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## Fighting Light Pollution in the Ottawa Area -- The Results

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### Introduction

The talents of the Ottawa Centre have been taxed over the last two years as it engaged in a Light Pollution Abatement Program (LPAP). The program was created in 1995 to save the dark skies around the Centre's observatory as well as the observing sites of its members. It has been very successful in motivating government and business to adopt lighting policies that will slow the growth of light pollution in the short term and reduce it in the long term. This paper outlines the LPAP and shows examples of its success.

### Background

The Ottawa Centre of the RASC has always been a very active "observing Centre". In the early 1960s an enthusiastic group of observers created an offshoot of the main Centre, at that time composed primarily of professional astronomers and "armchair" amateurs. The "Observers Group," as it became known, grew and matured so that it now dominates the Centre membership of about 230. In the 1970s a particularly active and able number of



members designed and built one of the first Centre observatories in Canada -- North Mountain Observatory (NMO). Our 40-cm Newtonian on its equatorial fork mount Figure1 became the envy of many Centres after it was displayed during the 1973 General Assembly in Ottawa. Within five years, however; Ottawa and the surrounding small towns had expanded, and with them grew the light domes over their urban sprawl.

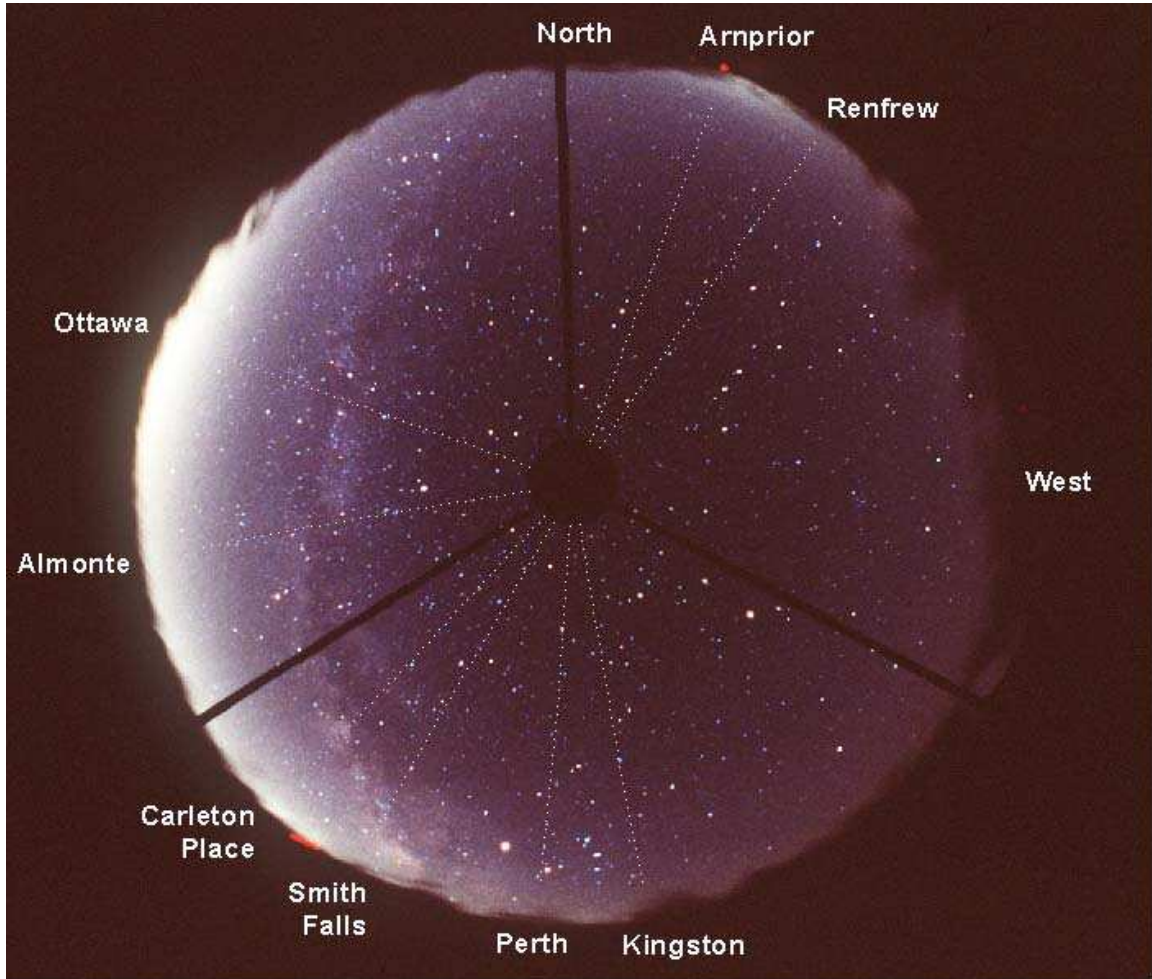
Figure1- The Ottawa Centre's 40-cm f/5 reflecting telescope was designed and built by members early in the 1970s. Although designed primarily for visual observing, it has proven to be a very user-friendly instrument for both photography and more recently, CCD imaging. It was the telescope used by Rolf Meier to discover his four comets and by Doug George for the co- discovery of his comet. Many other members have used the telescope for observing projects. In two such projects, the change in the period of the Cepheid CY Aquarii was discovered and the breakup of Comet West in 1975 was observed and reported to the SAO. (Photo by Glenn LeDrew. Ottawa.)

