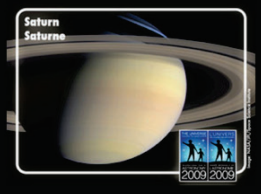
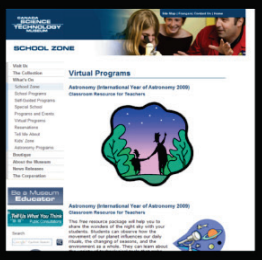
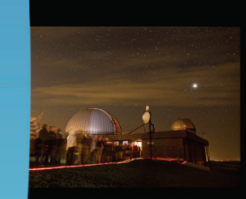
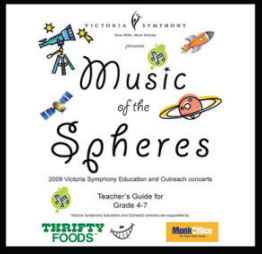
Final Report | Rapport Final

Education and Outreach | Éducation et vulgarisation



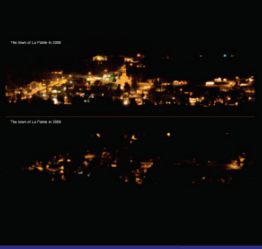


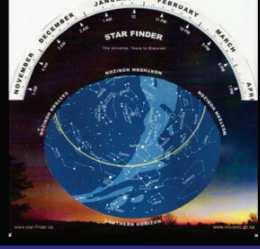




Media | Médias

IYA 2009 Legacy | Héritage de l'AMA





INTERNATIONAL YEAR OF ASTRONOMY
Année Mondiale de L'ASTRONOMIE
2009
CANADA

>1,930,000
'Galileo Moments'
Moments Galiléens

IYA activities in Canada are brought to you by / Les activités de l'AMA au Canada vous sont présentées par
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EXECUTIVE SUMMARY

2009 was officially declared the International Year of Astronomy (IYA) by the United Nations General Assembly, UNESCO and the International Astronomical Union (IAU). Under the slogan, ***The Universe: Yours To Discover,*** this year-long, global, education and public outreach (EPO) project inspired 148 countries to celebrate the 400th anniversary of Galileo looking through a telescope and changing forever the way that we view the Universe and ourselves. Canadian preparations began in late 2005 by the **partnership** of the Canadian Astronomical Society (CASCA), Fédération des astronomes amateurs du Québec (FAAQ), and the Royal Astronomical Society of Canada (RASC), collectively representing 210 years of EPO experience.

Our vision, "To offer an engaging astronomy experience to every person in Canada, and to cultivate partnerships that sustain public interest in astronomy," was accompanied by the ambitious goal that at least 1,000,000 persons would experience an engaging astronomy activity or Galileo Moment (GM). The key partners, collaborators and volunteers throughout the land (see the map), provided more than 3,600 diverse events delivering 1,931,439 reported GMs, exceeding our most ambitious expectations.

Those events included looking at the sky with the naked eye, binoculars or through a telescope; interactions with schools; exhibits of stunning Canadian astronomical images; collaborations with musical groups, theatres and artists; and many more. IYA was blessed with thousands of enthusiastic volunteers and collaborators in the form of amateur and professional astronomers, graduate students, educators, members of the arts communities and parks systems, the media, and countless others. Event planners were encouraged to consider how to leave an **impact that would last well beyond 2009**, which they took to heart. The larger legacy initiatives include projects in formal and informal education, Dark Sky Preserves, with underserved youth and Aboriginal communities, and more.

This Report briefly summarizes IYA Goals (Section 1) Uniquely Canadian IYA Activities (Section 2), Successes (Section 3), Lessons Learned (Section 4), Legacy Projects (Section 5), and Funding and Funders (Section 6). Several Appendices provide additional information. Extensive additional information is available at: http://www.astronomy2009.org/ (international) and http://www.astronomy2009.ca (Canada). Our success would not have been possible without the support of i) key funders; ii) our partner organizations (and the generosity of their members who made substantial donations); and of iii) our diverse collaborators. **Special thanks** to all whose support greatly enhanced the success of IYA.

