



PhD Thesis

Casting a New Light on Museums and Galleries

*towards modern industry guidelines
for lighting in museums and galleries*

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Author's Declaration

Except where stated and referenced, all of the work contained within this PhD thesis represents the original contribution of the author. Some of the material presented in this thesis has previously been published by the author in the following publications;

Roos, M. & Ulas, E. 2013, Looking art in a new light- Part A, Papyrus – the Official Publication of the International Association of Museum Facility Administrators, vol 11, p35-36.

Roos, M. & Ulas, E. 2013, Looking art in a new light- Part B, Papyrus – the Official Publication of the International Association of Museum Facility Administrators, vol 12, p14-16.

Ulas, E. 2010, Daylighting and UV study for the National Gallery of Australia, Steensen Varming, Sydney.

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Ulas, E. 2011, Lighting study for the NSW Parliament House, Brett Whiteley Artwork Display, Steensen Varming, Sydney.

Ulas, E., Crampton, R., Tennant, F. & Bickersteth J. 2015, *A Practical Guide for Sustainable Climate Control and Lighting in Museums and Galleries*, Steensen Varming and International Conservation Services, Sydney.

Ulas, E., Crampton, R., Tennant, F. & Bickersteth J. 2011, Technical Industry Report for Museums and Galleries, Steensen Varming and International Conservation Services, Sydney.

Abstract

Museums and Galleries are spaces where collections are made available, and where old or new information, heritage values, cumulative knowledge and experience of individuals and communities can be shared and cultivated further to advance the society. At the same time, museums and galleries are also the institutions that preserve and protect the cultural heritage and keep it safe for the benefit and enjoyment of the future generations. Often these two key objectives conflict with each other, because exhibiting an object, may cause ageing, damage and degradation of its materials, and may have a detrimental impact on its integrity, significance or value. An institution's decision to exhibit an item may mean that its future usable life is compromised to some degree. It is, therefore, crucial to understand the effect of the environmental parameters on the exhibited items within the display spaces so that they are displayed in a manner that minimises the impact on these objects while providing adequate conditions to optimise the visitor's experience. This requires the design of the spaces, the sorting of the material and the setting of the environmental parameters to be working hand in hand with the artistic and curatorial vision.

Lighting is important for the appearance of museum and gallery displays and is a fundamental element in shaping the visitor's experience of an exhibition. On the other hand, lighting, as an environmental parameter, is one of the key issues in preventive conservation. It needs to be used delicately and often sparsely to minimise damage on the objects as light may cause damage to exhibition materials by causing fading of pigments and may degrade objects over a long period. This process is called photodegradation. Photodegradation can be defined as the decomposition of molecules caused by the absorption of energy in the form of photons, particularly from the ultraviolet and visible parts of the electromagnetic spectrum. As a result of photodegradation, the material composition breaks up and becomes irreversibly transformed, i.e. it may be impossible to create or repair the lost information on an exhibition object through interventive methods. Therefore, the exhibition of a light sensitive object requires a well-balanced lighting that optimises the visual display quality versus the risk of damage, such as fading, colour shift or structural deterioration.

In this perspective, the design of lighting for museum and art gallery exhibition display spaces is a non-prescriptive task which requires numerous considerations. These applications involve intertwined necessities for the visual satisfaction and well-being of the visitor and the livelihood of the presented cultural material. The complexities of the visual perception, the care required for preserving cultural heritage, the environmental performance of the lighting systems and technologies within the gallery space, and the particular curatorial needs and circumstances of individual collections necessitate considerable attention to a myriad of comfort and performance factors. These factors require a holistic evaluation of the cross-related lighting issues, to address them in a balanced manner.

Subject to the research study here is a factor in the lighting of exhibition spaces that is regarded with more attention than almost any other; illuminance.

