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An Initial Retrospective on the International Year of Astronomy 2009 in Canada

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ABSTRACT: Canada's IYA vision, "To offer an engaging astronomy experience to every person in Canada, and to cultivate partnerships that sustain public interest in astronomy," resounded with diverse partners, collaborators, and volunteers throughout the land, exceeding our ambitious expectations. More than 3600 extremely diverse events provided engaging astronomy experiences to more than 1.9 million Canadians, young and old. Extensive media exposure brought IYA awareness to millions more. IYA legacy activities, with a strong focus on improving opportunities for youth in underserved communities (inner cities, rural, Aboriginal and First Nations, etc.), are underway, as we briefly describe. A longer final report, with extensive appendices, is being posted on the Canadian IYA Web site, as well as on partner Web sites.

Introduction

So long in the making, it is a bit hard to believe that the International Year of Astronomy 2009 (IYA) is officially over. As we catch our breaths and transition to *Beyond the International Year of Astronomy* (Beyond IYA) activities, it is natural to ask: How did we do? While perhaps still a bit close to respond with proper historical dispassion, the short answer is: we — no, YOU! — did well. We had a lot of fun sharing our passion for astronomy with members of our communities, and we laid foundations for improved education and public outreach (EPO) in Canada that can continue for years to come. Our short article aims to share a few highlights and anticipate some of the legacies.

A year-long, global education and public outreach (EPO) project, the International Year of Astronomy 2009 (IYA), was officially declared by the United Nations General Assembly, UNESCO, and the International Astronomical Union (IAU). While the IAU is comprised of 68 nations with some professional astronomy activities, IYA's educational vision was so compelling that 148 countries participated in this celebration marking the 400th

anniversary of Galileo looking through a telescope and changing forever the way that we view the Universe and ourselves. IYA's global logo, *The Universe: Yours To Discover*, was inspired by a Canadian, and it motivated Canadian IYA preparations that began in late 2005 and soon led to the partnership of the Canadian Astronomical Society (CASCA), Fédération des astronomes amateurs du Québec (FAAQ), and The Royal Astronomical Society of Canada (RASC). As experience was gained, this partnership evolved to being guided by an Executive Committee with two members from each partner organization, plus the Programme Manager, who received invaluable advice from a larger Advisory Board. All decisions were by consensus, a process that worked extremely well, no doubt because the diverse experiences of team members helped us to analyze ideas and keep focussed on achievable goals. The three partners have committed to working together (at a less intense pace!) on ensuring that *Beyond IYA* astronomy legacies are realized. While the CASCA-FAAQ-RASC partnership was key, we cannot stress enough how vital the collaborations were with planetaria and science centres, government,

universities, other parts of the astronomical community, with parks, libraries, arts and cultural organizations, and many other elements of Canadian society.

Early on, we adopted a simple way of summarizing progress towards our overarching goal of offering an engaging astronomical experience, a “Galileo Moment (GM)” of personal astronomical discovery, to every Canadian, thereby using the wonder of the night sky to inspire an interest in the cosmos and in science in general. The fairly inclusive definition was meant to encourage both traditional (*e.g.* star parties, visits to planetaria, *etc.*) and non-traditional (*e.g.* attending art or musical events with strong astronomy content) approaches to help people reconnect with the cosmos. Event organizers reported the Galileo Moments achieved (that is, attendance), and a simple counter on our bilingual Web site increasingly captured attention as 2009 progressed. Formally, we celebrated passing the one million goal on October 27, but when all the late reports of earlier events came in, we now know it actually occurred much earlier in the year. By the end 1.93 million GMs were recorded throughout Canada.



Figure 1 — Galileo Moment geographical distribution across Canada.

Broadly speaking, programmes and projects in Canada fell under four themes:

- helping Canadians to reconnect with the sky (lots of star parties!);
- using art, music, theatre and images to bring astronomy to new audiences;
- making Canadians aware of outstanding frontier astronomical research underway in Canada; and
- supporting and improving formal and informal astronomy education, with a focus on youth in underserved communities (*e.g.* inner city, Aboriginal, rural).

Each of these themes had connections, implicit or explicit, to the international IYA Cornerstone Projects. Those developing Canadian IYA activities were encouraged from day one to consider how to ensure impact beyond 2009. In the following sections, a few examples provide a sense of the outcomes.

