Newsletter 4 – November 06

RASNZ Dark Skies Group

Welcome to the fourth newsletter of the Dark Skies Group of the RASNZ.
This newsletter is a little longer than usual, but I felt you would be interested in the range of topics covered at the IDA Asia Pacific conference held in Sydney.

IDA Conference in Sydney
The First IDA Asia-Pacific Conference was held alongside the Illuminating Engineering Society of Australia and New Zealand (IESANZ) Annual Convention on 27–28 October 2006. The theme was "Our Lighting Future"; allowing good opportunities for useful discussions about how we can better work together to practically improve the nighttime environment resulting in major benefits for everyone.
Check the Conference Program here.

I was given the opportunity to attend this conference through the support of the Kingdon-Tomlinson Trust and the RASNZ.

I found the conference very interesting and encouraging in that much of the content was in line with our objectives. One particular observation was made that of the 11,000 members of the IDA world wide, over half are lighting professionals.

Overall impressions were that health issues of lighting are becoming more important, as is the energy efficiency of lighting installations over their lifetime.

Even the experts acknowledge that lighting is a very complex field.

LEDs for general lighting are poised to become more mainstream with significant benefits in energy use, though there will need to be more research and design effort focused around their colour spectrum and directional control.

The following are extracts from selected key presentations.

Dr Peter Boyce PhD, FSLL, FIES
The Evolution of Lighting
(This was a key-note presentation for the combined conferences.)
Light and health
For most of the last century, light was considered solely in terms of its impact on our ability to see. However, over the last decade, the impact of exposure to light on human health has begun to be appreciated. Exposure to light can have both positive and negative impacts on human health, impacts that can become evident soon after exposure or only after many years.
These impacts can be conveniently arranged in three classes. The first is that of light treated as radiation. In sufficient doses, exposure to light can cause damage to both the eye and skin, through both thermal and photochemical mechanisms.
The second is light operating through the visual system. Lighting conditions that cause visual discomfort are likely to lead to eyestrain and anyone who frequently experiences eyestrain is not enjoying the best of health. The lighting conditions that cause visual discomfort are well known and easily avoided.

The third is light operating through the circadian system. The sleep-wake cycle is one of the most obvious circadian rhythms so it is hardly surprising that exposure to bright light at the right time can be used to treat some sleep disorders involving the timing and duration of sleep. Exposure to bright light is also a useful means of stabilizing the rest-activity cycle of people with Alzheimer's disease and of relieving the symptoms of seasonal affective disorder (Boyce, 2003). Against these benefits must be set the fact that exposure to bright light at night has also been shown to contribute to the faster growth of breast cancer tumours (Blask et al, 2005).

Light is like fire, a good servant but a poor master. Exposure to light is essential for the visual system to operate, desirable for entraining the circadian system and valuable for the treatment of some medical conditions, but too much of the wrong wavelengths, for too long, at the wrong time, and damage may occur. It behooves anyone who is involved in the design and specification of lighting systems to be aware of these impacts of light on human health.

Given that lighting practice faces a number of changes and challenges and is likely to be influenced by the interests of a number of groups whose concerns are more with the consequences of lighting than with lighting itself, what can be done to guide how lighting practice evolves? This question can be addressed through two other questions, what is it that motivates people to want some form of lighting and how should lighting practitioners react to external interests?

The basic framework for understanding what motivates people is given by Maslow's hierarchy of needs (Maslow and Lowery, 1998). Graphically, this consists of a triangle formed of eight levels. The lower four are called deficiencies. They represent needs that must be met. The lowest need is simply the physiological need for food, water, sleep, warmth etc. The second is the need for safety. The third is the need to belong, to be accepted as a member of some group. The fourth is the need for esteem from others.
The fifth to eight levels are called the growth levels and represent needs that are optional. They are,

respectively, the need to know and understand, aesthetic needs, self-actualization which means finding fulfillment, and transcendence, where the individual connects to something beyond the ego.

Within this structure, the lower needs must be met before moving to a higher level. Everyone starts from the bottom and works their way up. Fewer and fewer reach each level. Anyone who achieves transcendence is a saint. The question now is what has lighting got to contribute to these needs?
The answer is that lighting at its most basic contributes to the physiological need to see and to the need for safety. Lighting also has a role to play in the need to belong, because lighting as an element of fashion can be used to define groups. It might also be argued that lighting has a role in satisfying aesthetic needs, but the number of people who have achieved this elevated level is small.
Overall, this is not a very encouraging picture. The contribution to the first and second levels should ensure that there will always be mass support for a simple forms of lighting but the failure to be an essential component in the next levels suggests that attempts to develop mass aesthetic appreciation of lighting will meet with limited success. The one ray of hope in all this is a growth in our understanding of how exposure to light influences human health. The concern with health operates at the first or second level and so could generate mass support for developments in lighting practice.