In 1976 the observatory was relocated to the darker skies west of Ottawa near the Mill of Kintail Museum outside Almonte, Ontario, and was renamed the Indian River Observatory (IRO) after the stream that feeds the centre-piece of the museum,



the old mill. The Centre rents a small parcel of land on the property of the Mississippi Valley Conservation Authority for a nominal fee, and provides public stargazing talks to museum visitors. The move left us feeling somewhat buffered from the encroachment of urban and even rural lighting. The only local light within eyeshot was easily shielded by nailing a piece of plywood to a distant hydro pole.

Figure2- The design of the Indian River Observatory [renamed the Fred P. Lossing Observatory in 1998] is essentially the same as that for the original NMO. It has a three-metre square heated building with a separate telescope compound covered with a roll-off roof. The present location of IRO is a 40 minute drive west of Ottawa, about ten kilometres northwest of Almonte, Ontario. (Photo by Glenn LeDrew, Ottawa)



The move to IRO only delayed the inevitable. The skies grew brighter (figure3). Although still acceptable, they foretold the future when the observatory might have to move again. Before passing the hat to raise money for a third new home for our venerable telescope, the Centre decided to work against the proliferation of the artificial sky glow that was driving both the observatory and other observing sites further from the city. In 1994 the Ottawa Centre took the first necessary step towards reducing light pollution by creating a Light Pollution Committee (LAC) to identify the problem, to propose solutions, and to recommend a realistic plan to save the dark skies around Ottawa. One of us (Robert Dick) was elected Chairperson of the Committee and the other (Arnie Weeks) was recruited to co-ordinate a results-oriented program. Our experience was complementary and both of us shared the same can-do philosophy. Weeks administered projects involving governments and their staff. Dick's background was in technical matters and as a communicator.

The Ottawa Centre's Light Pollution Abatement Program (LPAP) was created, and was structured to be pro-active. Since volunteers are usually in short supply, any effort made by volunteers must be focused, efficient and effective. There are five steps in the Ottawa

LPAP. They can be summarized as planning, action, implementing, rewarding and following up.

Figure 3 - An all sky photograph from IRO by Glenn LeDrew of Ottawa showing the sky glow around the horizon. The bright area to the east is Ottawa and to the southeast are Almonte and Carleton Place.

## **Planning and Development**

The first step is crucial for the success of any program. The development of the overall LPAP began with the rational assessment of light pollution sources in the National Capital Region, the identification of the most effective approach to reducing light pollution in the region, the identification of the tasks required for a successful program, the recruitment of individuals who could complete those tasks, and the development of a budget to support the volunteers.

With the work and workers in place, the technical and administrative information had to be collected and developed. For six months we gathered, by means of telephone calls and faxes, technical literature on architecture, lighting design and engineering principles. Local distributors were also canvassed for copies of their product catalogues and other literature. Papers and guidelines of the Illumination Engineering Society (IES) and the Transportation Association of Canada (TAC) were obtained, and publications of the International Dark Sky Association (IDA) and New England Light Pollution Environmental Group (NELPEG) were studied, as were papers from engineering and environmental journals and astronomy magazines.

Many light pollution articles written by astronomers focus only on their concerns, whereas engineers and other specialists focus on lighting technology, security lighting for commercial areas, and safety for the general public. Costs of lighting are of major concern to local governments. There is very little authoritative literature to bridge the gap. The IES and TAC publications are the only places where application was combined with implementation.