Reconnecting With the Sky

A high percentage of the GMs arose from the efforts of amateur astronomers, university and community observatories, and students, to go all-out to offer Canadians opportunities to see celestial objects through a telescope. These opportunities began in the middle of a Canadian winter, and ended with the New Year’s Eve “Blue Moon,” also in mid winter. In acts of “guerrilla astronomy,” many took their telescopes to the people, in shopping mall parking lots, downtown sidewalks, and so on. Bilingual *Astronomy Trading Cards* and *Star Finders*, distributed for free at these events, were designed to pique the recipient’s interest, leading them to continue to learn about the splendours of the Universe. *Astro Card* information also allowed people to register their name to be launched in 2010 aboard the Canadian Space Agency’s NEOSAT.



Figure 2 — Four of the set of eight AstroCards created by Jennifer West of the Winnipeg Centre.

Galvanized by the unique IYA opportunity, astronomers made impressive headway in efforts to provide more places where Canadians can enjoy the splendours of a dark sky, and to educate the public and municipal planners about deleterious impacts of light pollution on biota and energy consumption. Based upon guidelines widely distributed in 2008, four national parks newly designated by the RASC as Dark-Sky Preserves were added to the five they had recognized since 1999 and the two recognized by other organizations: Kouchibouguac National Park Dark-Sky Preserve, NB; Bruce Peninsula National Park and Five Fathoms National Marine Park Dark-Sky Preserve, ON; Mt. Carleton Provincial Park Dark-Sky Preserve, NB; Grasslands National Park Dark-Sky Preserve, SK.

The FAAQ laid the groundwork in 2008 for an innovative light-pollution-abatement approach by producing a draft proposal for outdoor-lighting regulations that all Québec municipalities could implement. The proposal was based upon material that led to the Mont-Mégantic International Dark-Sky Reserve designation. As described by Lacasse (2010), during IYA, the FAAQ organized a free one-day workshop, one each in Montréal and Québec City. Letters of invitation were sent through professional associations (landscape architects, town planners, engineers, *etc.*). From within a 150-km

radius of Montréal, 98 participants (compared to the ~30 predicted) attended, while 70 did so for Québec City. Positive participant feedback suggests this approach may be worth emulating in other provinces.

The RASC's *Mary Lou's New Telescope*, provided free at events across Canada, was a well-received introduction for children to the effects of light pollution, while the Victoria RASC Centre developed a set of nine informative, light-pollution "trading cards" for adults for distribution at public events (see <http://victoria.rasc.ca/LPA/Default.htm>). All of these activities addressing light-pollution abatement represent an important legacy of IYA in Canada.



Figure 3 — One of nine light-pollution cards created by RASC Victoria Centre.

Reaching New Audiences

A striking feature of IYA in Canada was the number of events bringing astronomy to a much broader public — both children and adults — through music, art, imagery, and theatre techniques. Many national or regional hosts prepared radio programmes, broadcast by Radio Canada and CBC, linking IYA with broader cultural themes. Excellent local and national spots focused on upcoming IYA events. Archives ensure continued access to many of the national programmes.

Many musical groups and orchestras in Canada presented programmes during the year that touched upon astronomy and its history. Canadian physicist Diane Nalini, who is also a talented jazz vocalist, issued her fourth CD, with songs all invoking astronomical imagery. Holst's perennial favourite, *The Planets*, was heard on stages throughout Canada, thereby creating opportunities for informal astronomy education. The Victoria Symphony's annual educational programme for 2009, *Music of the Spheres*, presented both on Vancouver Island and in Toronto, integrated astronomy with lively astronomy-themed music appealing to kids. Canada's world-renowned Tafelmusik Baroque Orchestra created *The Galileo Project*, which is an imaginative programme celebrating IYA through music, stunning images, choreography, and poetic and theatrical narration. An exemplary illustration of the deep historical, societal, scientific, and aesthetic dimensions of astronomy (Percy 2009), *Galileo Project* performances are continuing well beyond 2009 and in other countries and languages (Mexico, China). A video recording will soon be freely available to accompany the audio available on CBC radio archives. Both the Victoria and Tafelmusik orchestras created Teachers Guides that integrated astronomy and music content in a curriculum-

appropriate and engaging manner for young people.



Figure 4 — Tafelmusik Baroque Orchestra performing their Galileo Project concert in Banff.

