

Pekka Halonen and his paints – hidden secrets revealed using a geomaterials approach

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It is interesting how a pandemic, with its associated disruption to the normal way of life, can lead to an unintended burst of inspiration and brand-new ways of thinking. This is exactly what happened to us. During an imaginative moment, we asked ourselves the question “*what are oil paints made of, and what kinds of minerals and materials are in them?*”

Even though this is not an original area of investigation, we soon realized this had not been done before from a purely Finnish geomaterials perspective. One particular artist came to mind – Pekka Halonen (1865–1933) – who was well-known to one of us (SL) for his snowy scenes of Finnish landscapes. And so, we further pondered: “*what kinds of white paints had he used to create these masterpieces, and what was in those pigments that allowed him to create such a lovely range of tones and textures?*”

In order to find out the answers to these pressing questions, we somehow needed to gain access to Pekka Halonen’s original paints

and palettes. Did they even exist? It was at this point, as we were slowly emerging from lockdown in September 2021, that the helpful staff including Museum Curator Johanna Rintaho and Communications Coordinator Tarja M. Kärkkäinen at the Halosenniemi Museum came to our rescue and enabled our ideas to come to life (Fig. 1).

There are indeed extensive collections of used and partially used paint tubes at the Museum, all beautifully archived. We were allowed to *borrow* some of them, along with many fragments of paint from memorabilia such as original paint wells, boxes, and palettes. All of these materials had been rescued when his studio, (which doubled up as the family home), was bequeathed by the Halonen family in 1949 to the Municipality of Tuusula on the condition that it was to become a museum.

Every item had to be handled with extreme care, not only with curatorial cotton gloves, but any analysis needed to be strictly non-destructive. We first set about imaging the paint tubes using GTK’s powerful X-ray



Figure 1. Example paint tubes from the Halosenniemi Museum.

Kuva 1. Esimerkkejä Halosenniemen museon maali-tubeista.

862 White paint tube

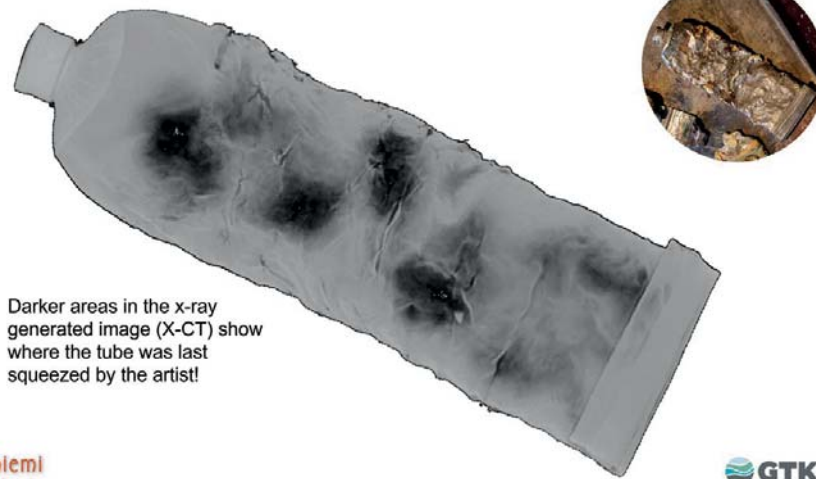


Figure 2. X-ray computed tomography system (X-CT) image of a complete white paint tube showing the areas where the artist last squeezed the tube.

Kuva 2. Röntgen-tomografia (X-CT) -kuva valkoisesta maalituubista, jossa näkyvät taitelijan sormenjäljet tummanharmaalla.

computed tomography system (X-CT), which provided 3D images of the outside of the tubes, but also revealed the hidden secrets inside! In one notable case, we were able to reconstruct what appears to be the original finger markings where the artist had last squeezed the tube (Fig. 2).

