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28 June 2016

Dear Mrs. Simpson,

### Blinding vehicle lights - dangers from LED II

I thank you for your response of 24 June 2016, please may I draw your attention to another new scientific publication from the American Medical Association by Louis J Kraus MD concluding that light from bright LED streetlights (similar to LED used by automakers) is damaging to the human eye.

#### Quotes from the AMA report:

*Page 3 Unshielded LED Lighting (also as installed on vehicles)*

*Unshielded LED lighting causes significant discomfort from glare. A French government report published in 2013 stated that due to the point source nature of LED lighting, the luminance level of unshielded LED lighting is sufficiently high to cause visual discomfort regardless of the position, as long as it is in the field of vision. As the emission surfaces of LEDs are highly concentrated point sources, the luminance of each individual source easily exceeds the level of visual discomfort, in some cases by a factor of 1000.1*

**Discomfort and disability glare can decrease visual acuity, decreasing safety and creating a road hazard.**

*Page 5 Recommendations*

*That our AMA encourage the use of 3000K or lower lighting for outdoor installations such as roadways. All LED lighting should be properly shielded to minimize glare and detrimental human and environmental effects, consideration should be given to utilize the ability of LED lighting to be dimmed for off-peak time periods.*

Injuries and fatalities to vulnerable road users are increasing in proportion to the number of vehicles equipped with blinding eye damaging 6,500k near blue spectrum 440 to 460nm radiation LED and BiXenon and Laser lights, not only in Europe, but also in the USA.

In view of this new AMA study (and the 30 appended) as life safety is at risk, I submit that this growing body of expert medical opinion can no longer be ignored and that the DfT has a legal and moral duty of care to protect UK citizens. Failure to take immediate action could result in the DfT management team right up to Patrick McLoughlin Transport Minister being held liable under the corporate manslaughter act 2007.

I do hope that the DfT will take appropriate and timely action to prevent further deaths and injuries.

Yours sincerely,

Roy Milnes

[roy@lightmare.org](mailto:roy@lightmare.org)  
 This open letter is published  
 at [www.lightmare.org](http://www.lightmare.org)

## Appendix Expert studies and reports on the dangers of blinding light

also listed at [http://www.lightmare.org/Expert\\_opinion.htm](http://www.lightmare.org/Expert_opinion.htm)

### [Human and Environmental Effects of Light Emitting Diode \(LED\) Community Lighting](#)

American Medical Association - Louis J Kraus MD June 2016

Also see associated CNN article "[Doctors issue warning about LED streetlights](#)"

#### Quotes for AMA report Page 3 Unshielded LED Lighting (also on vehicles)

Unshielded LED lighting causes significant discomfort from glare. A French government report published in 2013 stated that due to the point source nature of LED lighting, the luminance level of unshielded LED lighting is sufficiently high to cause visual discomfort regardless of the position, as long as it is in the field of vision. As the emission surfaces of LEDs are highly concentrated point sources, the luminance of each individual source easily exceeds the level of visual discomfort, in some cases by a factor of 1000.1 Discomfort and disability glare can decrease visual acuity, decreasing safety and creating a road hazard.

#### Page 5 Recommendations

3. That our AMA encourage the use of 3000K or lower lighting for outdoor installations such as roadways. All LED lighting should be properly shielded to minimize glare and detrimental human and environmental effects, and consideration should be given to utilize the ability of LED lighting to be dimmed for off-peak time periods. (New HOD Policy)

### [Human Responses to Lighting based on LED](#)

Public Health England, Chartered Institute of Building Services and Society of Light and Lighting May 2016

#### 5.2 Blue Light hazards and hotspots, page 18

"Some wavelengths are more effective at causing harm than others, with the peak effect very close to the sensitivity of the short wavelength cones, in other words blue light at around 440 nm. The blue LEDs used in street, office and domestic LED lighting generally emit at around 450 nm to 460 nm. For this reason, there are concerns that the guidelines may be exceeded, especially by lights with hotspots arising from LED chips in direct view."