Using actors and theatrical techniques, *Galileo Live!* — the first live planetarium show to be co-produced by the Calgary, Vancouver, Winnipeg, and Montréal planetaria — demonstrated that a planetarium program can combine both science and the arts, and be funded and staged nationally. In total, 32,814 people attended one of the 579 presentations during the 10 months it ran. Audience acceptance and satisfaction were very high. *Galileo Live!* provided the program partners with further experience with the style of show they feel will be essential for good audience appeal, and for a high-quality educational theatre experience as Canadian planetaria move into the age of all-digital projection, another valuable IYA legacy.



Figure 5 — Poster for the Galileo Live! planetarium production.

As readers of this *Journal* appreciate, the beauty of astronomical images captivates people while inspiring curiosity about the Universe. Most of the readily available images come from international sources, yet Canadian astronomers, both professional and amateur, produce a wealth of superb images. For IYA, a group of amateur

and professional astronomers and visual artists created a living, Web-based collection of stunning Canadian images freely available for use during and beyond IYA (see www.galaxydynamics.org/iya2009). Image displays were mounted throughout Canada, in science centres, breweries, art galleries, airports, shopping malls, universities, etc. The art and images at many of these exhibits were complemented by public viewing of celestial objects offered by local astronomers.

Canadian astronomical imagery and themes also inspired the artists at Canada Post and the Royal Canadian Mint, who produced stunning postal stamps and a silver \$30 IYA commemorative coin.



Figure 6 — Canadian IYA postal stamps featuring the domes of the DAO Plaskett and CFH Telescopes superposed on CFHT images and the Royal Canadian Mint \$30 silver Commemorative coin.

In collaboration with the Planétarium, Montréal's Botanical Gardens created a unique IYA event, *The Magic of Lanterns: Traditional Chinese Astronomy*, that drew large crowds. Lanterns inspired by classic images from Chinese astronomy and instruments from the Beijing Ancient Observatory allowed visitors to explore the mythological and scientific dimensions of traditional Chinese astronomy and to see how they compare with Western science. Every Thursday evening FAAQ members provided telescopic viewing opportunities.

Sharing Canada's Astronomical Research Successes

IYA motivated professional astronomers to provide expanded opportunities for Canadians to learn more about the excellent, exciting research being done by Canadians using Canadian facilities. Many university and college astronomers and their students, along with scientists at government laboratories and observatories, organized diverse public lectures on astronomy and its connections to society through the fascinating, fundamental research questions being addressed today.

CASCA funded and organized *The Galileo Lecture Series* (GLS). It enabled communities large and small to bring top researchers from Canadian institutions (who were also excellent public speakers) to present their science in an engaging and compelling way. The two goals of GLS were to introduce the excitement and reach of modern astrophysics to non-traditional audiences, and to provide a legacy for the host and the greater community. Two competitions resulted in 22 GLS lectures in English or French during 2009. A list of lectures, as well as video and audio recordings of certain lectures, is available at <http://iya.astrosci.ca>. Many GLS lecturers gave additional talks based upon their GLS presentations in schools and other venues, which at a minimum doubled the reach and impact of

the programme.



Figure 7 — A CASCA Galileo Lecture in Pangnirtung, Nunavut.

CASCA also partnered with the Canadian Association of Physicists (CAP) to provide a special joint lecture tour, with a focus on astronomy, for undergraduate students. By pooling the resources of the two societies, they were able to expand on the highly successful annual CAP undergraduate lecture tour, and bring the excitement of modern astrophysics to students and faculty at 31 colleges and universities.

The FAAQ organized an independent *Série de «Conférences Galilée»* in which nine French-speaking astronomers presented 23 public lectures throughout Québec during 2009 (see <http://iya.astrosci.ca> or www.faaq.org/2009/conferences.htm).

During National Science and Technology Week (15-25 October), and associated with IYA, Waterloo's Perimeter Institute organized the largest and most comprehensive science outreach event ever held in Canada, *Quantum to Cosmos Festival: Ideas For The Future*. Attendance at on-site events was 39,137, and organizers estimate that more than 1 million around the world have participated through a combination of live, on-line streaming, TV programs, archived versions, and derivative material.

Improving Educational Tools and Opportunities

Globally the IYA vision was that "Everyone should realize the impact of astronomy and other fundamental sciences on our daily lives, and understand how scientific knowledge can contribute to a more equitable and peaceful society" (www.astronomy2009.org/general). This philosophy underpinned many of the Canadian activities we've already described. We'll close our brief review with a few more examples designed specifically for Canadian youth.

