

COMMISSION C.B7 / PROTECTION OF EXISTING AND POTENTIAL OBSERVATORY SITES

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TRIENNIAL REPORT 2015-2018

1. Introduction

Reduction and prevention of artificial sky glow and radio-frequency interference is a priority goal of the IAU. Commission C.B7 was established on the basis of its proposal to address these critical issues.

Our Vision:

- To make tangible progress in stopping the encroachment of artificial sky glow and radio-frequency interference on major astronomical research facilities.
- To raise public awareness to prevent the losses caused by light pollution for all observatories and for the fundamental right to starlight as in Resolution 2009-B5.
- To work with relevant national and international authorities to set up legal policies and guidelines for the protection of astronomical quality of areas suitable for observational research and/or meriting astronomical world heritage status.

IAU Resolution 2009-B5, In Defense of the Night and the Right to Starlight, speaks to the night sky as an inspiration, to its scientific and cultural values, to the view of the night sky getting worse, to the need to educate the public, to the need to use intelligent lighting, and to astro-tourism.

Key Excerpts from the Resolution: An unpolluted night sky that allows the enjoyment and contemplation of the firmament should be considered a fundamental socio-cultural and environmental right, and that the progressive degradation of the night sky should be regarded as a fundamental loss; IAU members [should] be encouraged to take all necessary measures to involve the parties related to skyscape protection in raising public awareness of the educational, scientific, cultural, health and recreational importance of preserving access to an unpolluted night sky for all humankind. Protection of the astronomical quality of areas suitable for scientific observation of the Universe should be

taken into account when developing and evaluating national and international scientific and environmental policies, with due regard to local cultural and natural values.

The full resolution can be found on page 8 of http://www.iau.org/static/resolutions/IAU2009_English.pdf.

Long-term goals:

- Continue the strong voice of astronomy in IYL activities to educate about dark skies and quality lighting
- Sustainable development and provision of information and materials for education and public outreach about dark skies and quality lighting beyond the IYL through an IAU web clearinghouse.
- Creation of regional structure for focusing response on specific issues and providing interface for regional activities.
- Close interaction with CIE to set illumination standards that protect astronomical observations.
- Encouragement of industry efforts to produce spectrally controlled LEDs.
- Education of professional colleagues about urgency of site protection issues; provision of supporting materials for their public presentations. Includes interaction with radio astronomers for site protection against RFI.
- Close interaction with IDA.
- Engagement with the IAU World Heritage activities for astronomical site designation.
- Provision of forum for astronomer efforts to enhance local and national legal frameworks for dark sky protection.

2. Implementation

To set specific tactical goals and devise and carry out plans for implementation, the work of the Commission is divided among four Working Groups.

- Technical Working Group covering spectral output, propagation, artificial sky glow and RFI, and regulatory issues.
- Site Protection Working Group, to coordinate and facilitate efforts focused on professional observing sites.
- Inter-commission Working Group on Achieving Sustainable Development within a Quality Lighting Framework, joint with Commission C1. Primary focus is dark sky protection as part of sustainability in worldwide curricula.
- Inter-commission World Heritage Working Group, joint with Commission C4. Goal is to gain status for astronomical areas with cultural significance for the history of the field through the Windows on the Universe/High Mountain Observatories proposal to UNESCO.

All members of the IAU are invited to participate in this critical work.

The Organizing Committee of Commission C.B7, along with the chairs of the Working Groups coordinate the range of activities for dark and quiet sky protection. The OC + WG chairs comprise the Dark and Quiet Sky Protection Working Group approved by the Executive Committee to give prominence to the activities.

Following are more details for each Working Group.

2.1. *Technical Working Group*

The Technical Working Group has the major objectives to:

- Provide technical specifications at engineering levels for standards for outdoor lighting that promote dark sky protection.
- Inform the broader professional astronomy community about the technical issues of radio-frequency interference and mitigation efforts.
- Provide data and access to modeling that maps artificial sky glow by region and over time and that could provide the basis for assessing impact of new installations.
- Provide measurements and other data on the impact of enhanced airborne dust from mining, construction and other activities in proximity to major observatories, to provide the basis for voluntary and regulatory controls.
- Provide a forum for astronomer efforts to enhance local and national legal frameworks for general dark sky protection in the context of the IAU Right to Starlight initiative.

Aspects of Implementation:

- Close interaction with CIE to set illumination standards that protect astronomical observations.
 - *IAU's liaison to the CIE, Richard Wainscoat, participates in their international meetings and particular Technical Committees for outdoor lighting standards.
 - *The Commission will hold a joint working meeting with the CIE during the GA in Vienna.
- Encouragement of industry efforts to produce spectrally controlled LEDs.
 - *This is an anticipated outcome of the joint working meeting with the CIE.
 - *Astronomically motivated efforts in Hawaii and the US Southwest have led to the production of blue-blocked LEDs and the field testing of narrow-band amber LEDs.
- Close interaction with IDA.
 - *Good linkage and referral to and sharing of IDA online materials.
 - *Direct interaction with IDA officers and board has been more limited to individual national efforts.
 - *Establishing and reinforcing links with other scientific communities also affected by light pollution, especially from the fields of Biology and Human Health.
 - *So far, limited to awareness of relevant literature and key researchers, with linkage to web materials.