Next, we looked at several of the paint fragments under the Scanning Electron Microscope (SEM), using our combined Backscattered Electron Imaging (BSE) and Energy Dispersive Spectrometry (EDS) capabilities. This revealed not only the complex textures of the paints, but perhaps more importantly, the micro-chemical compositions of the individual particles. It turns out that the paints we had selected – which included fragments of white, blue, green, red, yellow, and violet paint – were incredibly interesting.

In summary (Fig. 3), we found out that the paints contained various combinations of Pb and Hg (known to be neurotoxic), Ba and Cr (considered genotoxic), and in some cases additionally Hg, Co, Cd, and As (potential for metal poisoning). This was to be expected but still alarming to us that the artist would have been exposed to such materials!

Furthermore, one particular paint (a pale pink colour) not only had an interesting

composition, but upon careful inspection, was found to contain fossils – more precisely micro-fossils. These look remarkably like the coccoliths found in the Cretaceous deposits of Europe and the UK, suggesting that the manufacturer had added crushed chalk to the paint, possibly as a filler or extender (Fig. 4).

Our studies with the Museum are continuing. The results of our initial findings have been summarised in a mini-documentary (YouTube: <https://www.youtube.com/watch?v=lKB6r-9tqkg>) and a small booklet, which form part of the current exhibition at the Halosenniemi museum (https://www.halosenniemi.fi/tiedotepalsta/show.tmpl?id=8533&sisivu_id=3004).

We have just completed imaging one of Pekka Halonen's original (paint mixing) wooden palettes using novel, extra large-scale, scanning micro-XRF techniques, and later on this year (August 2022), we hope to report on the findings of scanning some original paintings *in situ* at the Halosenniemi Museum using the same technology.

Talks are planned for August 2022 for those who are interested to learn more about the topic and to meet the researchers (<https://tapahtumat.tuusula.fi/en-FI/page/6267bdaad131e41dc8fd7553>).



Pekka Halonen's paints are highly toxic!

