Tools for "Dark Sky" Education

Elizabeth M. Alvarez del Castillo
Desert Star Outreach, 4830 W. Camino de la Amapola, Tucson, AZ 85745

[Formerly: International Dark-Sky Association (IDA), 3225 N. First Avenue, Tucson, AZ 85719-2103]

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Abstract To preserve our window to the universe, we must educate everyone about the value of dark skies and quality nighttime lighting. Astronomers, amateur and professional, are ideal ambassadors as we strive to raise awareness on a broad scale. Outreach programs can play an important role in collecting local light pollution data which are critical in the local decision making process. Resources (such as presentation materials, handouts, and activity ideas) are available from the International Dark-Sky Association (IDA) at http://www.darksky.org.

1. Introduction

Our ancestors enjoyed the solace and inspiration of a canopy of stars above their heads, leading them to dream, to wonder, and to know our world. Today, too many children know only hints of this splendor through planetarium shows. Two-thirds of the population of the United States live where they no longer have unaided-eye visibility of the Milky Way (Cinzano *et al.* 2001). Current generations are the first in history to grow up without this view that, over millennia, has inspired art, music, poetry, folklore, science, technology, and so much of our culture. The grandeur of the stars challenges us to explore and invites us to ponder our place in the universe. It is an essential part of our very nature as well as our culture. It is our heritage.

Preserving our heritage of dark skies is not the only reason to improve outdoor nighttime lighting. Glare and poorly designed lighting installations hinder visibility and detract from an ambient nighttime environment. Too much energy is being squandered by wasteful lighting. Obtrusive nighttime lighting adversely affects humans, wildlife, and flora. Communities are reacting to the problems caused by low-quality lighting. To preserve and protect our nighttime environment, we must respond during this window of concern and educate people about the value of high-quality outdoor lighting.

2. Background

Modern society depends on outdoor lighting at night. It benefits us in many ways, but the too common use of low-quality, outdoor lighting has many detrimental effects (Alvarez del Castillo and Crawford 2001).

Poor lighting creates glare that hinders visibility, detracting from safety, security, and our effectiveness in nighttime activities. Glare and "luminance overload" compound the vision challenges of the aging eye in a world where the general population is aging. While high-quality lighting guides us, low-quality lighting creates clutter and confusion. Shielded luminaires can offer better visibility and improved efficiency, leading to energy and economic savings for businesses and the community. Obtrusive light that spills out of the intended area of illumination wastes energy in a world with limited natural resources and an increasing need to protect our ecosystem. Poor lighting produces urban sky glow, a veil blocking our view of the pristine dark sky. The benefits of better lighting practices offer communities practical reasons to support improved lighting. Resultant economic savings and improved property values, for example, augment the motivation and support the goal of night sky protection.

Life on Earth evolved with daily, monthly, and seasonal cycles. We need periods of both light and dark. These cycles strongly affect patterns of behavior and changing them can affect wildlife behavior and survival in numerous ways. The alteration or extension of the length of the day can diminish habitat functions such as providing shelter or food. Light alters predation habits and effectiveness. It affects reproductive patterns and natural diurnal rhythms. Natural, predictable light regulates natural processes (Falzon and Bonnici 2001).

Circadian rhythm is a powerful one for all wildlife and for humans. For example, during dark hours, many organisms produce the hormone melatonin. Melatonin has been linked to the immune response. Exposure to small amounts of light suppresses melatonin production. Light at the wrong time can stimulate jet lag and sleep disorders. Our day/night cycle is ingrained, and changing it stresses our systems (Pauley 2001). As with noise pollution, obtrusive light also can cause stress. Our systems need a break. To maintain health, balance, and the ecological integrity of systems, we need both adequate, natural light during the day and darkness at night.

Fortunately there are workable solutions. Better outdoor lighting technology and practices exist and are improving as our understanding of how light affects us increases. Good design requires consideration of the following:

1) Do we need the light and why? What is the task?
2) Then we must use rational lighting levels, appropriate for the surrounding environment,
3) direct the light only where needed,
4) use the light only when needed, and
5) use energy efficient sources.

With better lighting we improve visibility, promote safety and security, conserve energy, and preserve our nighttime environment. As many are striving to regain a quality of life they find slipping away, light pollution is one environmental problem that can be solved now.

3. Tools for Education

The International Dark-Sky Association (IDA) is a non-profit, membership-based, education and research organization. It is dedicated to preserving and protecting the nighttime environment and our heritage of dark skies. Spanning 70 countries and every state in the U.S.A., its diverse membership includes organizations, city officials, professional and amateur astronomers, lighting professionals, architects, environmentalists, educators, and concerned members of the public. The IDA is uniquely positioned to help educate and bring interested parties together to devise workable solutions (Alvarez del Castillo *et al.* 2003). Their combined expertise has created reliable information on the diverse topics related to light pollution. Many valuable resources (such as slide sets, *PowerPoint* presentations, videos, and information sheets on key topics) are available now. Awareness of and interest in this issue is growing dramatically, and we will be even more effective as we all work together and momentum continues to build.

Astronomers, both amateur and professional, have many opportunities to educate and motivate the public. For behaviors to change, people have to be motivated. When giving a talk, use wondrous astronomy pictures, for example, to touch the hearts of your audience. The night sky is a precious resource that has contributed greatly to our society. Talk about or ask for anecdotes of how people feel about having that resource in their lives. That provides the powerful motivation needed to overcome inertia and get people to take action.

We also need to move them now. Satellite images of the Earth at night, combined with regional close-ups, address the question "Why should we act now?" while continuing to help the audience relate to the issue. Encourage people to remember what they saw growing up and what they see now, in their own backyards. Our dark sky sites are rapidly disappearing. Where do amateur astronomers in your area go for good viewing? (The IDA offers images showing various regions at night and showing some regions at several time steps.)

Next, offer a solution. Show people how to improve the lighting in their community. The IDA has many slides depicting the basics of good lighting and the problems of low-quality lighting. The solutions are "win-win." An effective, proven strategy is to use the IDA sample talk, but replace some pictures with similar ones taken locally. A few scenes which people recognize help them relate the issues to their own community. Information sheets provide background to address common concerns such as security, safety, cost, how to approach people, neighborhood and business issues, etc. People are very receptive and think "that's just common sense," but they had not thought about it before. Lighting affects us all so any audience can relate to some aspect of the issues.

The issues are especially conducive to education in K–16 classrooms. Exploring the topic of light pollution instills a sense of ownership and personal involvement that promotes real learning. Students quickly realize how it affects them, why they should care, and what they can do. They can and do make a difference. The topics are interdisciplinary, spanning Science (such as Astronomy, the Nature of Light, Biology), Technology (lamps and fixtures, for example), Society/Culture (Public Awareness, Community Decision-Making, Psychology), and the Environment (Energy, Ecosystems). The IDA has awards to recognize student achievement and numerous ideas for interactive demonstrations and hands-on activities to help students explore these topics. As teachers in both formal and informal education share their ideas, the diversity of available activities continues to grow.

The IDA has presentation materials (such as all those mentioned above), background information, and ideas for demonstrations and activities to help you educate our communities. Together we can educate an extended and diverse audience just by folding light pollution issues into the activities we already do. We encourage you to make this difference in your own outreach and to share your "lessons learned" and new ideas with the IDA (ida@darksky.org) so we build momentum together and protect our window to the universe. Inquiries may also be addresed to the author at ema26@cornell.edu.

References

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