The other possibility for mass support is to form an alliance with the groups who are concerned with the consequences of lighting rather than lighting itself. This increases the number of people for whom lighting operates at the third level. In a sense, lighting practitioners should be flattered by the attentions of these other groups. It means that like war and generals, **lighting has become too important to be left to lighting practitioners alone.** Further, using emerging technologies and knowledge to meet the desires of groups concerned with sustainability and light pollution represents an opportunity for lighting practitioners to demonstrate added value. Of course, such a course of action will require compromises from all parties but surely it is better to use our wits to work together rather than to defend the indefensible.

Dr Alec Fisher FIES PHD BSC and Phil Kenny
The Future Energy Efficiency Requirements For Road Lighting
Fisher(2003) showed that all types of lighting were inherently inefficient, with only about 10% of the energy consumed by the lamps in a lighting system (with discharge lamps) effectively used in illuminating the surface on which it is meant to fall.
Therefore all measures should be taken, as a matter of course, to ensure as good energy usage efficiency as possible (Fisher 2001,2002)

Lighting design has become more sophisticated and the potential for energy efficiency is present at every stage, specification, design, equipment choice, installation and maintenance (Fisher2004).
In particular the designer seeks to have Standard compliance with minimal equipment and hence cost. It is unlikely that the design process can become more efficient and indeed increased spacing of lighting points has been achieved by raising the beam of the luminaire light distribution. This has resulted in the values of TI, the glare restriction light technical parameter, in some situations being very close to the maximum allowable and the luminaires appearing glaring to the motorist.
However the incorporation of specific energy requirements in AS/NZS 1158.1.1 reinforces that one of the principle design objects is energy efficiency and further enhances the environmental credentials of the Standard and those engaged in lighting.

Mr David Tilbury
Energy Efficient Design In Retail Premises—A Lighting Application For The Future
In a Forward to Greenlight Australia, the Minister for Industry, Tourism and Resources, the Hon Ian Macfarlane, commented: Lighting generates almost 25 million tons of greenhouse emissions each year in Australia. It is responsible for about a third of the greenhouse emissions from the commercial sector, and is a significant contributor to both residential and industrial sector omissions. Lighting also costs the community over $2 billion in electricity each year. These startling statistics illustrate clearly why improving the efficiency with which Australians use energy is a priority of the Ministerial Council on Energy.
Greenlight Australia is a ten-year year strategy to reduce energy consumption from lighting, is part of a package of measures being implemented under the National Framework for Energy Efficiency and is the outcome of consultations stakeholders in both Australia and New Zealand.
These extensive consultations established the lighting technologies and market sectors to be included in the strategy, the voluntary and mandatory measures that will be used and priority areas and products targeted for action in the first three years.
Greenlight Australia has the support of both industry and government. The strategy sets out the immediate and future priorities for consideration of specific lighting products. I am especially pleased that Lighting Council Australia supports the strategy, and has suggested the target of 20% reduction in energy usage over business as usual over the course of the strategy.

(It is likely that the Greenlight Australia strategy will be implemented in New Zealand under the proposed NZ Lighting Efficiency Strategy. Steve)

Dr Alec Fisher
Lighting Standards and Restriction of Stray Light
The biggest impact on upward light will come from the push to make lighting more energy efficient and so reduce the associated greenhouse gas emissions (Fisher 2001, AGO 2005, 2006); Councils both enhance their 'green' credentials and reduce the bill for lighting. The additional upward light savings from main road lighting is likely to be minimal because that lighting is already reasonably efficient (in Australia - ed). The biggest savings are coming and will continue to come from changes to the lighting of local roads.

Over the years the ubiquitous fluorescent lamped luminaires of simple and cheap design have been replaced by high pressure mercury lamped luminaires of superior optical design because they need less maintenance. The UWLR value was reduced to one seventh of that previously! Currently the push is to utilise the latest high efficiency fluorescent lamps using half the electrical energy of the HPM lamps in the much better designed luminaires - currently Councils are encouraged to trial this lighting (AGO 2006). So the emphasis on energy efficiency and avoiding compromise of the surrounding environment has positive implications to minimising sky glow.

