

# Light Sensitivity of Inuit Prints from Cape Dorset: colour monitoring and microfade testing

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## Introduction

In 2009, during the development of the travelling exhibition "Inuit Prints: Japanese Inspiration", organized by the Canadian Museum of History (CMH, formerly Canadian Museum of Civilization), the light sensitivities of the Cape Dorset prints to be featured were noted as an area of possible concern. In early 2010 microfade testing was carried out on a selection of nine prints to identify areas with high light sensitivities. In order to quantify any colour change as a result of light damage during the exhibition colour monitoring was carried out on the same nine prints. Following the 5-year tour, which resulted in an accumulated light dose of 0.44 Mlx-h (50 lux for 8760 hours), the colour measurements were repeated. The results presented here demonstrate the value of colour monitoring, and how microfade testing complements it. It also illustrates how these techniques can be used to reduce light damage and help inform subsequent exhibitions of these materials.



*Shaman Revealed* with its polyester film template placed over top and the black standard underneath.  
*Shaman Revealed*, by Ningeoekuluk Teevee, 2007, Canadian Museum of History, CD 2007-021 ii, IMG2016-0117-0001-Dm



Taking colourimetric measurements.  
*Raven's Chorus*, by Kenojuk Ashevak, 2002, Canadian Museum of History, CD 2002-021, IMG2016-0117-0003-Dm

## Colour Monitoring

### Materials

- Minolta CR-200 tristimulus chroma meter with illuminant D65, 10° Standard Observer, CIELAB (1976) L\*a\*b\* colour space.
- Replicate positioning ensured by use of a polyester film template customized for each print.
- Measurements were taken using both Alpharag Artcare 8663 Natural Black and 8655 Pure White 4-ply mat boards as standard backings.

### Method

- Number of locations monitored per print varied depending on the number of colours selected for measurement.
- Each location was measured five times with each standard by lifting and repositioning the targeting nozzle between each measurement.
- Total Colour Change (Delta E 2000 (dE'00)) was calculated from the L\*a\*b\* coordinates for each location.

## Microfade Testing

### Materials

- Canadian Conservation Institute (CCI) APEX Microfade Tester

### Method

- The tester, based on Paul Whitmore's design, uses a Newport APEX Illuminator with a 75 W ozone free xenon arc lamp. IR and an UV filter were used to remove excess heat and UV radiation. The illuminated light spot is approximately 0.3 mm diameter, with an averaged luminous flux of 0.46 lm. The spot intensity is approximately 6.5 Mlx.
- Reflectance spectra of test areas were collected every 30 seconds for 10 minutes. Data was further processed using the Getty Spectralviewer (v.2008) software. The rate of total colour change of the test areas were compared to those of ISO Bluewool standards 1 to 3 (BW). Results are reported as BW equivalents.

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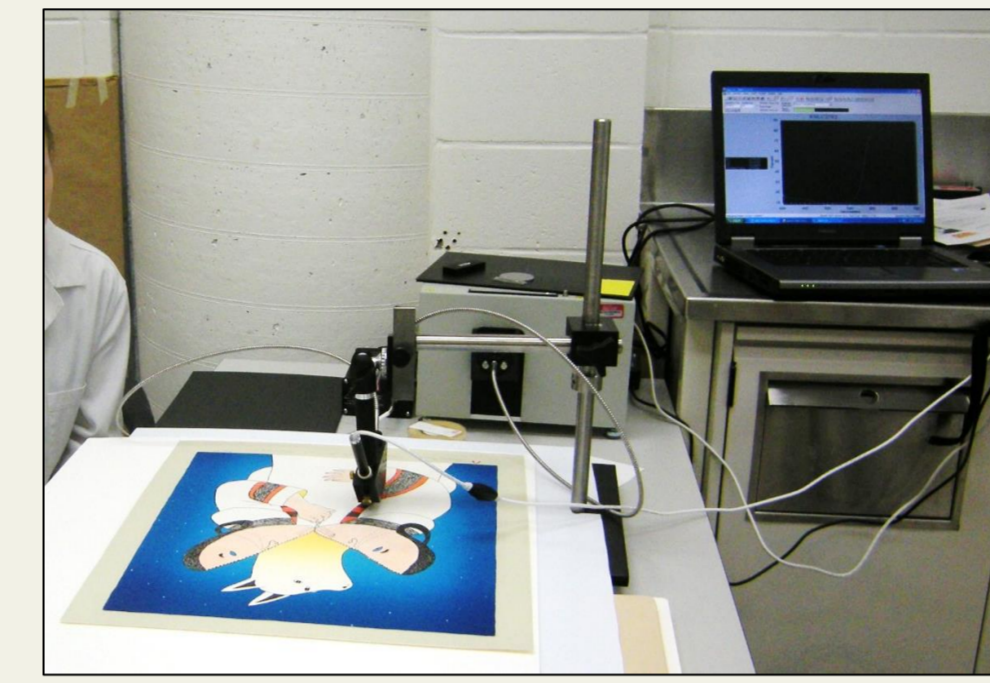
## Results and Discussion

- Microfade testing complements colour monitoring by identifying areas that are potentially highly light sensitive, and should therefore be targets for long term monitoring.