Schools reach millions of young Canadians each year, so support for the school astronomy curriculum, and support for teachers, is a high-impact approach. During IYA, astronomers gave dozens of in-school and after-school programs, and they gave presentations at science teachers' conferences, reaching hundreds of teachers in Ontario and Québec alone. Summer institutes on astronomy for school teachers were held in Halifax and Toronto, part of the global

Galileo Teacher Training Program. And astronomy resources for teachers were developed by astronomers and institutions across the country.

For instance, the National Research Council updated their popular *Canadian Skies* poster, with its information about Canadian ground-based astronomy, and activities for teachers and students. Throughout Canada, at teachers' conferences, in schools, and at public events, NRC distributed 11,441 posters (twice as many as during 2008), experienced a 30 percent increase in Web hits, and distributed 1100 RASC-FAAQ *Star Finders*. Emphasizing Canada's contributions to space astronomy missions, and thus nicely complementing the NRC poster, the Canadian Space Agency produced a new educational poster, *Secrets of the Night Sky*, to commemorate IYA. Since distribution began in June, students, teachers, and the public have received 6300 copies. Together these posters are reaching hundreds of thousands of young Canadians, providing another strong IYA legacy.



Figure 8 — The French version of an educational poster widely distributed by NRC.

Our early wish to celebrate, in a respectful manner, knowledge of the skies held by Canada's Aboriginal, Inuit, and Métis cultures alongside current astronomy knowledge was rewarded by the opportunity to partner in 2007 with the leaders of the innovative Integrative Science programme at Cape Breton University and their associated Mi'kmaq College Institute. Through their leadership, we envisioned three projects that we believe lay the foundation for a long-term partnership that will benefit the traditionally underserved youth of these communities, as well as all Canadians. At the core of the approach is the concept of uniting Elders and youth within a community through the sharing of night-sky stories. Throughout 2008, Mi'kmaq Elders and Cape Breton University artists and scientists prepared a beautifully illustrated video (narrated in Mi'kmaq, English, and French) to serve dual purposes. First, through digital technologies, to share with Mi'kmaq youth a traditional story illustrating how circumpolar motion of specific stars guided rituals important to community life; and, second, encouraging by example other First Nations throughout Canada to follow suit by making their sky stories readily available to their youth (and, where culturally permissible, more widely).

The premiere of the Mi'kmaq video of *Muin and the Seven Bird Hunters* occurred at a the IYA media launch on January 8 at the

Canadian Science and Technology Museum in Ottawa and is available for download from the IYA Web site, Cape Breton University, and <http://iya.astrosci.ca>. Throughout 2009, and continuing strongly in early *Beyond IYA* activities, the video is being extensively used to broaden understanding within and between cultures and communities.

The two other major components envisioned involve fostering greater respect for the environment by encouraging and supporting Aboriginal communities to act to preserve areas near their communities that currently have little or no light pollution, and to promote these "dark-sky" areas as an accessible cultural and scientific resource for community youth, today and in the future. And, finally but very importantly, to create visual educational pathways for Aboriginal children and youth who wish to pursue dreams and career aspirations to become scientists.

In an independent thrust, Aboriginal specialists at the Manitoba First Nations Education Resource Centre also created a First Nations IYA calendar based (predominantly) upon Cree knowledge that they shared with some 57 First Nations schools and their 60,000 students (www.mfnerc.org/images/stories/FirstNationsJournal/Volume2/008_buck.pdf).



Figure 9 — Mi'kmaq artist Gerald Gloade's *Reflections* capturing the Mi'kmaq belief that everything that happens in the sky is a reflection of what takes place on Earth.

These and many other activities are already inspiring numerous *Beyond IYA* efforts with Aboriginal education. To build upon and extend the impact of these efforts, the three partner organizations applied for funding to support coordinated educational efforts beyond 2009.

Many readers will know that it is relatively easy to do EPO in

schools, science centres, libraries, and other places where one finds youth who are already in the educational system. But there are many youth who do not have access to resources, and who are not reached by regular educational channels, for example, inner-city or remote rural youth, those in hospitals and institutions, those who are new to Canada and don't speak either official language, and so on. Our IYA (and Beyond) Underserved Youth Project aims to reach out to these young people who are invisible to the usual EPO approaches.