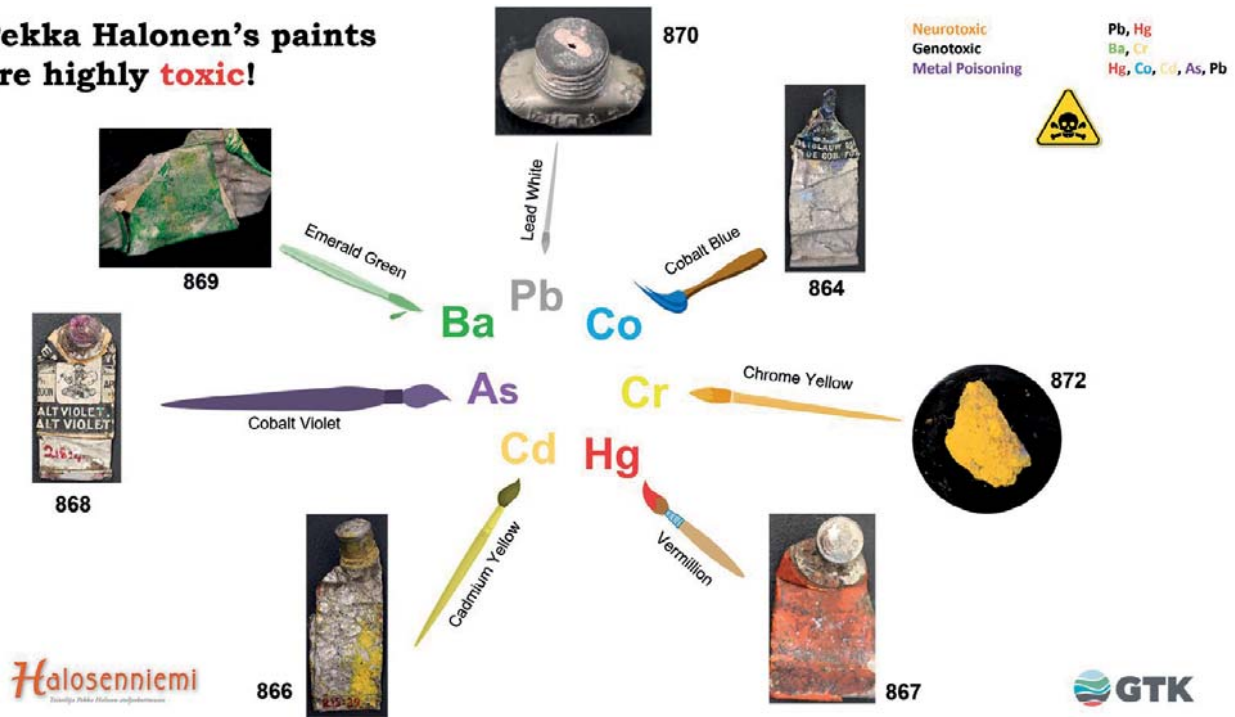


Figure 3. Graphic to represent the different types of paints and their broad compositions.

Kuva 3. Erityyppisiä maaleja ja niiden yleisluonteiset koostumukset. Lyijy (Pb) ja elohopea (Hg) määritellään neurotoksisiksi (hermosoluille myrkyllisiksi), barium (Ba) ja kromi (Cr) genotoksiksi (perimämyrkyllisiksi) sekä elohopea, koboltti (Co), kadmium (Cd), arseeni (As) ja lyijy myrkyllisiksi metalleiksi.

Painting with fossils!

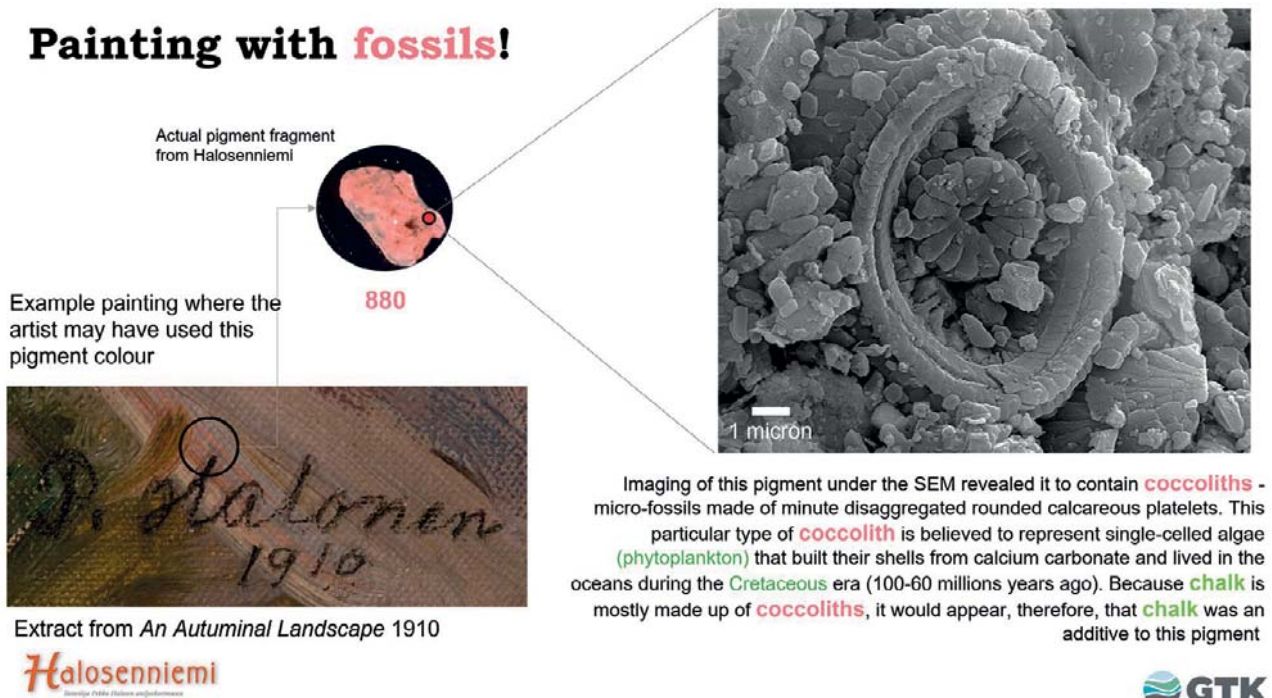


Figure 4. Pekka Halonen was unwittingly painting with fossils, as revealed in this particular sample taken from his studio, which contain coccoliths.