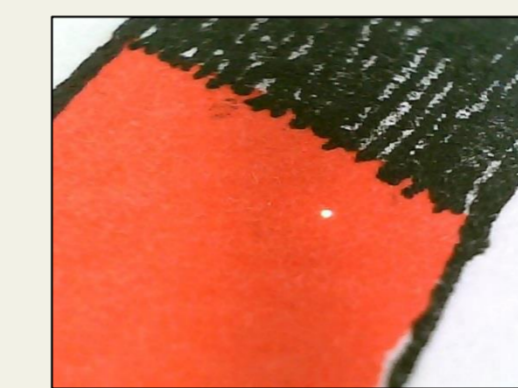
- Of the nine prints, the lithograph *Shaman Revealed* was identified by microfade testing as containing several light sensitive areas (equivalent to BW1 to 3). The "Pink" and "Orange-red" areas showed some fading, with increase in lightness (L\*), decrease in red (a\*), and decrease in yellow (b\*).

- Upon closer examination of other test areas, such as "Light blue sky", the main contributor to colour change is loss of yellow, and not fading of blue. Fading of blue should result in increase in lightness and/or loss of blue.

- This suggests that for some of these coloured areas, the predominant process during microfade testing is light bleaching of aged (and yellowed) media and substrate. Any fading that occurred is secondary by comparison.



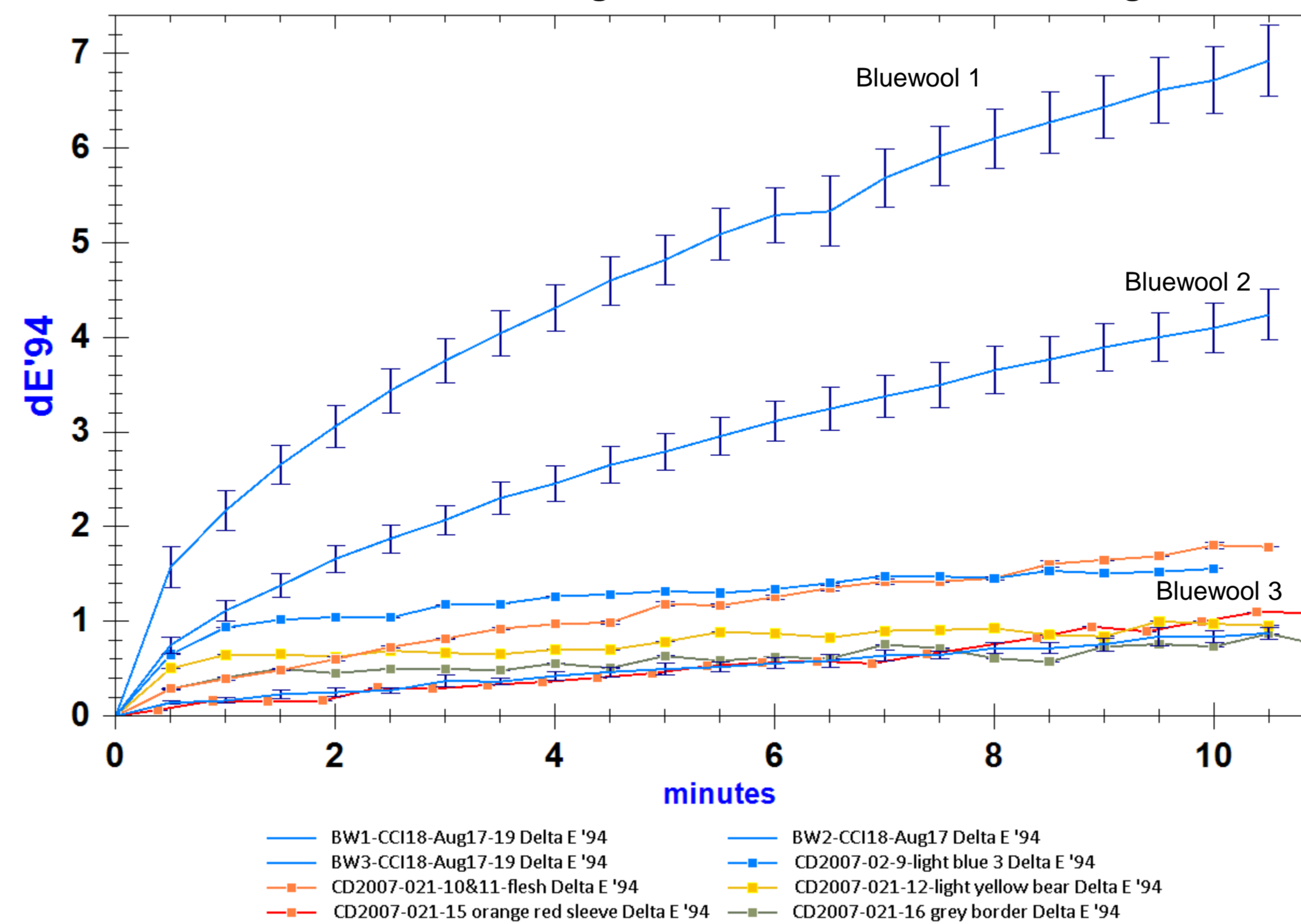
Microfade testing of *Shaman Revealed* (CD2007-021 ii) in 2010  
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Pencam image of microfade test spot  
© Canadian Conservation Institute

