On the changing appearance of, and potential treatment options for, softening and dripping paints in CoBrA oil paintings

Ida Antonia Tank Bronken (1), Jaap J. Boon (2), Robert W. Corkery (3), Hartmut Kutzke (4) and Calin Constantin Steindal (4).

1. The National Museum, Pb. 7014 St. Olavs plass, N–0130 Oslo, Norway. ida.bronken@nasjonalmuseet.no 2. JAAP Enterprise for Art Scientific Studies, Nieuwendammerdijk 79, 1025 LD Amsterdam (NL).
3. Applied Physical Chemistry KTH Royal Institute of Technology, Stockholm, Sweden. 4. Museum of Cultural History, University of Oslo, Norway.

Figure 1: Solid black paint and a sticky drip of soft black paint from *Le nu bleu* by Karel Appel in: (a) normal light; and (b) UV light. Henie Onstad Art Centre collection. Images: © The National Museum, Børre Høstland.

Figure 2 Drip from soft black paint from *Le nu bleu* by Karel Appel in: (a) UV light; and normal light (b). Henie Onstad Art Centre collection. Images: © Jaap Boon.

Background

Since 2013 the condition of the paints on ca. 100 paintings from five collections has been examined in the context of our project on exudates. From this larger group, 21 paintings by Asger Jorn and Karel Appel are chosen for further investigation. These paintings date from 1946 to 1971 and the condition of the paint varies from solid to matt and cracking, and/or from soft to dripping. Earlier projects have shown that uneven fluorescence is a strong indicator that the paint is softer than normal and sometimes exuding (Bronken & Boon, 2014). These 21 paintings were selected for further examination because some of their paints were dripping or exhibited an uneven fluorescence in UV light, which can be directly linked to the degree of softening of the paint (Fig. 1 a and 2 b). This poster focuses on preliminary results from the investigation of a four of the 21 paintings.

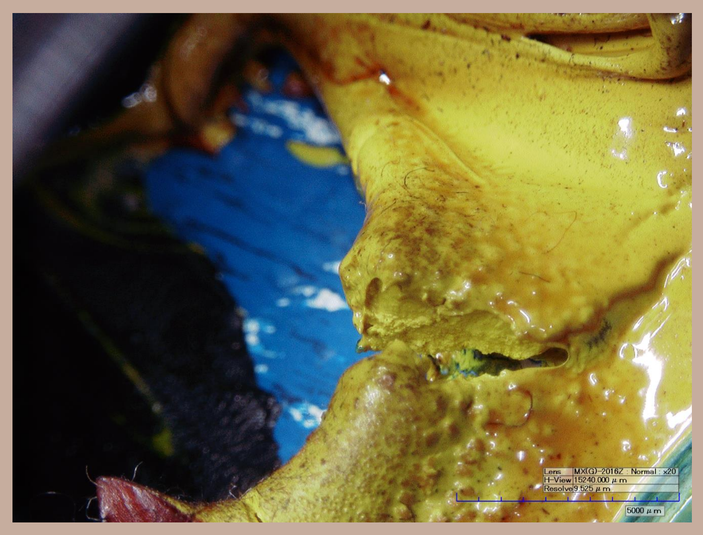

Figure 3: Ductile crack in soft yellow paint from *L'été* by Karel Appel. Henie Onstad Art Centre Collection. Image: © Jaap Boon.

Some paintings were investigated extensively with digital microscopy (Hirox KH7700), which showed various degrees of exudation at the surface appearing as shiny, sticky films attracting fibres and dust in general (Fig. 3). In severe cases droplets or even long fluorescent drips can be observed (Fig. 2a and 2b). The paints underneath exudates show uneven breaks with ductile or rough edges (Fig. 3).

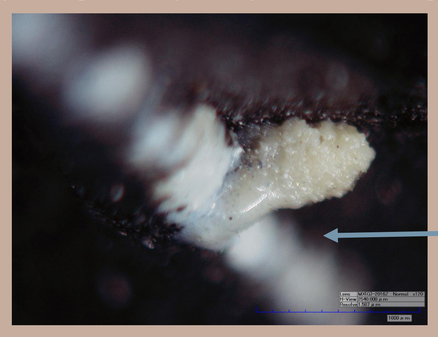

Figure 5a: Detail of protrusions from *Libellules blesses* dated 1961 by Karel Appel. Nasjonalmuseet for kunst, arkitektur og design Collection. Image: © Jaap Boon.

Figure 4: *Libellules blesses* dated 1961 by Karel Appel. Nasjonalmuseet for kunst, arkitektur og design Collection. Image: Børre Høstland © Nasjonalmuseet for kunst, arkitektur og design.