But - populations are ever growing and becoming more urbanised (Australia is one of the most highly urbanised societies in the world) and wealthy, so expect the provision of all services - hence the predicted growth in lighting use set out earlier – and perhaps the best efforts and will of those engaged in outdoor lighting, as has been demonstrated up to now in this paper, will not be enough to stem the increase in sky glow.
(Dr Fisher is Chairman of the Australia/New Zealand Standards Committee for AS/NZS 1158 for road way lighting.)

Ms Mary L Crawford
Lighting for Senior Living
Here are a few very simple guidelines. Any and all could be elaborated on, but the simple list is enough to prove the point. All are easy to do if we are aware of the issues and of the needs. All will improve the quality of our nighttime environment. All will lead to a much better holistic nightscape.
1. See the effect of the light, not the light source.
2. Don't overload the eye with too much light or glare.
3. No glare. Glare is blinding light.
4. Use adequate lighting levels, but do not over-light. Follow the standards.
5. Use good transition lighting.
6. Use adequate uniformity but not too much.
7. Use adequate contrast but not too much.
8. Light only where and when needed.
9. Be aware of the need for a good personal circadian rhythm.
10. Use energy efficient sources. Not a senior issue directly, but it is tax money!
11. Think of we seniors. Think holistic. Be proactive in meeting the real needs.

Government Issues
Mr Peter Downes & Mr Ron Van Katwyk

The Siding Spring Observatory Dark Skies Regional Environmental Plan. (REP)
With this plan, we have tried hard to think of everything and get it right.

The plan's controls will extend at least 200 kilometres to an identifiable boundary like a road, not just an arc of a circle on a map. This plan will prohibit upward light, set upper light limits in each zone and target high-impact lights. It will prevent light pollution from sportsgrounds and other public activity areas such as plazas. It will cover lights at mines, industries and grain elevators (silos), as well as bright town centre lights like car park and car sales yard lights. But none of this will disadvantage the community – lights will be aimed down at the task they are lighting, not up into the sky.

Lights will need the concurrence of the Observatory Director if they are brighter than normal or within 18 kilometres of the observatory. This plan will certainly add to the work of the observatory and councils, but that is the only way to protect observing conditions.

At the same time we have tried not just to impose extra controls on people, but to help them. We have tried to guide people to choose good lights and to make development applications that can get quick approvals. We have also exempted normal low powered residential lights from needing development consent, except within 18 kilometres of the observatory.

Strong plans are important, but education and publicity are essential. The observatory has a weekly notice in the local newspaper publicising the telephone help line of the Observatory Manager. We have also held a small but successful trade night for local designers and contractors, and have printed a flyer for the council showing good and bad lighting fixtures.

Prof. Fred Watson
Dark Matter, Dark Energy and Dark Skies
The nature of dark matter and dark energy remain two of the most puzzling problems in contemporary astrophysics. The mystery is deepened by the fact that together, these two invisible components of our cosmic environment make up around 95percent of the mass-energy budget of the Universe.

The quest to discover their nature presents a challenge that demands all the ingenuity of modern astronomers. Moreover, it requires a formidable array of scientific hardware, representing a major investment in astronomical technology. Much of this instrumentation is still in the planning stage, but it is already clear that large ground-based optical and infrared telescopes will continue to play a major role.

This mission to understand nature at its most fundamental level places strict limits on sky quality at observatory sites, since the measurement of exceedingly faint objects is required. This short article gives a broad brush overview of some of the strategies that can be used to explore dark matter and dark energy, highlighting the ongoing requirement for extremely low levels of sky background at the world's great observatories.

Keeping things in the dark

A common theme in all these endeavours is the observation of extremely faint objects at visible or near-infrared wavelengths with very large telescopes. The major limitation of this technique is that the flux from the target objects is usually much less than one percent of the natural sky background. Thus, very careful sky-subtraction is required in order to maximise the signal-to-noise ratio in the detected image. Background sky is, in fact, the dominant source of noise in such faint work, and for this reason, any artificial sky glow is fatal.

Most major observatories built since the 1960s are on sites selected for their low levels of artificial sky glow (among other considerations), and their dark skies are usually protected by local legislation (such as the Orana Regional Environmental plan, relating to Siding Spring Observatory in New South Wales). While this is an important facet of controlling light pollution, there is also a pressing need for sustained public outreach to win support for the endeavours of these observatories among local populations. This allows a direct link to be made between environmentally friendly outdoor lighting and the productivity of large telescopes in world-scale scientific projects.