Current editions of IES and TAC documents were developed in the 1970s and 1980s, and technological advances in lighting design were dramatic in the last decade. The IES revised its lighting standards, although the revisions would not have been available to us for several years. We could not wait since we knew that, to affect lighting in a municipality, our committee would have to talk the same language and promote the same goals as the municipal engineers, administrators and politicians.

In the literature collected were articles describing the innovative work of the National Capital Commission (NCC) and lighting design engineers, many of whom are members of the IES who deal not only with standards but also with the design of appropriate lighting for a variety of situations. Existing literature revealed that most astronomy groups engaged in light pollution education typically distributed literature to parties they thought might be interested. There was little direct involvement with decision-makers in

local governments, with three notable exceptions: the David Dunlap Observatory (DDO of Richmond Hill, Ontario), the Dominion Astrophysical Observatory (DAO near Victoria, BC) and Ruth Lewis (RASC in Calgary).

In the 1970s the DDO, spearheaded by Dr. Tom Bolton, began meetings with officials of Richmond Hill. That led to the promulgation of city by-laws on lighting standards, and is an excellent model for towns with astronomy centres. Richmond Hill was awarded the first national RASC Light Pollution Certificate in 1995. Beginning around the same time at the DAO, Drs. Crampton, Fletcher and Hill worked with municipal officials to create a lighting by-law for the City of Saanich, north of Victoria. It covers a large area surrounding the observatory. Dr Chris Aikman, of the DAO, continues the effort by encouraging the reduction of light pollution from new commercial and residential projects near the observatory. A successful program must be long term. Ruth Lewis, as Chairperson of the RASC's National Light Pollution Committee, introduced a program of public awards. They are given to progressive communities willing to engage in a program of light pollution abatement.

Analysis of the information gathered and reviewed indicated that an eclectic approach was needed to secure lasting results. Therefore, a pro-active hands-on activity that could be applied in the Ottawa area was created from proven elements to meet our objectives. It was decided to focus on light pollution as it affected the general public, thereby increasing the chance of public acceptance of our program rather than creating the impression that light pollution abatement was of concern only to the astronomical community.

## **Action**

After about six months the draft version of the strategy for the Ottawa Centre LPAP was completed. As the name implies, it does not address light pollution but its abatement. It affects the lighting policy of not only the City of Ottawa but also the entire National Capital Region. The program is proactive and hands-on, involving presentations to government officials and rewarding them publicly with awards as progressive city managers.

As the national capital, Ottawa has several tiers of government: the National Capital Commission (NCC) at the federal level, the Regional Municipality of Ottawa Carleton (RMOC), and the cities of Ottawa, Nepean, Kanata, Gloucester and Vanier. In addition, lighting on some roadways is controlled by a provincial body the Ministry of Transportation of Ontario (MTO). Ottawa is essentially corralled by a ring of separate communities that have grown over the last thirty years to become cities in their own right. Ottawa cannot grow any larger. However, there is little to restrain the expansion of its surrounding cities: Almonte, Carleton Place, Stittsville and Richmond in the Township of Goulborne, Smith Falls, Perth, Orleans and Cumberland

Dealing with all those governments individually would be an impossible task, so another strategy was required to bring the effort within the means of a few volunteers. Volunteers

have little time for such work, and whatever time is available must not be wasted. Activities must therefore be well planned so that any effort is both effective and efficient. The resulting strategy was based on the LPAP objective, which was expanded further into a plan to focus on the development of an audio-visual presentation for municipal officials during the implementation step.

The objective of the LPAP was to meet with municipal decision makers -- politicians, engineers and administrators -- to make them aware of the social and economic costs of light pollution and its adverse affect on the quality of life. Why not give public lectures? Why not "target" the general public? As many of us know the general public has little impact on the installation of lights. By the time most citizens see lights being installed, the lighting policy has been in place for perhaps a decade, and the specific project has been in the planning process for at least a year and in the municipal budget for many months. Making your interests known after the concrete footings are laid is too late. We believe that the time to influence municipal lighting is in the policy, budgeting and design stage. The "leverage of time" can allow the work of a few volunteers to move, if not mountains, at least municipal minds.