Illuminance is the amount of luminous flux per unit area, i.e. the amount of light falling onto a surface. While being only one of the numerous lighting performance parameters, illuminance, is often regarded as the sole means of assessment for the evaluation of satisfactory viewing of the cultural material and for determining whether a lighting setup satisfies the requirements for minimising light damage (photodegradation).

It is also important to note here that visual richness (or satisfaction of viewing) is phenomenological in its nature and is rather a subjective experience that is formed in the human mind as a result of an interaction of the attributes of a lit environment and its context, the characteristics of the source of light itself and the many perceptual factors that are particular to the perceiver. Therefore, considerations of objective reality are not fully sufficient in explaining visual phenomena, yet alone illuminance (lux) level alone as a sole criterion.

Embarked on the above issues, this research questions the commonly referenced museum and gallery industry guidelines and practices of designing exhibition lighting strictly by certain lux values that predetermine the band of adequate lighting environment, by postulating minimum and maximum illuminance values. This approach needs to be challenged due to two key reasons: Firstly, illuminance alone, as a metric, does not provide the designer with adequate information on the quality of the visual environment, neither does it solely provide adequate information on the impact of the light exposure on the cultural material. To address these, one needs to consider, amongst many, the spectral composition of the light source, the spatial

distribution and the surface attributes of the illuminated environment and objects. Secondly, the light sources used in museum and gallery environments are in a rapid changeover from incandescent-based technologies to semiconductor-based, Light-emitting Diode (LED) technologies. There are profound differences between these two light sources both regarding their spectral and spatial characteristics and working principles. Moreover, the light source that was used to form the basis of most industry guides is the xenon-arc technology, which again has profound differences with the Light-emitting Diodes. These differences inevitably affect the lighting composition and may result in very different outcomes regarding the visual results and the damage potential, even when the measured illuminance levels may be equal.

This research, therefore, examines the relevance of the common industry practices of today, in order to derive practically applicable outcomes that can improve industry guidelines and provide information for the museum and gallery sector, on some of the key perceptual aspects of museum and gallery exhibition display, to contribute to developing more thorough lighting design criteria for exhibition display environments that support the visitor experience and contribute to the protection of the cultural material for future generations.

The research suggests an alternative approach to the 50/200 lux rule (Thomson, 1978) and also proposes a framework to rethink the allowed exposure levels (“Kluxhours/year” values) for revising the CIE 157:2004 guidelines to better suit the use of Light-emitting Diodes in museum display lighting applications.

Key Words

Key Words: museum and gallery lighting; exhibition lighting; display lighting; lighting design; museum environment; art lighting; light-induced fading; photodegradation; light damage; art conservation; visual acuity; colour recognition; detail recognition; illuminance level; CIE 2004:157; kluxhours/year;

Biography of the Author

A lighting designer, Emrah Baki Ulas is an associate at the consultancy practice Steensen Varming where he co-leads lighting design.

After graduating from high school as the valedictorian in 1999, Emrah completed his undergraduate studies in Electrical and Electronics Engineering at Bogazici University in 2004 and then continued to complete his postgraduate studies at the University of Wismar in Germany in 2006 in the field of Architectural Lighting Design. His practical career in lighting began at the Istanbul Foundation for Culture and Arts, working for the Istanbul Biennale and other high profile cultural events during his university years. He was mentored by Kemal Yigitcan, Istanbul-based leading lighting designer, Dr. Ing. Georgios Paisidis, a leading Greek lighting thinker, Dan Mackenzie, a respected engineer, Michael Day, a lighting educator, and worked alongside Mirjam Roos, a distinguished lighting designer.

Emrah holds many accolades and recognitions from the lighting industry. His projects portfolio has an emphasis on cultural institutions, particularly museums and galleries. He contributed to numerous professional lighting forums around the globe. His work has been published internationally.

Emrah describes himself as an enthusiastic advocate of the development of academic lighting education and research. He promotes a stronger integration of theory and philosophy into design practice. He pursues to challenge common best-practice methodologies through research-based evidence, for the advancement of lighting design profession.