NOTE: IMAGES IN THE RIGHT MARGINS ARE FROM THE CANADIAN ASTRONOMICAL IMAGES WEBSITE AT: WWW.GALAXYDYNAMICS.ORG/IYA2009/

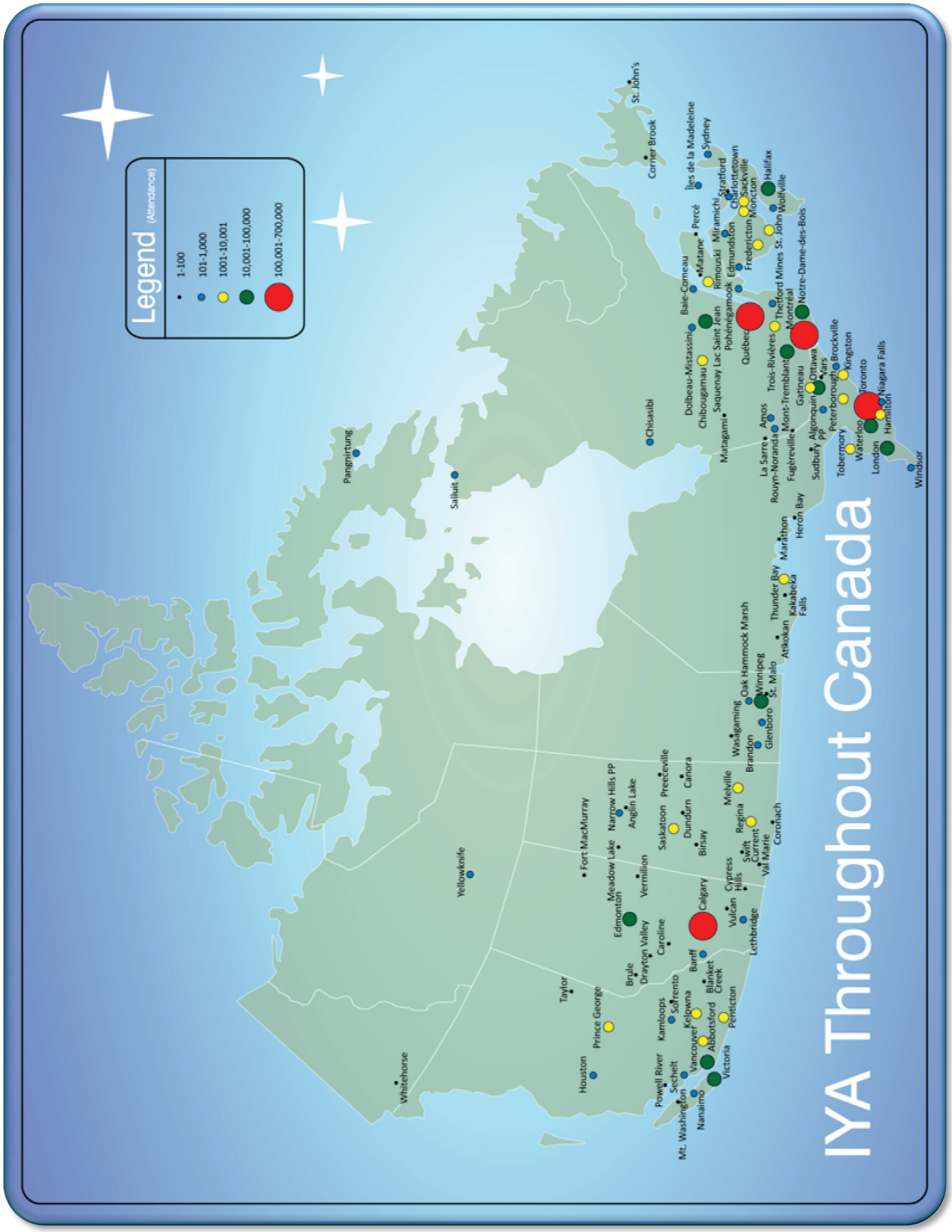


FIGURE 1: DISTRIBUTION OF THE 3,600 REGISTERED CANADIAN IYA EVENTS

TABLE 1: IYA 2009 - BY THE NUMBERS

IYA 2009 - by the Numbers	
Reported Galileo Moments	1,931,439
Reported Events held	3,589
Event liaison count (mid year)	324
Names to be launched into space on NEOSSAT	10,955
Promotional posters printed	10,000 English / 3,500 French
Astronomy trading cards printed	700,000 (100,000 each of seven types)
Mary Lou's New Telescope books printed	16,000 English 7,000 French
Star Finders printed (1st print run)	70,000 English 20,000 French
Star Finders printed (2nd print run)	123,000 English 52,000 French
Sidewalk Astronomer Booklet printed	24,000 English
Canada Post IYA stamps printed	6,000,000 (300,000 souvenir sheets)
Royal Canadian Mint IYA silver coins made	10,000
Dark Sky Preserves designated	4
"Galileo Live!" planetarium shows delivered	579
Website visits (from April 29 to year end)	47,539
Website page views (from April 29 to year end)	154,795
Website visits per day (from April 29 to year end)	196
CASCA-organized national Galileo Lectures	22
FAAQ-organized Galileo Lectures in Québec	23
CAP-CASCA astronomy-focused lectures	31
CSA astronomy themed workshops	31