<i>Shaman Revealed</i> CD2007-021 ii Microfade Test Results after 10 minutes					
	Blue Wool Equivalent	dE'00	dL* Lightness	da* +red – green	db* +yellow – blue
<i>Pink-tan (human)</i>	2.7	1.57	0.49	-1.19	-2.90
<i>Light blue (sky)</i>	2.8	1.02	0.21	0.91	-1.73
<i>Orange-red (sleeve)</i>	3.0	1.04	0.79	-2.15	-0.69
<i>Green (paper)</i>	3.0	0.80	0.26	-0.14	-1.33
<i>Yellow (spirit face)</i>	3.0	0.64	-0.20	-0.05	-1.07

*Shaman Revealed* CD2007-021 ii Rate of Colour Change of five areas during 10 minutes of Microfade Testing



- The table below shows the colour change of *Shaman Revealed*, in areas similar to those in the microfade testing, after 5-year exhibition (0.44 Mlx-h).

<i>Shaman Revealed</i> CD2007-021 ii Colour Monitoring Results after 5 years				
	dE'00	dL* Lightness	da* +red –green	db* +yellow –blue
<i>Green (paper)</i>	1.23	-0.54	0.16	1.90
<i>Pink-tan (human)</i>	0.84	0.29	-0.70	0.33
<i>Yellow (spirit face)</i>	0.68	0.28	-0.81	0.39
<i>Light blue (sky)</i>	0.27	-0.05	-0.36	0.79