**Light pollution: the possible consequences of excessive illumination on retina Eye 30, 255-263 (February 2016) | doi:10.1038/eye.2015.221 M A Contín, M M Benedetto, M L Quinteros-Quintana and M E Guido Abstract:**

Light is the visible part of the electromagnetic radiation within a range of 380–780 nm; (400–700 on primates retina). In vertebrates, the retina is adapted to capturing light photons and transmitting this information to other structures in the central nervous system. In mammals, light acts directly on the retina to fulfill two important roles: (1) the visual function through rod and cone photoreceptor cells and (2) non-image forming tasks, such as the synchronization of circadian rhythms to a 24 h solar cycle, pineal melatonin suppression and pupil light reflexes. However, the excess of illumination may cause retinal degeneration or accelerate genetic retinal diseases. In the last century human society has increased its exposure to artificial illumination, producing changes in the Light/Dark cycle, as well as in light wavelengths and intensities.

**Light in man's environment. Marshall J. Eye (Lond). 2016. Abstract:**

Light in the form of solar radiation influenced early civilisations and resulted in the independent development of a number of sun-worshipping dieties. These were of particular importance as hunter gatherers transformed into settled agricultural societies. All artificial light sources were synonymous with fire, and early civilisations began to expand their visual day by burning brands, oil, and candles. Fire-based light sources extended for thousands of years and were still present in the era of gas lighting. Light meant fire risk. The advent of incandescent bulbs and the era of electric lighting really only expanded in the early part of the twentieth century. Fluorescent lighting became available in the 1940s, and today the drive for low energy has resulted in a plethora of novel light sources-in particular, light-emitting diodes (LEDs). Evolution governed the development of the eye in relation to roughly 12 h of light gradually changing to 12 h of darkness. Today almost daylight levels can be achieved abruptly at the flick of a switch.

[Eyecare research LED cause 5x more phototoxicity](#) Dr. Celia Sanchez-Ramos RCC Harvard

[Inattentional Blindness and Conspicuity](#) Professor Marc Green Phd Yale University updated 2011

[Tailored to the Eye P. Heilig March 2015](#) Professor Peter Heilig University of Vienna explains how bright light affect the eye down to photon and molecular level

[Daytime Running Lights - What good? P. Heilig Jan 2014](#) "Traffic Safety: No Benefit, Contravention of Human Rights, Children at risk particularly on pedestrian crossings

[Bright white headlights: are they safe? Flyingshingle.com Jan 2012](#)  
Michael D. Mehta, Ph.D. Dean and Professor, Faculty of Arts Thompson Rivers University BC

[Light Pollution P. Heilig December 2011](#) "Light Pollution can be prevented. It has to be prevented – for the sake and for the benefit of ecology, economy and sensory physiology. And the beauty and the magnificence of the world heritage Starry Sky".

[Verirrte Lichtstrahlen \(Stray Light Rays\) P. Heilig June 2011 - deutsch](#)

[Letter to Lightmare 12 May 2011](#) by Professor David Rees Ph.D. FlOD, FRAS

**Dr. Daniel McQueen:**

"Although I am a cyclist, I have more problems with HID lights when driving my car, maybe because when cycling, I am higher than when driving. As a motorist I am frequently completely blinded by Sports Utility Vehicles driving behind me, they are so high, and the glare in my wing mirrors, actually blinds me to the road ahead, I dip the rear view mirror, but can do nothing about the wing mirrors. I had assumed that it was ignorant motorists driving with undimmed lights, I now realise that the lights are dipped, they are just too bright to be safe for other road users".

**Dr. Trevor Dale B.Sc., Ph.D., LL.B**

"Headlights do not help much in well lit streets and my night vision is destroyed each time a vehicle passes with headlights on. Sidelights are quite sufficient in these cases. Headlights should be reserved for emergency use and for the dark. They also draw indirectly on fuel to power them – not green."