A three-year PromoScience grant from NSERC in 2009 allowed the partner organizations to hire a part-time coordinator who is developing partnerships with agencies and services that access these "invisible" youth. Ultimately, these service providers and the youth themselves will define what constitutes effective EPO for them. The Coordinator is also using a similar approach to help us further develop the Aboriginal Project. In parallel, effort is underway to improve materials available for formal and informal science education in Canada. The EPO committees of the three partners and enthusiastic volunteers and collaborators from IYA have many rewarding opportunities to make a big difference in the long haul, and it is our aim to foster that process through this grant.

Final Remarks

We are all too conscious that many wonderful, creative, effective, deeply appreciated IYA activities have not been explicitly mentioned in our short review, which in no way diminishes their importance to IYA's tremendous success in Canada. We hope we will be forgiven for the omissions necessary to meet length guidelines. Had the economic situation permitted more fund-raising success, more would have been accomplished. Nonetheless, as we look back only six weeks after the close of IYA, we feel that all the thousands of people — whose largely volunteer efforts led to some 3600 registered events, nearly 2 million Galileo Moments, and many millions more

Canadians touched by astronomy information during IYA — may take great pride in what we collectively accomplished. IYA2009 was a great celebration of an epochal turning point in human history. Long may *Beyond IYA* efforts continue to bring to all Canadians the sense of wonder that connection with our Universe inspires!

Acknowledgements

Words cannot adequately express our thanks to each and every volunteer, collaborator, and participant who made IYA2009's success possible. While many people, not acknowledged as authors, made insightful suggestions that improved IYA, we would like particularly to acknowledge key contributions to IYA planning from members of the IYA Advisory Board: Randall Brooks, Ruth Ann Chicoine, Dennis Crabtree (the very effective first leader of IYA in Canada), Jeffery Crelinsten, Jayanne English, Peter Jedicke, Margaret Kennedy, Pierre Lacombe, Phillip Langill, Robert Lamontagne, Lindsay Marshall, Bob McDonald, and Scott Young. We are particularly grateful to the Trottier Family Foundation, whose support enabled us to have a part-time Programme Manager for 21 months. In addition to the outstanding support received from RASC, FAAQ, CASCA, and many individual donors, we also gratefully acknowledge important support received from the CSA, Lumec Corporation, NRC, NSERC, SkyNews, and the University of Calgary. ●

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Lunar Observing

by Ken Backer, Mississauga Centre (backer@iprimus.ca)

I have been an amateur astronomer now for almost four years, which in many circles still gives me "Newbie" status. I tried to cover all bases with my observing and studies — deep space, planets, double stars, our Sun — a little bit of everything, and to see what was what out there. The one object I found myself returning to most often was our Moon.

New astronomers may pick the Moon for some of their first observations (you can't miss it in the sky), but probably move on from there without taking the time to understand what they are seeing, or learning what makes the Moon "tick." After all, it is only the Moon, and a far-off galaxy or star cluster should be more exciting, right?

It seems that for most astronomers the light from the Moon is considered an annoyance that gets in the way of observing the "good stuff," like galaxies, nebulae, and globular clusters. Yet, at public-outreach events, it is probably the main object shown through the eyepiece. Why? Because its structure is fascinating to look at.

Now, don't get me wrong. I do enjoy viewing deep-space objects that I can see well with my scopes from my location. I also

enjoy solar observing with my PST (Personal Solar Telescope), and I like looking at the planets, when they are around. But, my main observing enjoyment is the Moon. At first, I had guilt feelings when I realized this - maybe I wasn't a "real" astronomer, since I would rather look at the Moon than the Lagoon Nebula.

So why am I an avid lunar observer? First of all, I enjoy observing physical structure and the Moon has plenty! Impact basins, old walled plains, craters of all size and description, wrinkle ridges, cracks (rimeae), mountain-like structures, valleys and gouges, odd-ball formations, bits and pieces sticking up from the surface, and any combination thereof.

The Moon also provides observing possibilities not found with many other objects in the heavens. Live in a large city or light-polluted neighbourhood and can't drive those two hours to a dark-sky location? Not a problem; the Moon is bright enough to cut through all that.

The Moon can be viewed in a variety of seeing conditions that would otherwise keep you and your scope inside. When the seeing