Kuva 4. Pekka Halonen maalasi tietämättään fossiileilla, joka selvisi tästä hänen ateljeestaan otetusta vaa-leanpunaisesta maalinäytteestä (vasemmalla). Maalipala sisältää kokkoliitti-fossiileja (pyyhkäisy-elektro-nimikroskooppikuva oikealla).

Finally, we have even started to make our own mineral-based oil paints to see if we can replicate what the Old Masters worked with, and even though we have a way to go, initial results are very promising!

Acknowledgements

We would like to thank the staff at the Halosenniemi Museum (Johanna Rinta-aho and Tarja M. Kärkkäinen), who have generously given up their time to help us with the Painting with Minerals Project. We also acknowledge the help we have received from the following colleagues at GTK: Ian J. Corfe, Jukka Kuva, Ester Jolis, Bo Johanson, Kati Kiviniemi, Pasi Heikkilä, Seppo Töllikkö, and Peter Sorjonen-Ward.

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Alan R. Butcher is both a generalist and a specialist geologist, with a keen interest in rocks of commercial importance. His lack of a single-track specialism has enabled him to develop topical trends in geoscience over the years. Currently leading research into battery minerals as part of the Circular Economy Research Group at the Geological Survey of Finland, Alan is working on an improved Circular Economy of Raw Materials, as part of Finland's drive to attain carbon neutrality by 2035. Painting with minerals is a new interest.

Sari Lukkari is Senior Scientist at the Research Laboratory, Geological Survey of Finland (GTK), Espoo, Finland, where she is responsible for all the

electron microscopy-related work. Her research interests are varied and include the magmatic evolution of pegmatites, and the development of secondary materials characterization and processing. She is a specialist in the mineralogy and geochemistry of Li-pegmatites, as applied to exploration, mineral processing and traceability. Sari is also an art enthusiast.

Tiivistelmä

Pekka Halonen ja hänen maalinsa – piilotetut salaisuudet paljastettiin geomateriaalitutkimuksen avulla

Geologian tutkimuskeskuksen (GTK) ja Halosenniemen museon yhteistyönä on juuri valmistunut tutkimus Halosenniemen maali-
tubeista ja pigmenttifragmenteista, joiden uskotaan olevan Pekka Halosen alkuperäisiä materiaaleja. Pandemian aikana syntyi idea tutkia luonnonmineraalien osuutta öljymaalien synnyssä. Tapaaminen syyskuussa 2021 Halosenniemen tutkijan Johanna Rinta-ahon ja viestintäkoordinaattori Tarjan Kärkkäisen kanssa mahdollisti pääsyn laajaan maalituubien kokoelmaan (esimerkkejä kuvassa 1) ja johti tähän tieteelliseen tutkimukseen. Espoon GTK:n tutkimuslaboratorion kuvantamis- ja analysointimenetelmillä saatiin selville mistä monet Halosenniemen maalit on tehty (kuvat 3 ja 4). Röntgentomografialla havaittiin myös taiteilijan sormenjäljet maalituubista (kuva 2). Koko tarina on esitetty minidokumentissa YouTube: (<https://www.youtube.com/watch?v=lKB6r-9tqkg>) ja pienessä kirjassessa, jotka ovat osa Halosenniemen nykyistä näyttelyä (https://www.halosenniemi.fi/tiedotepalsta/show.tpl?id=8533&sivu_id=3004). Elokuulle 2022 on suunniteltu yleisöluentoja kiinnostuneille ja tutkijoiden tapaamista varten (<https://tapahtumat.tuusula.fi/en-FI/page/6267bdaad131e41dc8fd7553>).