For the coming generation of ELTs, the issue of sky background is even more acute. It is likely that most of these telescopes will be built on such remote sites, however, that dark sky legislation and enforcement will be fairly tractable issues. Some, indeed, are already planned on existing sites with dark sky protection in place.

By ensuring that such major facilities are kept in the dark, we may be on the brink of unlocking the deepest secrets of dark matter and dark energy.

Light and Health

Mr Terry McGowan FIES, LC
Lighting Research Office (EPRI/LRO)
Cleveland, OH USA

This paper briefly reviews the current research and especially the research related to architectural lighting and outdoor lighting that is being considered by the International Commission on Illumination (CIE). It also reports on the results of lightingindustry efforts to use the research and incorporate it into lighting practice.

Artificial light and the effects of certain kinds of electrically-produced radiation in the visible, ultraviolet and infrared have been studied with respect to their effects on humans for many years. To put that knowledge in perspective, here are the general areas of interest with those areas where new research should be taken into account emphasized:

- Optical Radiation Hazards
- Medical Applications: Phototherapy (Psoriasis, SAD); Germicidal
- Vitamin D Stimulation
- Circadian Effects of Light
- Environmental Applications: “Healthy” Lighting; Daylighting
- Effects on Plants and Animals from Outdoor Lighting

Circadian Effects of Light

Research, particularly since 2002, has focused on the human health implications of day/night cycles and what those do to hormone levels. The circadian cycle involving melatonin has emerged as a key factor in this work which has also resulted in the discovery of a new light-sensitive, but non-visual receptor in the eye with a different wavelength response than either the rod or cone cells. This new cell is now linked to blood melatonin levels via light. [Brainard 2006] [Lockley 2006]. Further, the spectral sensitivity of the system has now been established. The curve shows a peak about 450 nm. and a response from 400 to 600 nm.

So, why is this important to the lighting designer? The research indicates that the interruption of normal circadian rhythms and, particularly, lower levels of melatonin, over time, are linked with major diseases. Several large and careful studies have looked at breast cancer in women and colon cancer in men, for example. Light is implicated as a factor because blood levels of melatonin can be suppressed by light. At the very least, there are light-related human health effects that we don’t fully understand.

Lighting Application Guidelines

Lighting designers and lighting societies have begun to develop recommendations and guidelines which take the research above into account. [Aries 2005] [NSVV 2005].

Miller and McGowan [Miller and McGowan 2004] suggest that likely applications can be categorized into three groups: Day, Night and Day for Night. This last category is particularly difficult from the lighting design standpoint because it involves situations where there are both sleeping and day-functioning people such as patients and care-givers in a hospital at night.

Their design recommendations are preliminary, but common-sense, based upon the idea that humans generally require bright days and dark nights.

An overall environmental approach

So far, the light and health research has been focused on how light affects human health. But what about other life forms –
the plants and animals that live and share the night environment with humans? Here efforts and recommendations are somewhat sparse, but perhaps not less important.

Fortunately, the research may be more extensive than thought and such research has grown significantly since 2003. While the popular press has mentioned certain cases where artificial light and animals come into conflict -- such as sea turtle hatchlings on beaches mistaking road and flood lighting for the sea and becoming disoriented, material covering the interaction of artificial lighting with a wide variety of living things has not appeared in either the popular or, more importantly, the lighting literature. However, there have been recent efforts to gather, organize and present that research.

One effort was in 2002 when a conference entitled, "Ecological Consequences of Artificial Night Lighting" focused attention, from the technical and research standpoints, on the question of lighting's effects on animals and plants [The Urban Wildlands Group, 2006] As a result, more research appeared from those working with the very specialized lighting aspects of ecological issues and that information was gathered into a recent, well referenced, book on the subject [Rich and Longcore, 2006].

In addition, the exchange of observations and research among groups has increased resulting in joint efforts such as those between the National Park Service (U.S.) and the International Dark Sky Association [Duriscoe, 2001] to develop, designate, study and maintain dark-sky parks and preserves. They are now recognized as having growing value as experimental "controls".

Conclusions

For more than 130 years, the artificial lighting of indoor and outdoor spaces has expanded virtually unhampered other than by technology and cost. The resulting growth has benefited society by improving visibility and productivity. Light entertains, makes human activity possible after dark and satisfies critical needs including safety and security and provides other significant benefits.