Project description

It is our objective to collect sufficient comparative data by using a broad analytical approach and selecting paintings created over a 25-year period with a wide variety of paint conditions. Scanning electron microscopy with energy dispersive X-ray analysis (SEM-EDX), Fourier transform infrared spectroscopy (FTIR), direct temperature resolved mass spectrometry (DTMS), electrospray ionization mass spectrometry (ESI-MS) and gas chromatography-mass spectrometry (GC-MS) are being used to characterize healthy, soft and dripping paints from the 21 selected paintings in an ongoing research project. The possible variations in the composition of materials make it difficult, at this stage, to predict which combinations are linked to the softening of paints.

Figure 5b: Detail of several globular protrusions from *Libellules blesses* dated 1961 by Karel Appel. Nasjonalmuseet for kunst, arkitektur og design Collection. High peaks at ca. 1520 and 1540 indicate a soap. Image: © Jaap Boon.

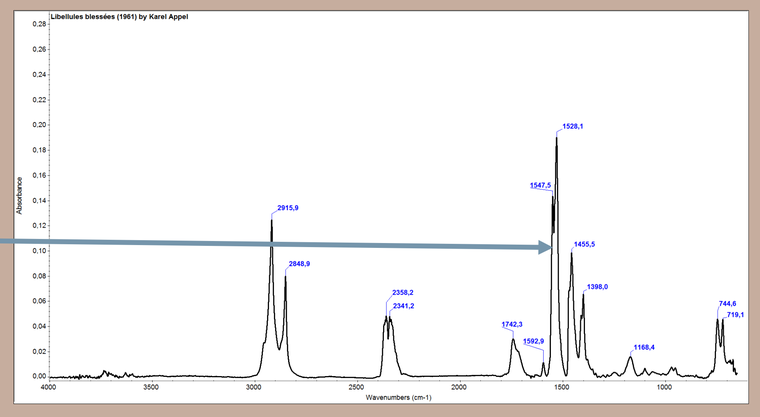

Figure 6: FTIR spectra of globular sample from *Libellules blesses* dated 1961 by Karel Appel. Nasjonalmuseet for kunst, arkitektur og design Collection. High peaks at 1528 and 1547 indicate a soap. Spectra: © Calin Steindal 2014.

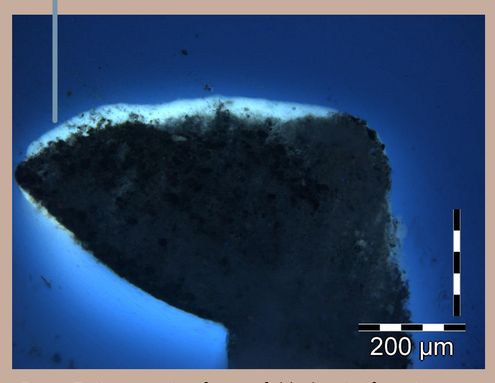

Figure 7: Cross section from soft black paint from *Le nu bleu* by Karel Appel in UV light 20x; showing fluorescent exudate on upper part of the sample. Taken from area with soft drip (see Figure 2). This separation of materials is typical for soft paint. Henie Onstad Art Centre collection. Images: © Ida Bronken.

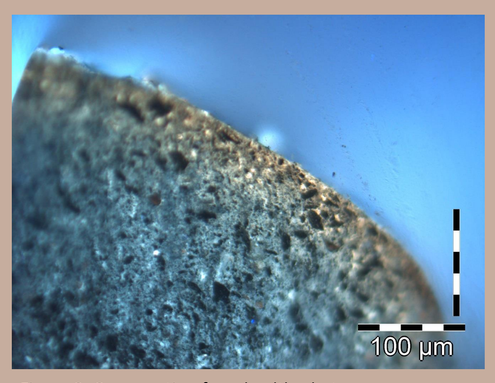

Figure 8: Cross section from healthy, but slightly soft black paint from *Le nu bleu* by Karel Appel in UV light. Henie Onstad Art Centre collection. Images: © Ida Bronken.

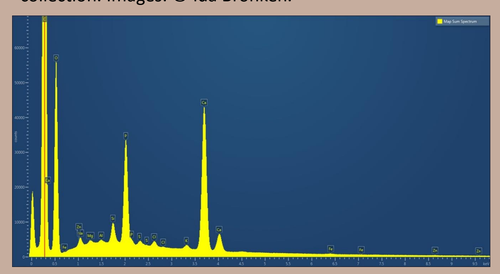

Figure 9: SEM EDX spectra of soft black paint from *Le nu bleu* by Karel Appel. Henie Onstad Art Centre collection. High peaks at calcium and phosphor indicate the use of boneblack pigment. Spectra: © Calin Steindal.

