

Light pollution: penetrating the veil

Bob Mizon, co-ordinator of the BAA's Campaign for Dark Skies, describes how amateur astronomers can fight the curse of light pollution and suggests some objects to observe from even the most light polluted areas.



The night sky near Stonehenge (!) compromised by a golf range. (CfDS)

As we move through the twenty-first century, the twentieth-century phenomena of light pollution and light nuisance have gained an increasingly high profile in the environmental debate. The growth of towns, rural urbanisation, the 24-hour lifestyle and fear of crime have all led to a rapid expansion of *uncontrolled* exterior lighting. Newcomers to astronomy in urban areas might well decide that it is a pursuit more easily followed in an armchair or at a computer keyboard – what is there to see outdoors at night, beneath what the Royal Commission on Environmental Pollution compared in 2010 to ‘a cloud of visually impenetrable, artificial vapour’?

Three types of light-related problems concern the amateur astronomer and the responsible citizen.

Skyglow is caused by wasted light escaping upwards from wasteful and unshielded fittings, scattered by atmospheric aerosols to create the familiar glow hanging above every town (and many villages) in the UK. Skyglow has veiled the starry sky for more than 90% of Britons, according to a 1990 survey by the BAA's Campaign for Dark Skies (CfDS), and more recent national star counting projects organised jointly by the Campaign to Protect Rural England (CPRE) and the CfDS.

Glare is the most safety-related aspect of light pollution, and is the typical result of the ubiquitous 500W home ‘security’ lamp, usually angled outwards in the vain hope that its excessive dazzle may deter burglars (it does not). While road lighting shows a trend nationally towards better, downward direction, the lack

of regulation of private lighting means that poorly aimed domestic, commercial and sports lights continue to steal the stars from most residents of the British Isles.

Light intrusion, the spilling of light into neighbouring houses and gardens, is increasingly a matter of concern to environmentalists. Local authorities, and retailers of the offending lamps, react to that concern in a variety of ways, some seeking to alleviate the problem, others showing little interest. Even thick bedroom curtains may not give relief to victims of excessive lighting, and anyone advised by councils and judges to seek such a solution should firmly reject the advice: would councils and courts tell victims of noxious smells to wear pegs on their noses? In law, the polluter must solve the problem.

The answers to the problem of wasted light seem self-evident: simply aim lights properly, with appropriate shielding, and use appropriate wattages (500W is half as bright as Britain's brightest lighthouse, the Longstone!). In these energy-conscious days, why isn't everyone using economical, environmentally sensitive lighting?

There are several answers to this question. First, whole generations have now grown up knowing only poor-quality lighting, and they think it is normal. Second, lighting practice in the UK is often subject only to guidelines rather than regulations, and guidelines can be ignored with impunity. Other contributory factors include the fostering by manufacturers of the myth that bright lights deter crime, and the fact that retailers still offer lights that are not designed for the task in hand. Most electrical devices are carefully designed to perform their stated functions, but lights are usually allowed to shine not only where their emissions are needed, but also where they manifestly are not. Government, manufacturers and retailers have sometimes responded sympathetically to calls for improvements, but they are slow in coming.

Environmental Health Officers have powers to deal with light-nuisance offenders under the Clean Neighbourhoods Act of 2005, but many local councils seem strangely reluctant to pursue

complaints. Victims sometimes resort to expensive litigation. Planning laws and advertising regulations may also be invoked against intrusive lighting, especially from commercial premises. Illogically, transport hubs such as bus stations and docks are exempt from legislation, and can pollute at will, an anomaly currently being addressed by the CfDS in consultations with DEFRA.

Bodies such as the BAA and the CPRE have taken the lead in urging the government to ‘get lighting right’, but the night sky is still without protection in law. It seems perverse that those who dump rubbish in fields and spoil our countryside can be fined thousands of pounds and



Example of a ‘rottweiler’ light set at the wrong angle. If used at all, such a unit should be mounted with the glass almost parallel to the ground. (Bob Mizon)

even go to prison, but the night sky can be spoiled, and its beauty veiled with wasted light, without fear of penalty.

Humans are not the only species whose lives are disrupted by spilled light. Nocturnal insects, birds, fish, reptiles and mammals have no curtains to pull. Millions of our fellow creatures on this planet are disturbed, and even die, because we do not aim lights properly or use rea-

Observing basics is a series of articles by BAA Section Directors and other experts, designed to help you get started in observing, whether you are a newcomer to astronomy or an ‘old hand’ thinking of taking up a new area of interest.

Look out for further articles in the series in future issues of the *Journal*!