But growth, as we have come to realize, has limits. We traditionally deal with practical limits to more light such as glare and we are dealing routinely now with lighting energy limits. Now, we are also finding out with lighting and human health research, there are important "side effects" to lighting. As with medicines, if lighting can affect the health of living things, it must be tested, measured and carefully administered to achieve optimum results. The implication of this is significant – this new knowledge has value. It can be organized as an opportunity for technical development and lighting improvements just as light source development, lighting application technology and energy efficiency have been opportunities in the past. It is time to expand our efforts to gather the evidence, carefully weigh the alternatives and to develop complete lighting recommendations, which take both human and ecological health into account.

Outdoor Lighting – The Unintended Consequences

Dr Phil Ianna PhD, MIES
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Charlottesville, Virginia, U.S.A.

Urban development sprawls across many landscapes, and the associated artificial lighting bathes those environments in low levels of continuous light. There is growing evidence suggesting significant ecological impacts from such 'light pollution'. The constant light may affect plants, trees, birds and other animals in various, sometimes detrimental, ways. In much of Europe and North America, few truly dark places remain to those who wish to view the stars at night. Australia is the "lucky" dark country. The needs of expanding populations in many places limit available practical measures that might alleviate such problems. New technologies may help when darker nights are important.

In the beginning there was the sun, the moon, and fire. We wished for more light, and we invented it, going from simple flames to electric lighting. The electric lamp started with the carbon-arc lamp, and progressed through the first practical incandescent lamps in the latter part of the 19th century to modern discharge lamps. Electric lighting would not have spread so widely without the parallel development of power generating and distribution systems. LED sources are the likely future.

Lighting leads to improved productivity in the workplace, as well as the ability to navigate and enjoy our surroundings after dark. For most people it is a good thing that we now have lighting at many levels in many places.

Clearly it makes only limited sense to talk about lighting, good or bad, and its effects for dark skies (and ecosystems) without mentioning the root cause of the loss of dark skies: explosive population growth. The simple evidence is that in the 1950's, there was little quality outdoor lighting, yet there were many very dark places. At that time, the population of the U.S. was 150 million, now it is 300 million, and there are worst case scenarios having the U.S. reaching a billion people by the end of this century. Australia may be lucky to be headed for only 45 million inhabitants by 2100. Of course it is only almost as simple as the population. Sociological and financial factors also play a role.

Astronomical Consequences. Much astronomical progress may be made with moderate and small telescopes, but advancing the frontier of astronomical knowledge now requires advancing the technology through overwhelmingly large telescopes and the instrumentation for them. Given the large capitol costs, placing the next generation of large telescopes at very dark sites is essential. Future large telescope projects include the Large Synoptic Survey Telescope (LSST), Giant Segmented Mirror Telescope (GSMT), and Giant Magellan Telescope (GMT). These facilities are certain to go in Chile.

Biological Consequences. Aldo Leopold wrote "The last word in ignorance is the man who says of a plant or animal: 'What good is it?'... To keep every cog and wheel is the first precaution of intelligent tinkering." We know close to 2 million plant and animal species, and estimates of the total number range from 6 million upwards. Of course we don't really know how many.

And given all organisms suffer circadian rhythms we don't know the impact of replacing dark nights with light ones. Biological research will have to fill in all the pixels before we can see the full picture. We know only a little now.

Daily cycles are universal in organisms from cyanobacteria, to fruit flies, and people. The circadian oscillators regulating physiological and behavioral events are found in a variety of tissues (Bell-Peterson 2005); in mammals it is the suprachiasmatic nuclei of the hypothalmus. Recent work shows that nighttime exposure to light suppresses the production of melatonan in people, but the possible health impacts are very, very complex and caution before action has been advised. (Boyce 2006).

Beyond people, most other species are more vulnerable to upsets in their natural surroundings. Artificial lighting may interfere with normal predator-prey relationships, foraging, and mating behaviors in both vertebrate and invertebrate species. We know rather more about these problems for turtles and birds, for example, than for some other animals such as snakes, not so widely loved.

