's paintings. This chapter discusses some examples of these changes; metamorphoses of the pigments chrome yellow, chrome orange, cadmium yellow, emerald green, synthetic ultramarine, and red lakes. The degradation of a cadmium yellow containing paint layer for example, led to a powdery texture as well as to the crystalline efflorescence of cadmium sulphate and cadmium zinc ammonium sulphate (analysed with XRF and FTIR). With the help of a paint cross section and 3D-synchrotron x-ray microtomography it was determined that these crystals form first within the layer and then migrate to its surface.

A type of degradation seen repeatedly in Amiet's work is the crumbling and flaking off of grounds due to bad cohesion and/or adhesion. Some of the examples of this must have been caused by Amiet's failure to pre-size his canvasses. He also appears to have excessively reduced the amounts of binding medium in his usually aqueous self-prepared grounds, with the aim of increasing their absorbency; these grounds seem to be rather porous. The contribution of their porosity to their degradation is currently under investigation at the Swiss Institute for Art Research.

So-called "protrusions" have occasionally been observed in Amiet's paintings. In two of the cases investigated they could be traced back to the formation in the grounds of zinc and calcium soaps respectively.

Some paintings Amiet executed on very lean aqueous grounds and left unvarnished have unfortunately been damaged via restorations. They were impregnated with a consolidant, or varnished, or both, so that their originally unsaturated, bright colours – in particular the originally bright white of the partly visible areas of ground – were irreparably darkened.

The catalogue of types of degradation found in Amiet's paintings is not exhausted by the examples given above. In many cases the investigation of their nature and causes is still at a very early stage.