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sonable wattages. The health implications of living with artificial light at night, and not sleeping in darkness as we have for countless thousands of years, are only beginning to be realised. Anyone seeking more information on what has become known as the 'LAN (light-at-night) debate' should refer to the CfDS website, www.britastro.org/dark-skies.

Observing targets

Can the enthusiastic newcomer to astronomy do some real observing beneath tainted skies? Apart from the Moon and planets, there are many night-sky objects that can be found and studied in light-polluted areas, if the observer is not standing directly beneath a streetlight or a few metres from a 'Rottweiler' ('security') light. Here is a small selection of five assorted targets, near brighter objects that help to locate them, arranged by season of culmination (when at their highest point in the sky).

Spring

Galaxy NGC 3992, RA 11h 57m, Dec. +53° 22'

This tenth-magnitude barred spiral galaxy is part of the group of galaxies strewn across Ursa Major. It is in the same low-power field as γ UMa (Phad). Sometimes referred to by Owen Gingerich's 1960 appellation M109, it is a beautiful object in photos, shaped like a slewed Greek θ . I first observed it at a magnification of 108 times on a clear spring night in 1992, when it was almost at the zenith, in a moderately light-polluted sky. I noted a large inner area of brightness, bulging slightly northwards to give the nucleus a bean-shaped appearance; a fainter oval glow surrounds this. Distance 60 million light years.

Summer

Variable star R Coronae Borealis, RA 15h 48m, Dec. +28° 09'

This reliable sixth-magnitude variable, easily studied through binoculars, lies within the distinctive and delicate arc of the Northern Crown (Corona Borealis), at its highest in May. R Coronae has an interesting habit of disappearing from time to time. It is a yellow supergiant, and fades at intervals varying from weeks to years, to magnitudes as faint as +14. This is due, it is thought, to a continual build-up of carbon dust in its atmosphere. It is intriguing to think that you might be the first person in the world to notice that R Coronae has disappeared again.

Autumn

γ Andromedae (Almach), RA 02h 03m, Dec. +42° 20'

This bright naked-eye star is a fine double system for any size of telescope. The primary (magnitude +2.3) is golden yellow. The secondary (+5.1) is often listed in handbooks as blue, but it remains resolutely *green* whenever I look at it. Is this just an *idée fixe*, a contrast effect, or a real colour? Try a moderate magnification. I see it well at $\times 108$.

Winter

Cluster M35 (NGC 2168), RA 6h 09m, Dec. +24° 21'

This is a superb, tight cluster of hundreds of sparkling stars, with a pleasing curve of slightly brighter stars at its centre, at the 'top right-hand corner' of the box-shaped constellation of Gemini. Even low powers will give great views



A fish-eye lens view of the night sky from the Channel island of Sark, the UK's first dark-sky community. (Martin Morgan-Taylor)

Winter

h3945, RA 7h 17m, Dec. -23° 18'

In summer, telescopes at star parties often turn to Albireo (β Cygni), a double star with components of wonderfully contrasting colours. In winter, however, they are rarely aimed at the finest coloured double star then available in the sky, h3945 in Canis Major. Look for this orange-red and electric blue pair, just east of α^2 CMa and north of τ CMa. I found it by chance for the first time in 1971, low in the south through the light pollution of Poole, and was surprised that I had never heard of it before. The magnitudes are +4.8 & +6, and the separation 27", so it is easily split with moderate power. This is an optical double, i.e. a line-of-sight effect; the brighter of the two stars is 2500 light years from us, while its 'neighbour' is only one-tenth of that distance away.

through the telescope; binoculars will show a fuzzy mass. American astronomer and writer Jeff Kanipe described it as resembling 'a tangle of Christmas lights strewn across the floor', and it is at its highest around the end of December.

Apart from observing only bright objects, are there other courses of action astronomers can undertake to counter light pollution?

Publicise the problem

Arm yourself with facts, and approach those with poor quality lighting. Talk to local media about problems caused by waste light in your area. Remember that not everybody thinks astronomy is important, but they all want to save

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money and energy, so stress these before mentioning the wonders of the night sky. If you give talks or hold star parties, or belong to a club or society, take the opportunity to mention light pollution as part of more general discussions.

Can darkness be measured? How much money and energy are being wasted? Can the lighting be better managed? The CfDS can provide plenty of supporting 'ammunition', much of which can be found on its website. Surveys have shown that most owners of offending lights will take action, and will be surprised that they were causing a problem – whole generations have grown up surrounded by indifferent lighting, and consider it normal.

The measurement of the amount of skyglow above a given location is not easy, depending as it does on many variables.