**Dr. Richard H. Barton**

"These high intensity lights have a bluer spectrum than the older lights, which adds to refractive scatter, and in fact because of this spectral balance, is also less useful for yielding information from the reflected light"

[Glare on the roads: Are we being driven to distraction?](#)

Geoff Roberson from the [Association of Optometrists](#) says that HID-Xenon lights could be a problem for motorists - April 2011

[How Much Light do we need? P.Heilig Nov 2010 - deutsch](#)

Prof. Peter Heilig lucidly explains how vehicle lights affects the safety of children, adults, the elderly and athletes

[Safe Cycling P. Heilig Apr 2010 - english](#)

Safe Cycling is a good introduction to the problems blinding Xenon-HID and DRL lights cause vulnerable road users.

[Impaired Perception - Driving and Sports P. Heilig Aug 2010 - english](#)

Impaired Perception takes a step further explaining how blinding Xenon-HID and DRL lights cause change blindness, inattentional blindness, effect on Visual Short Term Memory and Capacitive Dysfunction

[Why HID Xenon headlights bother older drivers British Journal of Ophthalmology 2003](#)

M A Mainster, G T Timberlake, Department of Ophthalmology, University of Kansas Medical Center,

"Governmental regulations determine which headlights we encounter. Acceptance or rejection of the current generation of HID xenon headlights ultimately depends on their record in traffic and litigation.

[Can Xenon lights affect vision?](#)

[Dr. Edgar Leuenberger](#), Asian Eye Institute March 2009

[Retinal Light Damage 2009 Dr. P. Heilig, Dr. Elena Rozanova, Dr. Jasminka Godnic-Cvar](#)[EPIGUS - Prof. Dr. Ernst Pfeleger Sep 2007 deutsch Report on the failed Austrian DRL experiment](#)[Monitor on Psychology - inattentional blindness - Siri Carpenter](#)[The Morbid Philosophy of Advertising Dr. P. Heilig Oct 2010 english](#)[Unrestrained Advertising Dr. P.Heilig Oct 2010 - deutsch](#)

These publications describe how the cumulative effect of roadside adverts diminish safety

[Disability and Discomfort Glare of Headlamps - english](#) Locher, J.& Kley, F. (2009). ISAL 8th International Symposium on Automotive Lighting (38 - 42) This paper seeks to justify Xenon headlights - it concludes in static laboratory conditions that there is minimal difference between Xenon-HID, LED and normal Tungsten-Halogen headlights if correctly aligned. However if mis-aligned discomfort glare is present.

A major failing of this static laboratory experiment is not carrying out real-world tests on moving vehicles with Xenon-HID headlamps - when they traverse legal speed humps or potholes they temporarily blind drivers.

This is a real concern as the laboratory was Hella's who make headlights for many vehicles.

[Glare from oncoming traffic: Headlight properties -Visual performance and glare – deutsch](#)

Locher, J., Schmidt, S., Isenbort, A., Kley, F.& Stahl, F. (2008) Blendung durch Gegenverkehr: Der Einfluss unterschiedlicher Scheinwerfereigenschaften auf die Sehleistung und das subjektiv empfundene Blendgefühl. Zeitschrift für Verkehrssicherheit, 54 (1), 10 – 15.

[Countermeasures for the effects of reducing Headlight Glare](#) AAA Foundation 2001 Mace, Garvey, Porter, Schwab, Adrian

This report proposes using the well known effects of polarised light to minimise headlight glare and seems an eminently sensible solution

[Inattentional Blindness by Marc Green Ph. D.](#) Occupational Health & Safety Canada 2002**Videos:-**

**BBC Sangita Myska, Ken Perham takes on SMMT** <http://www.bbc.co.uk/news/uk-13143206>

**Prof W. Schober Lethal Lights** <https://player.vimeo.com/video/30590238>