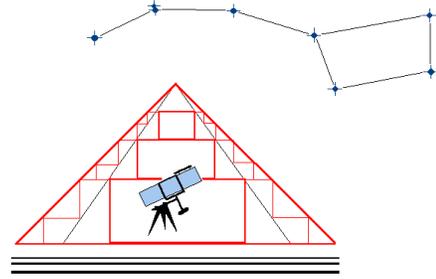


Milton Keynes

✦ *Astronomical*

Society

(founded 1972)



28 April 2003

Science and Technology Committee

Inquiry into Light Pollution and Astronomy

Response from Milton Keynes Astronomical Society

Introduction

Milton Keynes Astronomical Society is a gathering of around 25 amateur astronomers from the Milton Keynes area. We promote and conduct a full programme of talks and activities which include observing the skies. The Milton Keynes area is set to expand drastically in the coming decades and we are keen to see that the Science and Technology Committee recommends new ways to prevent the obliteration of the night sky and redress the present trend of haphazard lighting schemes.

Our response will be more qualitative than quantitative. We shall leave the detailed technical response to organisations like the Campaign for Dark Skies (Cfds) at the British Astronomical Association which have appropriate experience in this field.

We shall consider successively the following specific questions as set by the Committee:

1. **What has been the impact of light pollution on UK astronomy?**
2. **Are current planning guidelines strong enough to protect against light pollution?**
3. **Are planning guidelines being applied and enforced effectively?**
4. **Is light measurable in such a way as to make legally enforceable regulatory controls feasible?**
5. **Are further controls on the design of lighting necessary?**

Here are our answers to the following specific questions set by the Committee:

1. What has been the impact of light pollution on UK astronomy?

As we perceive it, the impact on UK Astronomy is two-fold:

1.1 Increased sky background:

Firstly, it has brightened the sky background so much that from urban locations, where most amateur observers live, it is only possible to observe stars brighter than magnitude +3, *making* it impossible to recognise the outline of well-known constellations, never mind fainter objects. From a truly dark site, i.e. one out in the countryside and well away from urbanised centres, it would be possible to observe stars up to magnitude +6. In addition, light domes from urban areas affect vast swaths of countryside well beyond their direct line of sight. The effect is more insidious and can probably only be detected over a period of years - by which time it's too late. This masking of starlight diminishes with distance but as cities are seldom further apart than tens of miles, it is impossible to escape the attenuating effect of poor urban lighting.

For telescopic observers of extended objects like nebulae and galaxies, the problem is worse as the light from these objects is spread out over a larger area. Competition between sky background and incoming photons is more acute. The same problem is encountered when detectors (photographic film, CCDs) capture incoming starlight and are swamped by stray man-made light.

It would be difficult not to mention environmental factors when tackling this subject as the state of our atmosphere amplifies greatly the magnitude of the problem caused by light pollution. Thankfully, past legislations through the application of the Clean Air Act have removed the majority of particulates from the atmosphere. However, we live in a maritime climate with varying degrees of moisture concentration in suspension in the atmosphere. On its own, moisture droplets will attenuate the brilliance of starlight but they are a very effective scattering agent of stray man-made light.

We should cite at this stage the example set by the Czech Republic which has passed legislation designed to protect the Atmosphere and Skies as a whole. I quote:

'The law defines "light pollution" as "every form of illumination by artificial light which is dispersed outside the areas it is dedicated to, particularly if directed above the level of the horizon." Under the law, Czech Republic citizens and organizations are obligated to "take measures to prevent the occurrence of light pollution of the air".

<http://www.astro.cz/darksky>

1.2 Loss of awareness of the stars

Since the majority of the population live in cities, most people do not notice the sky and are therefore not inspired to find out more about the universe they live in. This will inevitably lead to a reduction in interest in astronomy generally - at a time when the government has realised that astronomy can have a bearing on normal daily life such as studying the risk of impact by near-Earth objects. Furthermore, light pollution will make those objects harder to detect.

Secondly, the present state of light polluted skies de-sensitises a large section of the population to the wonders of Astronomy. Already, several generations have missed out on the natural phenomenon of the star canopy. The impact of this can be translated to a lessening of scientific inquisitiveness in young minds with long term consequences to academic and professional astronomy.

Even in our modern world, an awareness of the celestial sphere is an advantage, and the history of mankind teaches us that it has inspired human progress and the advancement of scientific knowledge over the centuries. Mankind has benefited greatly through the progress of discovery and scientific thought. By hiding the stars, we compromise our ability to discover the processes that will, one day, supply our next source of clean energy.

We know now that the Earth is not immune from a collision with an incoming space object. We may not yet have all the means to shield ourselves from such a global catastrophic threat but we should protect our ability to detect such objects.

Even though probes have reached a little way in our solar system, astronomical objects still have to be studied remotely. Whilst space orbiting observatories are essential to study some parts of the electromagnetic spectrum inaccessible through our atmosphere, at other wavelengths, it is better and cheaper to use our Earth platform to carry out these scientific investigations. Professional institutions seek out remote locations to carry out their observations but amateur observers have to remain in their respective localities to engage in their day-to-day activities. Amateurs are now using sophisticated detectors, and the most prolific amateur supernova hunters are British.

2. Are current planning guidelines strong enough to protect against light pollution?

Clearly not. They may help prevent new light pollution but will do nothing to reduce existing problems which are already past the planning stage.

At last, we are starting to feel that the subject of light pollution is being taken seriously rather than being considered a joke by planning authorities. The full impact of current regulations can be glimpsed in current developments i.e. the updating of bulky and ageing low-pressure sodium lamps thanks to a Government grant making £300 million available in 2003-04 to help local authorities modernise

their street lighting but the proliferation of light usage for our 24-hour society makes any improvement very hard to quantify.