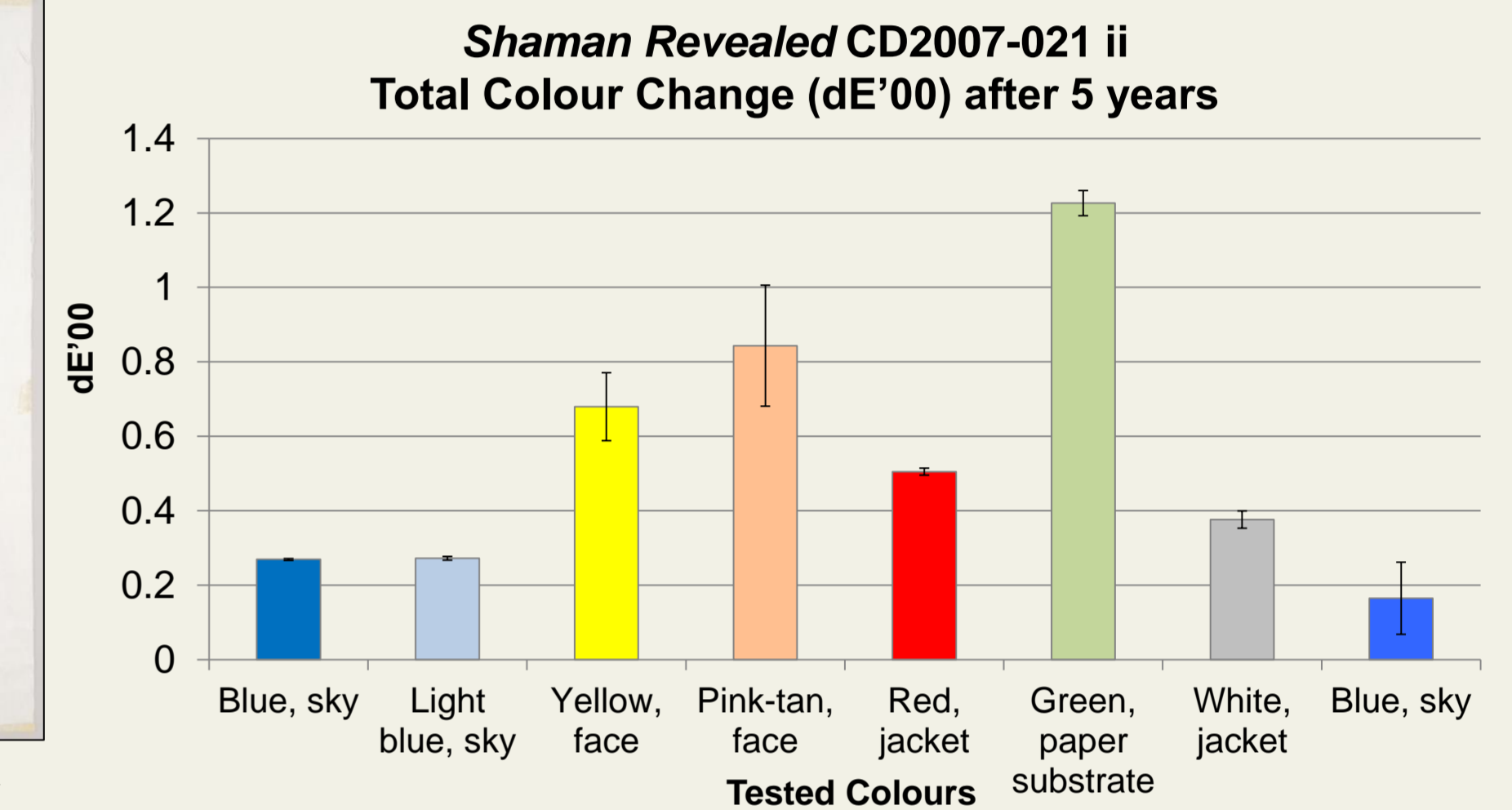
- Colour monitoring results showed that two prints have areas with total colour change dE'00>1 after the exhibition. For *Shaman Revealed* (CD 2007-021 ii), all areas tested have dE'00<1 except for the paper substrate (dE'00=1.23). The paper substrate darkened, and became slightly more red and more yellow. This is consistent with oxidation of paper with aging. While the coloured printing inks did not show dE'00≥1, the results showed a trend of lightening (fading) and yellowing.

- For the second print *Owl, Fox and Hare Legend* (CD 1959-021 SS) colour monitoring showed several areas with dE'00>1. With slight increase in lightness (L\*); slight decrease in red (+a\*), and in one area, slight increase in green (-a\*). There is a consistent decrease in yellow (-b\*) which can be attributed to light bleaching of the paper substrate and ink media.

- Microfade test results showed that the printing inks on *Owl, Fox and Hare Legend* do not have highly light sensitive colourants, equivalent to BW1-3.



*Owl, Fox and Hare Legend*, by Osuitok Ipeelee, 1959, Canadian Museum of History, CD 1959-021 SS, IMG2008-0902-0065-Dm



- There are differences in the extent and manner of colour change between colour monitoring and microfade testing. This is expected due to the difference in light intensity between the microfade testing light spot (6.4 Mlx) and museum lighting (50 lx).

- Microfade testing only measures colour change as a result of light exposure, but colour monitoring captures colour change as a result of all environmental factors not just light.

<i>Owl, Fox and Hare Legend</i> (CD1959-021 SS) Colour Monitoring Results after 5-years				
	dE'00	dL* Lightness	da* +red –green	db* +yellow –blue
<i>Blue</i>	1.29	1.45	-0.33	-0.34
<i>Dark blue/black</i>	1.14	0.26	-0.44	-1.06
<i>Dark blue/black</i>	1.12	-0.41	-0.49	-0.93
<i>Blue- purple</i>	0.89	0.68	-0.05	-0.89

## Conclusions and Notes

- Colour monitoring data demonstrated that only two out of nine prints contain colour change greater than dE'00=1.0 after the 5-year exhibition. These results are an indication of the trajectory of future colour change that may occur due to further exhibition.

- Light, with or without UV, is one of many factors that contributes to long term colour change. Other factors must be considered to understand or to minimize colour change. These include composition of the substrate and the ink, natural aging apart from light, temperature and relative humidity, history of light exposure and pollutants.

- Not all colour change is a result of light fading. It is important to examine changes in colour co-ordinates, and not just total colour change (dE).

- Microfade test results, when used with the CCI Light Damage Calculator, are useful tools for estimating the possible fading of colours due to light exposure. Based on the BW ratings and the exhibition light dose of 0.44 Mlx-h, no noticeable colour change is expected even for the most light sensitive areas.



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