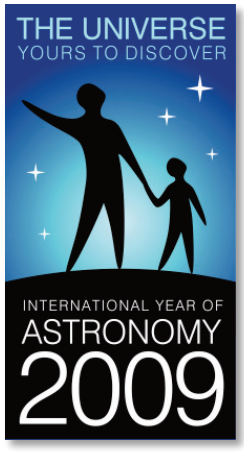
1 GOALS OF IYA CANADA

The IAU global IYA committee (co-chaired by a Canadian) led hundreds of international participants in developing a series of global project concepts. Each participating country adopted (or adapted) those that were appropriate to them and designed unique ones.

All of the Canadian partners and their collaborators – the FAAQ, RASC, CASCA, universities, science centres, planetariums, the Canadian Space Agency (CSA), the National Research Council (NRC), and others – have a successful history of providing science education and public outreach (EPO). Our goal was to provide bilingual EPO to all Canadians in a nationally coordinated effort over six time zones, including vast regions where the population is spread quite thinly.

FIGURE 2: AN FAAQ PRESENTATION IN SALLUIT, THE NORTHERNMOST TOWN OF QUÉBEC, FEB. 2009

IYA activities in Canada were coordinated by a seven-person Executive Committee (EC) comprised of two representatives from each partner organization plus the Project Manager; a larger Advisory Board (AB) provided invaluable perspective from individuals with broad, diverse experience. We established a series of IYA liaisons in, e.g., astronomy departments, RASC Centres, independent astronomy clubs, and First Nations organizations that were responsible for distributing information, encouraging IYA activities, answering queries, etc. at the local level. With NRC support, the EC chair, the so-called Single Point of Contact (SPoC) with the IAU, reported on Canadian preparations and activities at numerous national and international meeting from 2007 onward (see Appendix 1).



Canada's IYA goals were a combination of IYA Themes, to be realized during 2009, and Legacy Projects, which will bear fruit for years following IYA. Throughout planning and implementation, however, we emphasized legacy aspects in all elements. The major Canadian IYA Themes, as defined by mid-2007, were:

The Galileo Moment: Canada's overarching goal for IYA was to offer an engaging astronomical experience, a 'Galileo Moment' of personal astronomical discovery, to every Canadian, using the wonder of the night sky to inspire an interest in the cosmos and in science in general. (Section 2 and Appendix 2).

Dark Skies Preserves: to provide more places where Canadians can enjoy the splendours of a dark sky, to educate the public and municipal planners about deleterious impacts of light pollution on biota and energy consumption, and to access to provide one of Nature's greatest gifts. (Section 3)

Heavenly Arts & Entertainment: to create opportunities to convey astronomy through music and theatre events, art and image shows, for children and adults alike. (Section 3)

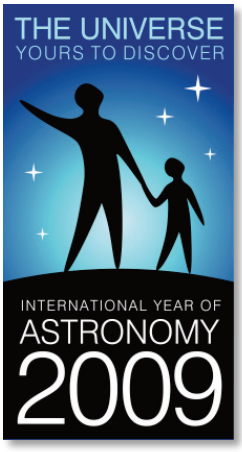
Planetariums and Science Centres: to promote development of major shows, including a co-ordinated national effort on *Galileo Live!* using live actors to convey the drama and impact of Galileo's discoveries. (Section 3)

Galileo Lecture Series: to bring to communities, both large and small, excellent Canadian researchers who could share the outstanding research being done at Canadian institutions and engage the audience with their presentation skills. (Section 2)

Canadian First Nations, Inuit and Métis Peoples: Historical Knowledge of the Heavens: to establish partnerships with Elders in Aboriginal communities across Canada, with the long-term goal of using astronomy to illustrate pathways for Aboriginal youth to careers in science and technology. The respectful pairing of traditional and current scientific knowledge about the skies is a powerful tool in this activity. (Sections 3 and 5)