Certain light installations like the globe with 'sugar bowl' diffuser (louvered globe luminaire) are still being installed and they are the worst offenders. Whereas lighting installations can be replaced by friendlier fixtures as part of a rolling refurbishment programme, the worst installations should be removed and replaced forthwith.

Security lighting or 'insecurity' lighting as some people have renamed it is a major bugbear. Although most of it is sensor-switched, it is predominantly overpowered (too many watts), overpowering (creating shadow zones) and badly installed. It contributes to a rise in the background stray light invading the skies.

Sporting installations (golf driving ranges, outdoor tennis courts and athletic tracks) are probably the worst offenders in delivering stray light to their environment, and therefore the skies, and they must think of better ways to design their lighting.

Our case against light pollution is not helped by the fact that stray light is not currently recognised as a statutory nuisance as noise, dust, smells already are. It is essential that stray light/ light spillage is recognised as a pollutant in the same legal framework as pollutants in the air or water.

3. Are planning guidelines being applied and enforced effectively?

Let's mention firstly that guidelines should encompass public, commercial and residential lighting. Our experience here in Milton Keynes (late 2002 when a searchlight was installed at the shopping centre without planning permission) indicates that there is insufficient manpower or funding to deal promptly with breaches of the regulations. Also a recent addition to the shopping centre comes with what appear to be full-cut-off street lights (which is good) but these have an attached light lower down which throws light in all directions, negating the benefit of the main light.

Looking at current developments, it is difficult to imagine that current guidelines are being effectively enforced. Architects must specify a certain type of lighting in their brief to their clients in agreement with current guidelines and regulations. I do not insinuate that there is some element of institutionalised flouting taking place at some stage but council departments seem to condone such actions either through lack of manpower, lack of funding for their departments or inaction on their behalf.

The question of control and enforcement should perhaps be passed to a dedicated department of the Environment Agency (in the same way that the National Rivers Authority policies the Regional Water Authorities). This would ensure that the council departments policing this sector are supervised in their present function and it would promote the application of a national standard as some councils are much more responsive and enthusiastic to the implementation of new policies than others.

4. Is light measurable in such a way as to make legally enforceable regulatory controls feasible?

Measurement is possible but is open to a range of factors that greatly reduce its usefulness such as:

- The amount of natural brightness in the sky - measurements taken at midnight in winter will be different from midnight in summer as the sun is further below the horizon in winter.
- The amount of water vapour/dust in the air.
- The skill of the operator if an automatic device is not used.
- Accurate calibration and maintenance of devices

Measurement of ambient light is not required for legally enforceable controls. The simplest control is to ensure that lights shine down and not near or above the horizontal.

It follows that, if light is not allowed to be emitted above the horizontal, then it is easy to spot offending installations and to recommend to their operators that they should be modified. Non-compliance should generate a fine and a compulsory order should be serve to have the modification carried out. Natural reflectance of surfaces is inevitable but luminous output of a luminaire should be tailored to the reflectance index of such a surface.

The amount of stray light is measurable from above and orbiting satellites at night already deliver data quantifying the problem. This is locking the stable door after the horse has bolted (<http://www.lightpollution.it/dmsp>).

5. Are further controls on the design of lighting necessary?

If designs followed the guidelines produced by the Institution of Lighting Engineers for preventing light pollution (<http://www.ile.org.uk/>) the vast majority of problems would be prevented.

Security lighting is a particular problem. It is understandable that householders feel the need for security lighting, but installations are frequently inexpertly done and use equipment which although widely available is unsuitable. The government website on crime reduction highlights this: (<http://www.crimereduction.gov.uk/burglary45.htm>).

Other consequences:

I would also like to mention that Astronomy is not the only thing to suffer from light pollution - wildlife and humans do also. Studies have shown that too much

light when people are trying to sleep can cause brain chemistry imbalances and insomnia.

There is also a considerable waste of energy. If you look out of the window of a plane flying over a town, a good deal of the lighting is going up in the air to no purpose at all. If the light were better directed the power requirements could be reduced, saving energy and no doubt CO2 emissions also.

Wherever the light is projected downwards and not allowed to escape from the horizontal, we are left with good quality lighting. To this effect, professional bodies like the Institution of Lighting Engineers should compile lists of luminaires complying with a policy of full light cut-off above the horizontal. Manufacturers or importers of luminaires bringing light scattering luminaires on the market should be subjected to the same regime of fines that are currently in force with other pollution offences.

Glare is a major by-product of badly shielded luminaires. It is a nuisance when driving, particularly on wet surfaces. It contributes to higher levels of driver fatigue and compromises road safety.

On another level, we must consider whether all areas have to be lit throughout the night or at the same intensity. Taking the case of countries like France, some local authorities switch off some public lighting after 11pm. Public lighting schemes in the middle of country areas are especially sensitive to inadequate installations and should be overhauled to comply with a full light cut-off above the horizontal. Local authorities go to great lengths to slow the speed of traffic on the roads (urban and country) but they increase the intensity of lighting to facilitate traffic flow leading to a contradiction of purpose in the aims set to be achieved.

Conclusion

We want to restate that the proper control of artificial light does not compromise personal and public safety. To argue the contrary is plain emotional blackmail. Also, saturation lighting is not a solution to social problems in areas of high crime rates. The remedy to this problem lies much deeper in these communities and must be addressed through education and empowerment of the people.

As sites of special scientific interests (SSSI) are protected by law in the natural world, we would like the skies to gain the same recognition. Although the astronomical objects we strive to see are very remote, their momentary loss to our eyes is as great as the disappearance of endangered species here on Earth.

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Website: <http://www.mkas.org.uk/>