The circadian clocks of plants derive environmental clues from their photorecptors. The primary photorecptors of higher plants are the cryptochromes (400-500 nm) and the phytochromes (600-700 nm) through which most aspects of a plant's life from seed germination to flowering time are modulated. Research with the plant model Arabidopsis thaliana, the first plant to have its full genome determined (www.arabidopsis.org), has elucidated the genetic pathways and molecular components of plant development. Photoreceptors work to relay light signals through enzymatic activity or changes in conformation and so cause interactions with other molecules. Eliminating light/dark cycles by artificial light can help or hurt plants. Some tree species are said to be sensitive to artificial lighting and may be harmed especially in cold climates (Andresen 1976)

Coastal lighting threatens sea turtles globally. Six of the seven species of sea turtles occur in Australian waters. One of these, the Flatback (Natator depressus), is endemic to this area. All are threatened by various sorts of human activity. Artificial lighting along nesting beaches especially leads to increased turtle mortality by interfering with the sea finding ability of hatchlings and adults, and it may dissuade gravid females from nesting on a favored beach. Three species of sea turtle have had their visual spectral sensitivity measured (Goeke 2003). Experiments with beach lighting for these species have shown how to obviate adverse effects of lighting. No lighting is best, but shielded LPS lamps work well and filtered red lighting may be better still (Witherington and Bjorndal 1991).

After the effects of habitat loss to birds (e.g. Eyre Peninsula population of yellow-tailed black cockatoos) perhaps the next largest killer of birds is window glass. The number of collision fatalities in the US has been estimated (with difficulty) as from 90 million to 900 million birds annually (Klem 1990). Perhaps half occur with nighttime illuminated windows. To put this in perspective, some 10-15 billion birds are lost from one breeding season to the next each year in the U.S. (Fisher and Peterson 1964) An Australian example is the endemic Swift Parrot, breeding in Tasmania and migrating to southern Queensland.

About 1.5% of the limited population (1000 pairs) is killed annually by colliding with windows (Klem et.al. 1994). Hazard lighting on communication towers is another attractant for nocturnal migrants, killing significant numbers annually (Clark et al.2005). With a better understanding of the behavioral responses of birds at such towers, they might be modified to reduce their attractiveness to birds (Benson 2000). However we do not know enough about the more complex color vision in birds and how they process visual information.

Much more needs to be known about ecological impacts and ways to preserve threatened and endangered species. Lighting may only play a minor role for some species, but when the numbers have been reduced to hundreds, any and all losses are significant.

Future Intended Consequences. There should be a balance between the needs of all with a stake in outdoor lighting. There is every reason to do good, non-obtrusive lighting to the benefit of all living things. I admit to much pessimism regarding the preservation of dark skies and ecosystems in a developed world with few constraints on population growth. Population increases in the eastern portion of the U.S. mean little hope to retain what we have left of natural darkness. Still there are dark holes in the lit landscape, local sites that are dark today and valuable as public dark sky preserves. These few places may justify heroic efforts to minimize and control nighttime lighting.

As urban sprawl spreads, better lighting control systems can help ameliorate sky glow growth. For example StreetLightIntelligence (www.StreetlightIQ.com) offers adaptive lighting systems that reduce initial lumen output of an HID lamp then maintain it at the design level and as well reduce lighting levels up to 50% when nighttime activity is low. LEDs will offer even greater savings. Since LEDs do not suffer the restrike problems of HID lamps, there is an opportunity here to integrate motion detectors with area and roadway LED luminaires and turn them off completely when unneeded for significant savings in unwanted uplight and energy use (e.g. www.mooncell.com).
There are many complicated issues, much to be concerned about, and much to do.

Talk Environment
The Ministry for the Environment's flagship event was held again from 27th October to 10th of November. In Invercargill two Dark Sky members attended with two references being made to Light Pollution in the summary of discussions at the end of the session. Some good contacts and leads can be made at these sessions. Let me know if you attended a session.

What is ahead for our group?
We have been surveyed by the Ministry for the Environment about progress made toward our agreed Action Plan for the Urban Design Protocol. I'll let you know if there is any feedback.

We have been asked to register any research projects we undertake. The definition of a project is quite wide, so I will register the "Research of effective and efficient lighting equipment and processes in New Zealand" as our project. This gives us some further exposure as all projects are listed on a website. More later.

RASNZ DarkSkies web site changes.
Last newsletter, with best of intentions, I tried to give you all an updated link to the DarkSkies web site. But I got it wrong. I think it is right this time!!

Following the shift of the RASNZ Web site to the Royal Society of New Zealand's Web Server the new link for the DarkSkies Group site is DarkSkies See below also. Please update any links you have for this site. Note this address is case sensitive.

That's all for now.

Best regards,

Steve Butler
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