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2.2. *Site Protection Working Group*

The Site Protection Working Group has the major objectives to:

- Develop and share site protection standards for near zones around optical and radio observatories

*Upcoming review article by Green et al. contains review of relevant codes

- Integrate radio protection standards to an even greater extent in optical observatory planning and operations.

*Representation and presentations by WG member Harvey Liszt has strong impact on observatory management.

- Provide a forum for astronomer efforts to enhance local and national legal frameworks for dark/quiet sky protection in the near zones around observatories (in collaboration with Technical WG).

*Goal for next triennium.

- Support the IAU effort to obtain UN endorsement of dark/quiet sky protection of professional observatories through the UN Committee on the Peaceful Uses of Outer Space

*Effort initiated by Secretary General now being pursued by the Commission to establish agenda for COPUOS-sponsored technical meeting in 2019.

- Evaluate requests for IAU endorsement of proposals for special protection status to other entities, such as IDA.

*The commission provided official endorsement for a request to IDA by San Pedro Martir Observatory for IDA Dark Sky sanctuary status.

*Commission members provided endorsement for reducing the temperature of LEDs in Chicago street lights and considering new color distribution indices for lighting standards in the EC.

- Educate professional colleagues about urgency of site protection issues; provision of supporting materials for their public presentations. Includes interaction with radio astronomers for site protection against RFI.

*Linkage to IDA material valuable here; Commission activities at the upcoming GA are being publicized in service of informing professional colleagues.

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2.3. Education Working Group (C.B7 Co-sponsorship with Commission C1)

The Education Working Group has the objectives to:

- Continue the strong voice of astronomy in IYL activities to educate the general public about dark skies and quality lighting
- Support sustainable development and provision of information and materials for education and public outreach about dark skies and quality lighting beyond the IYL, in part through an IAU web clearinghouse.
- Create regional structure for focusing response on specific issues and providing interface for regional activities. (Note that the regional structure will have technical and site protection components as well.)

A specific goal of the joint education working group is to make quality lighting education part of the curriculum worldwide, in the context of the UN protocol on sustainability under resolution 42/187 and the IAU Resolution 2009B5 Right to Starlight.

This Joint Working Group is co-sponsored by Division C, with co-chairs Margarita Metaxa and Connie Walker.

The implementation plan for this WG:

1. Establish in 2016 a National Contact for the Quality Lighting Joint Working Group of IAU Com. C.B7 & C1 in each country with active members of the Commissions, through the main observatory of the country or other institution willing to support the activities of the National Contact, with the commitment to the transfer and sharing of knowledge.

2. The plan for 2017-2018 was for each liaison to

2.1 Run locally the proposed programs of Quality Lighting education.

2.2 Establish liaisons with governmental education organizations, UNESCO local offices, etc. The goal is to identify jointly the opportunities for inclusion of sustainability and dark sky protection in the curriculum, in the specific local context.

2.3 Connect with environmental government bodies. The goal is to identify jointly the top priorities for sustainability and the opportunities to include dark sky protection, as well as to define ways to include those items in local and national curricula.

2.4 Encourage citizen science programs that measure the level of light pollution in their countries and report results to international databases accessible to IAU C.B7 and C1.

2.5 Identify cultural, natural or professional observatory sites in need of special dark sky protection within their country, and promote educational and outreach efforts that make the public case for that protection.

A brief report from the Working Group was filed under Commission C1 through Commission C.

2.4. World Heritage Working Group (C.B7 Co-sponsorship with Commission C4)

WINDOWS TO THE UNIVERSE: HIGH-MOUNTAIN OBSERVATORIES, AND OTHER ASTRONOMICAL SITES OF THE LATE 20th AND EARLY 21st CENTURIES

This group is working closely with an international network for the Windows to the Universe/High Mountain Observatories initiative, which goes well beyond the IAU, including governmental representatives from participating countries.

SUMMARY OF WORK TO BE DONE The WG is established to support the development and coordination of one or more nominations of modern astronomical observatory

sites for inscription on the UNESCO World Heritage List (WHL). The goals of having these observatory sites recognized as World Heritage Sites are twofold:

(a) to enhance the recognition of these sites for their exceptional scientific and cultural value (in line with the goals of Commission C4),
and

(b) to enhance the protection of these places as sites of active astronomical research, particularly focusing on protection against mining, light pollution, and radio spectrum interference (in line with the goals of Commission B7).

As a joint initiative, the WG will work with experts from the UNESCO World Heritage Centre and its advisory bodies (ICOMOS and IUCN) to promote and guide the development of nomination portfolios. The WG will work in association with an International Working Group, which includes government officials from interested countries, to coordinate efforts toward one or more proposals that may include serial international nominations.

A complete triennial report was filed for this Working Group under separate cover.

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| CO-CHAIR | R. Chris Smith (Chile/USA) |
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| | Juan Antonio Belmonte Aviles |
| | Miguel Roth |
| | Malcolm Smith |
| | Richard Wainscoat |
| | with broad community and government participation |

Richard Green
Commission President