An action plan was created to gain public and government attention. A showpiece project was needed that had high political and public interest. The Committee selected the Hunt Club Road Extension that passes south of Ottawa through lands preserved by the NCC. It involved three levels of government: federal (NCC), regional (RMOC), and local (the City of Nepean on the west side of the City of Ottawa). The NCC required that the road have minimum environmental impact and specified the use of sharp cut-off luminaires that do not let any light shine directly into the sky. The design minimizes glare for motorists, light trespass to the neighbourhoods along the roadway, and sky glow that results from light that would otherwise be directed upward.

## **Implementation**

The success of the LPAP depended on direct discussions with municipal officials. Therefore, a presentation and information package was targeted at municipal decision-makers. A professional presentation with slides was developed to outline clearly the issues of glare and light trespass and their impact on sky glow. Tables and figures were created specifically to demonstrate costs and social impact of various lighting fixtures and illumination guidelines.

Our presentations consisted of a standard slide set of text and graphics, but about a quarter were taken especially for each meeting. Collecting the photographic material required a lot of driving around, typically after midnight, to find examples of lighting that accurately represented the "good, the bad and the costly" in the municipality in which the presentation was to occur. Although the International Dark Sky Association (IDA) has a good assortment of slides, their examples are not applicable to municipalities in the National Capital Region and they are of poor quality. The municipalities were impressed that we used local examples of good lighting as well as bad lighting. "Imported" slides from other cities could not show the local problems we wished to solve. Showing the

lighting of a local shopping centre or popular roadway was more effective than a slide of Los Angeles.

## Rewards

It was intended that officials would be congratulated for the quality of their good lighting, and encouraged to up-grade their older polluting fixtures to less polluting designs as part of their on-going infrastructure renewal programs. In order to gain popular support for the program, the Committee adopted Ruth Lewis' concept of an award that would be presented before the media. The Ottawa Centre Light Pollution Abatement Certificate was designed and produced by Don Fougere, who is now the Chairperson of the Ottawa Observers Group. The Award shows the Parliament Buildings under a dome of light (Figure 5). The use of the Parliament Buildings gives the Certificate national respectability, as they are a national symbol. The citation on the Award was adopted from that developed by Ruth Lewis of the Calgary Centre.

The first award was presented to recognize the co-operation between three layers of government on the Hunt Club Extension Project. Early in our program we contacted the NCC regarding a ring road called the Hunt Club Extension, then under construction, with the intent of ensuring that luminaires along the roadway would not be light polluting. We were impressed by the fact that the NCC was already working with the Regional Municipality of Ottawa Carleton (RMOC) and the City of Nepean to ensure that sharp cut-off luminaires were used, thereby maintaining the environment of the green space.



Figure 5 - The Light Pollution Abatement Award of the Ottawa Centre created by Don Fougere of Ottawa. It shows the Parliament Buildings silhouetted against a dark sky with an inscription outlining the goals of the Ottawa Program.



Figure 6 - The Ottawa Light Pollution Abatement Certificate being awarded to, from left to right, Mr. Jaap Schouten for the National Capital Commission, Mr. C. Merv Beckstead for the Regional Municipality of Ottawa-Carleton, and Mayor Ben Franklin for the City of Nepean. Robert Dick is on the right. (Photo by Brian McCullough.)

We arranged for awards to be made to all three levels of government along with television coverage. The awards were given to the Chairperson of the NCC, the Chairperson of the RMOC, and the Mayor of the City of Nepean (figure 6)

In the news broadcast all three governments espoused the virtues of working together to provide a quality environment for all citizens. Through the media the surrounding communities became very much aware of the RASC and the LPAP. It is far easier to orchestrate a 30 to 60 second video bite on the 6 o'clock news than to talk to 10-50% of the region's population. A press release identified the RASC as a prestigious organization, noting light pollution abatement as a very positive program for the future of cities.

We immediately followed up on the media attention by developing contacts in other municipalities that presented light pollution problems for our members. Meetings were scheduled in the months to come with city planners responsible for lighting. Making the contacts resulted in subsequent presentations and discussions with other municipalities.



Various key municipalities were selected, and the mayors, council members, urban planning managers, and appropriate staff were identified. A copy of the first press release was provided and an invitation was offered to get on board our successful program. All communities agreed to hear our presentation.

To prevent misunderstanding and to increase our effectiveness, preliminary discussions were made by letter and fax. We visited officials in their offices with a positive and constructive attitude. Despite their concerns over changes in standard procedures and possible higher costs for lighting. Following the meetings we were on a first name basis with senior officials, and meaningful relationships were developed.