Commemorative Stamps and Coins: to establish a partnership with Canada Post and the Royal Canadian Mint to develop a series of stamps and a coin commemorating Canadian astronomy. (Section 3)

Canadian Astronomical Images: to create a new selection of astronomical images by amateur and professional astronomers, photographers and artists from across Canada for use in creating IYA image exhibits, EPO activities, etc., as well as a legacy for use in future education and public outreach. (Section 5)



Astronomy Kits: to assemble kits of first-rate educational materials for distribution to teachers throughout Canada, to help them engage their students with the wonders of astronomy. (Section 4)

In this report, you will find examples of how these themes became events, as well as other types of activities that gained importance as the year progressed, including many created by single individuals who were inspired by IYA.

2 UNIQUELY CANADIAN IYA ACTIVITIES

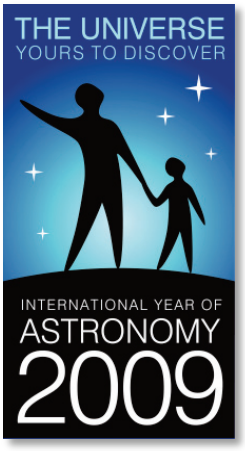
2.1 Galileo Moments

One of the most useful and innovative tools of IYA in Canada was the Galileo Moment (GM). It was simultaneously a way of defining the goals of IYA, a template for event organizers to understand the possibilities and parameters of IYA, and a tool for measurement and evaluation. As the GM counter on our web site steadily increased as IYA progressed, it inspired participation, too.

Essentially, a GM was "an engaging astronomy experience" during IYA2009, looking through a telescope for the first time, attending a concert or art exhibit that entertained and educated about astronomy, being in the audience at a lecture, school visit or planetarium show, and so on. GM events were designed to make a complex science real and accessible by reminding people of the child-like wonder that looking at the skies inspires. A total of 3,589 registered events were organized by well over 250 individuals, groups or coalitions of groups. Event organizers registered their event's GMs on the Canadian IYA website. The complete definition of a GM, with examples, can be found in Appendix 2.

The Executive Committee originally set a goal that 1,000,000 Canadians would experience a GM during 2009. That goal was formally surpassed on October 27, with two months to go! The GM counter registered 1,931,439 at the end of IYA. Due to the outstanding efforts of event organizers throughout Canada, most of them volunteers, our initial goal was nearly doubled! *And the GM count does not include the millions of Canadians who were exposed to astronomy through diverse media events.*

With the publication of this Report and its Appendices, the Canadian website, with its IYA vision, useful links and record of how IYA unfolded in this country, has been frozen and archived for future reference. We currently envision that *Beyond International Year of Astronomy* activities will rely upon existing partner websites for dissemination.



2.2 Website

The official bilingual website, www.astronomy2009.ca, was designed on the *Joomla!* content-management platform, and was maintained through the generosity of the Planétarium de Montréal and hosted by the Université de Montréal. Our policy was to publish all content in English and French simultaneously.

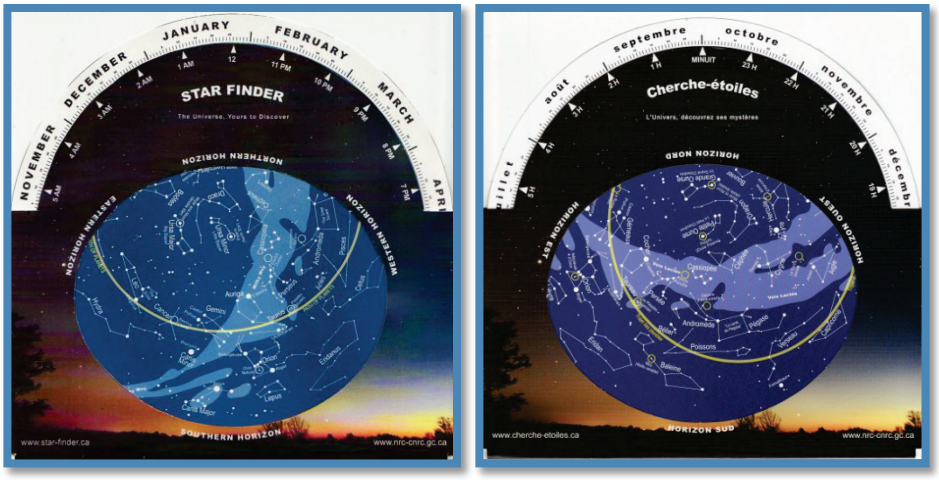
FIGURE 3: IYA WEB SITE

2.3 Bilingual EPO materials

The beautiful and extremely popular EPO materials – *Astronomy Trading Cards, Mary Lou's New Telescope,* and *Star Finders* – were a true success for IYA in Canada. The materials were developed through an RASC funding competition open to any of their Centres and members. The winning projects were further developed into a series of high-quality, bilingual resources. The translation was done by FAAQ volunteers. About $100,000 was invested from various funding sources to allow these materials to be distributed for free at IYA events.

