Intro to into –

Impact to museums

Impact to vision

Ranging from lab to real world

**Chapter Summary**

Museum objects damaged by light, but need lighting.

Damage factors tell us that certain wavelengths are less damaging than others.

We can have comparable lights which change only in CCT (with luminance and colour rendering held roughly steady), where the damage potential is radically different.

A standard understanding of colour constancy would suggest that there is no perceptual difference between choosing one or the other.

Interviews with museum professionals showed that whilst great care was taken to limit luminance with the aim of minimising damage, the choice of CCT was not considered as a means to limit damage.

**Conclusion 1:** Where damage by light is a concern, damage indices should be calculated for each prospective illuminants, using the most appropriate available damage function. *A MATLAB script has been written and made available which allows for such calculations to be made easily.*

Where such a calculation is not performed, a rough rule-of-thumb would be that if all other factors are equal, choosing an illumination with a lower CCT is highly likely to reduce the potential for damage.

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However…

There is not yet a full understanding of how the human visual system adapts to illumination of different chromaticities.

Additionally, there is not yet a full understanding of what attributes make a light source pleasant, or natural.

It is possible that the recently discovered iPRGCs are involved.

*Arguments*: position in retinal circuitry, absolute signalling (rather than relative), slow and spatially broad

Computational and psychophysical experiments were performed to study the effect of melanopic signals:

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**Sphere experiment 1:**

Tested adaptation to different wavelengths, using an achromatic matching method, to see whether specific wavelengths had specific effects (which would be unexpected from simple Von Kries adaptation).

Null hypothesis: Existing CATs can explain data collected for adaptation to narrowband illumination.

Conclusion: \_\_\_\_\_\_\_

**Sphere experiment 2:**

Tested adaptation to perceptually matched illuminants, which varied in melanopic luminance, using a set-up very similar to the sphere 1 set-up.

Null hypothesis: There is no difference between the two conditions (since they are perceptually matched). A difference between conditions (above a threshold for splatter / stimulus drift) would suggest a non-visual input.

Conclusion: \_\_\_\_\_\_\_

**Computational experiment:**

Considering the lack of clarity provided by the results of the above experiments, an exploratory computational experiment was performed to increase our understanding of the problem of varying illumination in real natural environments, and ask the question: what *is* the optimal linear method for solving this problem in a natural context?

Conclusions:

1. A melanopic signal does not directly give an indication of average illumination chromaticity in a scene.
2. \_\_\_\_\_\_\_

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**Tablet methodology:**

The sphere experiments were conducted in a carefully controlled, and thoroughly unnatural, lab environment. The computational experiment attempted to simulate a visual problem in a natural environment.

A method for exploring colour constancy in real/complex environments was developed, and assessed. It has been made available for use, though I recommend several modifications to anyone who would wish to employ it.

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Conclusion: novelty

Where things were, where now?

Next steps – significant works