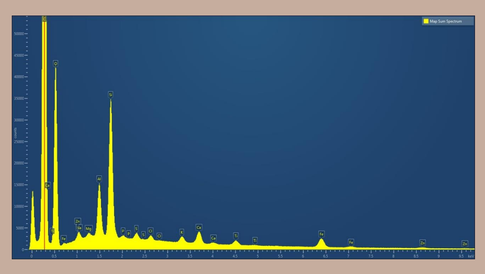

Figure 10: SEM EDX spectra of healthy black paint from *Le nu bleu* by Karel Appel. Henie Onstad Art Centre collection. High peaks of Silicon and aluminium indicate the addition of kaolin as a filler. Low peaks at calcium and phosphor indicate trace of bone black pigment. Spectra: © Calin Steindal.

Microscopic examination of several paintings, sometimes, shows severe damage in locations at which the different layers exhibit dissimilar properties. Some of the results so far indicate that many of the symptoms and instances of damage can be linked to a growing incompatibility of compounds inside individual layers and between different layers in the paintings (Fig. 3. 5, 7 and 12). In our opinion, the development of treatment options for paintings displaying soft and dripping paint requires in-depth analysis and an assessment of the potential future chemical and physical changes in the paint. The insights presented here should provide a foundation for the further development of our experiments on hardening soft paint using metal ions (Bronken *et al*., 2015).

Selected examples

Sometimes softness in a black paint coincides with zinc saponification and the predominance of polar compounds in the paint, raising the question of whether these factors are linked. In the painting *Libellules blessées* (*ca*. 1961) by Karel Appel zinc soaps with a globular form are protruding out of the black paint (Fig. 4-6). So far these different globular and amorphous shapes has been found on several of the soft black paints Initial chemical analysis, as well as visual examination and preliminary experiments on possible conservation treatments, have shown that the current state of softness for specific paints is a result of various chemical and physical changes.

There are ample evidences from a number of paints studied by mass spectrometry (DTMS) that the exudates are rich in triglycerides with moieties of mid-chain oxygen-functionalized stearic and azelaic acids. Dripping paints show an increase in saturated compounds where their polar fractions are phase separating as weeping exudates (Figs 1a and 1b). Mass spectrometric and FTIR data mutually support each other. Our observations have led to the hypotheses that polar, i.e. acidic organic fractions, develop in the oil paints due to use of semi-drying oils, while exudation is caused by the absence of sufficient anchoring sites to retain the acidic fractions within the paint structure.

Figure 11: At work on location. Investigating C'est grace à nous from 1957 by Asger Jorn. Image: © Ida Bronken.

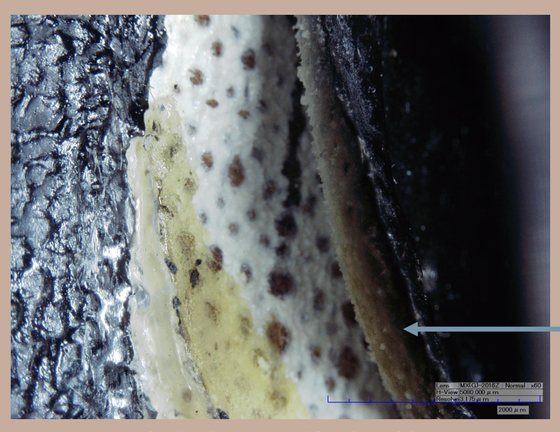

Image 12: Area that has been consolidated are delaminating again. Soft paint is difficult to give a lasting treatment. C'est grace à nous from 1957 by Asger Jorn. Image: © Jaap Boon.

References

Bronken, I.A.T. & Boon, J.J. 2014. Hard dry paint, softening tacky paint, and exuding drips on *Composition 1952* by Jean-Paul Riopelle. In: K.J. van den Berg, A. Burnstock, A. de Tagle, M. de Keijzer, G. Heydenreich, J. Krueger & T. Learner, eds. *Issues in Contemporary Oil Paint*. Amersfoort: Springer: 247–62.

Bronken, I.A.T., Boon, J.J. & Vila, A. 2015. In search of a solution for softening and weeping paints in contemporary paintings by Tal R and Frank van Hemert. In: R. Clarricoats, ed. *Current Challenges in Paintings Conservation*. London: Archetype Publications: 28–41.