In official meetings with municipalities, we set the agenda. That allowed the Committee to focus the presentation and subsequent discussions on the issues, our concerns, and our recommendations. To increase the effectiveness of the presentation, slides were used to deliver our message. A handout was prepared, but to avoid distractions it was not distributed until the discussion period following the formal presentation. As a follow-up measure, if the municipality indicated they were ready to adopt a program of light pollution abatement, we made arrangements for an award ceremony, press releases, and television coverage for them.

Through such close mutual working relationships, we were able to assist some local communities in effecting major savings in the acquisition of lighting fixtures. They were delighted with the positive feedback made possible by Lee Macdonald, a member of our Committee and a professional purchasing agent. His insight and experience were major contributors to the acceptance and credibility of the RASC and the LPAP.

### **Follow Up and Maintenance**

It has been demonstrated that a hands-on, person-to-person approach is most effective in communicating ideas and obtaining commitment. A natural outgrowth of our success is to reach greater numbers of the general public so that interest in light pollution and its negative effects on the quality of life, the value of real estate, and the waste of precious resources, continue to be supported. We have assisted several local communities to change their attitudes towards old lighting systems that were good enough forty years ago but not today. In our experience, cash-strapped administrators must be convinced that there are benefits for the municipality in the sharp cut-off lighting technology we recommend. Politicians must be convinced that they are doing the right thing by reducing waste and investing in the quality of life in their community.

Since local officials in Ottawa's immediate geographical area have now been informed of the benefits of the LPAP, it behooves the Committee to convince provincial officials as well. That is not as difficult as it sounds, since we have made an award to a federal government group (the NCC) which is very progressive in its lighting policy. In our talks with the NCC we made a number of very good contacts and provided strong encouragement for their non-polluting measures. It became evident that we had strong

allies in the NCC and in the general lighting architecture community. That was most evident at the recent City Lights Conference.

The National Capital Region has a unique feature in the wide green space that encircles the cities of Ottawa, Nepean, Gloucester and Vanier, and crosses the major satellite cities of the region. The "Green Belt", a band of undeveloped and agricultural green space around the region, is managed by the NCC, which is responsible for the planned development of the greater Ottawa region. Subsequent to our meetings with the NCC and other governments, we were invited to play an advisory role on the development of a new lighting policy throughout the RMOC. The precursor to the development of a regional lighting policy was a City Lights Conference held in October of 1995.

The conference was sponsored by the RMOC, the NCC, and the IES. It was attended by lighting architects from around the world, lighting engineers, city planners, municipal administrators, politicians as well as representatives from industry. The authors and four other members of the LPA Committee represented the Ottawa Centre's interests during the two days of meetings. We presented a paper at the conference on the activities of the RASC Ottawa Centre in the promotion of light pollution abatement and the success we were having. Terry Dickinson was also a speaker and provided a North American perspective on light pollution and its impact on astronomy

One of the main themes was improving visibility with less light, primarily through reducing glare. It was most apparent that there is plenty of good will and a positive attitude toward providing the best and most effective lighting possible to the general public. It was most encouraging for our Committee members and other public interest groups who attended the meeting.

There were four parallel sessions that included presentations by manufacturers, lighting engineers and architects, municipal engineers, policy makers, police and community groups. The consensus from the meeting was that more light is rarely good light. The aim of lighting is to render visible both hazards and landmarks, attract the public into the streets, and thereby increase personal safety. The police representatives advised that cities focus on increasing visibility and not just on more light, because more light does not necessarily reduce crime. Safety comes with company, so lighting should be designed to draw pedestrians into the streets. Business representatives, lighting architects, light manufacturers and civic groups all agreed that "good lighting" was beneficial to everyone. Attractive lighting drew shoppers, pedestrians supported business, and people on the streets provided safety in numbers. Municipal planners and engineers were advised to minimize glare and tailor the regional lighting plans for pedestrians instead of cars, as well as to control "bad" lighting.

In workshops the few who were asking for more lighting along pathways and parking lots were convinced that improved visibility can be more easily attained at the same cost with better lighting design. That was a welcome theme for us. The City Lights Conference provided a significant step towards the reduction in light pollution. The IESNA lighting standards are being revised and the authors of the standards were represented at the

conference. Though their work will be based on research into perception and available technology, it may include the priorities of society as voiced at the conference. Personal and property safeties were shown to be paramount. It was reported that safety is improved with better visibility and that excessive lighting and misuse of existing products often compromise visibility, with glare being a major contributor.