An instrument now well known to astronomers is the Sky Quality Meter, for example the Unihedron SQM designed by Dr Doug Welch and Anthony Tekatch. The meter is a small handheld instrument, about the size of a TV remote control. It measures sky brightness. The instrument is aimed at the zenith, and 'sees' a cone of about 80° width of sky. The meter has a digital display showing a number, usually between 15 and 20 for most night-time observers. The larger the number, the darker the sky.

20 is a typical reading at a fairly dark site, while 15 represents a very light-polluted sky. For example, in 2009, in one of England's darkest places, Exmoor in the south-west, David Brabban recorded a meter reading of 21.85 at Prayway Head, showing it to be one of the best

observing sites in the country. See page 147 in the June *Journal* (*JBAA*, 122(3), 147) for a description of how North Norfolk AS used an SQM to find their darkest local observing sites.

Exmoor became the UK's first dark-sky reserve in 2010, joining Galloway Forest Park in south-west Scotland (a dark-sky park) and Sark (dark-sky community) as areas where stars are protected by local administrators and inhabitants.

The amount of energy and money wasted by poorly aimed lights – a very useful item of information to have when approaching their owners – can be calculated if the model and power of the lamp can be identified, and its mounting angle measured. Recently, a hospital in Dorset, whose new lighting scheme caused skyglow visible from many kilometres away in the New Forest, re-configured its lights to a more acceptable angle when local astronomers pointed out the correct mounting angle (available from the manufacturer) and informed the hospital how much energy it was wasting.



Poorly aimed lighting at a Dorset hospital. (Bob Mizon)

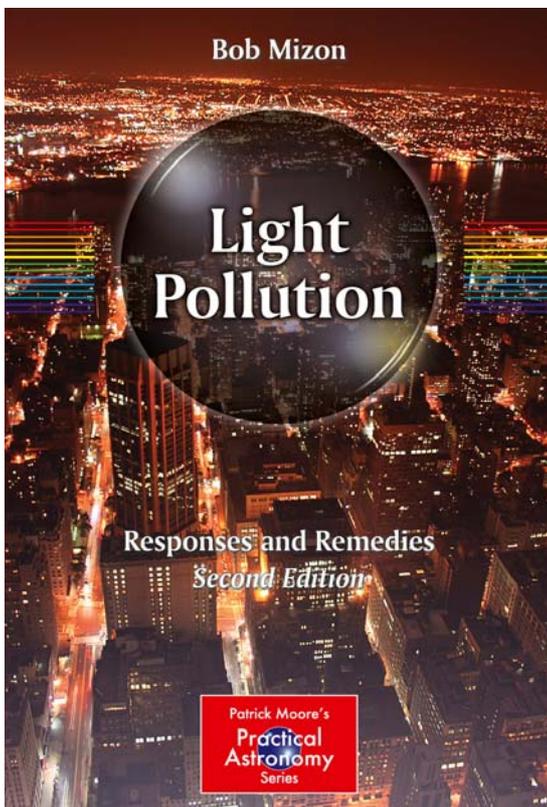
Join the CfDS

Most amateur astronomers take no action on light pollution, a fact that is a source of constant bafflement to dark-skies activists. To support the Campaign, you can subscribe to its newsletter, donate to its fighting fund, or become one of its local representatives. CfDS officers are not expected to walk around with banners and try to extinguish lights – reasoned argument and a constant outflow of information are the aims, since we realise that to change attitudes, we need informed friends, be they our neighbours, local and na-

tional legislators, or lighting professionals. The aim of the CfDS is a gradual but sure evolution towards a well lit environment and the optimum night sky for all Britons, whether or not they are astronomers, and wherever they live. Be part of that evolution.

Bob Mizon

Bob Mizon is co-ordinator of the BAA Campaign for Dark Skies (www.britastro.org/dark-skies), and author of *Light Pollution: Responses and Remedies* (Springer, 2001, ISBN 1-85233-497-5). The second, updated edition of this book has just been published by Springer.



The new edition of Bob Mizon's classic book on the problems of light pollution was published by Springer in 2012 July.

Notice

Your vote for the BAA Council

Members will find the Balloting List for the election of Council for the next session enclosed with this issue of the *Journal*. Please take a few minutes to vote and return the Balloting List to the office in the envelope provided no later than 2012 October 10.

When returning the Balloting List please make sure that nothing else is enclosed in the envelope. These envelopes are not opened by the scrutineers until after October 10. Anything enclosed other than the Balloting List will be discarded.

Ron Johnson, *Business Secretary*