Astronomers will have to compromise. Visibility can be improved by illuminating vertical surfaces such as trees and buildings, although at low illumination levels. Thus, we may expect luminaires that point from ground installations upwards and from roof lines sideways to trees or building walls. We hope that lighting designs that make use of such techniques will be required to be collimated to minimize light trespass and upwards-directed light. Such a requirement will also minimize glare and will improve aesthetics.

The results of the conference will be adapted into a lighting policy for the region. Under the umbrella of the NCC and RMOC it will be applied to lighting projects in all the cities in the National Capital Region. The smaller towns already seem to favour a less polluting strategy.

LPAP has not been 100% successful, but we have been encouraged by the extent of the matter-of-fact acceptance of the LPAP. One example is the lighting policy of the City of Nepean. On February 25, 1997, the City of Nepean, one of the original recipients of Ottawa's Light Pollution Abatement Award, announced the development of a municipal lighting policy. In March 1997, we were invited to their information session for interested groups. During our early discussions with their engineering department, we had received a rather cold response. Weeks and Macdonald represented us at the information session, and they were pleased to report that the proposed policy conformed to the overall theme of the 1996 City Lights Conference and our LPAP. We like to think that our arguments were effective by offering grassroots support for a non-polluting lighting policy.

A large arena has been built west of Ottawa in the City of Kanata beside Highway 417 in order to provide a home for the Ottawa Senators hockey team. Initially the lighting plan called for standard cobra-type luminaires in the large parking lot and access road, and seven fixed vertical luminaires to illuminate a large sign on the exterior of the building. Before the lighting had been installed, we contacted the City and the MTO regarding the lighting design. We recommended to the City that they advise the developers to use flat glass luminaires in the parking lot and along the access road in order to reduce glare along the highway and to delay the installation of the vertical lights. The delay would reduce the initial costs of the construction by about \$45,000. They agreed and the building, the COREL Centre, is far less polluting than initially planned. The parking lot is illuminated entirely by flat glass, cobra-head luminaires, and the COREL sign is back-illuminated in red.

After the television lights have been removed from the mayor's office, it is easy for a municipality to hang up, forget the award, and continue with the old lighting policy. Therefore, follow-up is one of our most important tasks. It is very important to check with the local community's urban planners periodically and to ask for a status report on

recent developments because, just like gravity acts on an object, so does the importance of short-term cost on new ideas. We must constantly be on the alert for "backsliding" caused by fiscal pressures on new lighting policies. We have several members who drive around their municipalities and stay aware of the future plans for municipal and business construction. When alerted, we contact the municipalities to verify that sharp cut-off lighting will be used in the projects. That is a litmus test for the LPAP.

## **Results**

It is hard to say whether we have convinced the public of the importance of light pollution abatement, but it certainly did not hurt. Several shopping centres have been built in the region since our LPAP began to receive media coverage. They have all used flat glass and shielded luminaires for their extensive parking lots. Although we can not claim that we convinced all the developers to use them, we can highlight the COREL Centre where we did. Indeed, less than a year after we received media attention, we began noticing sharp cut-off lighting in parking lots of strip malls and car dealerships. Businesses adopted the idea of "better lighting" faster than municipalities because of the perceived link between aesthetics and attracting customers.

The results of meeting with government representatives speak for the success of our program in Ottawa. Most of our presentations went very well; several communities adopted flat glass ("sharp cut-off") luminaires as their first choice in all new developments, and our volunteers have not suffered from burnout!

The City of Gloucester, on southeast of Ottawa, has not yet agreed to the use of flat glass luminaires. However, we were most gratified that we were able to convince several towns near our Indian River Observatory and other observatories owned by our members to adopt them. After our presentation, one town council clarified the statement of our objective by saying that we just wanted them to use common sense!

(To be continued in the next issue.)

*Robert S. Dick is heavily involved in astronomy education and in light pollution abatement. He has worked on a wide variety of engineering projects for both the military and commercial interests, including experiments flown on shuttle flights. He has also taught astronomy courses to Canadian astronauts by contract with the Canadian Space Agency, to university students, and to the general public. He has built several telescopes, the last being a 25-inch telescope housed in one of the largest privately owned amateur observatories in Canada, at his country place at Rideau Landing, Ontario.*

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