EPO materials were available free of charge to IYA partners (RASC Centres, FAAQ Clubs, University/CASCA Liaisons, Science Centres) who registered activities on the Events Database.

The ***Star Finder*** (or planisphere) allows users to see the patterns of the stars visible at any date and time. It was developed by a team that added features and information to a version from the National Research Council's *Canadian Skies* poster (http://www.nrc-cnrc.gc.ca/images/education/cdnsky1_e.jpg



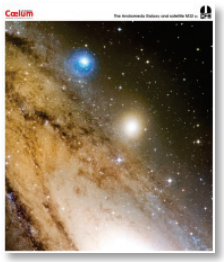


FIGURE 4: STAR FINDERS

Mary Lou's New Telescope: This full-colour children's book is aimed at making young people aware of the problems caused by light pollution. For more information see www.rasc.ca/mlnt.

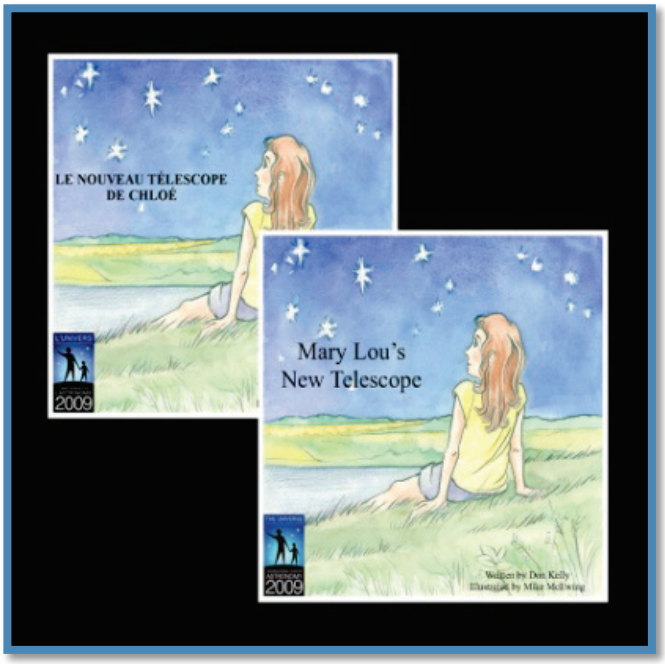


FIGURE 5: MARY LOU'S NEW TELESCOPE / LE NOVEAU TÉLESCOPE DE CHLOE

Astro Cards: Seven beautiful cards-modeled after hockey trading cards-show full-colour images (most taken by Canadians) of the Sun, the Moon, Jupiter, Saturn, a star cluster, an emission nebula and a galaxy, with educational text in both languages. The *Astro Cards* can be viewed at: http://www.rasc.ca/astro-card (to be confirmed). Anyone who received an *Astro Card* could visit our website and register their name to be sent into space on a Canadian Space Agency mission in 2010. (See Names in Space, below)

FIGURE 6: TRADING CARDS

Promotional Posters: These eye-catching full-colour 11"x17" posters were designed to facilitate promotion of local IYA events in either French or English. They had a blank space to customize with information about local events, and were available for download from the website. Limited numbers were printed and distributed to RASC centres and FAAQ clubs.

FIGURE 7: PROMOTIONAL POSTER

2.4 Sidewalk Astronomer Booklet

This black and white, English booklet designed for distribution at viewing events contains basic viewing and astronomy information with contact information for all RASC Centres. Geared to younger children as an entry to astronomy, the eight-page booklet listed simple observations and a viewing log that a novice could fill out and send to the RASC for verification. A certificate would then be sent to the participant. The booklet can be downloaded at www.rasc.ca/sidewalkastronomer.

2.5 Names in Space

Each of the seven *Astro Cards* came with a registration number, which event attendees could use to enter their name on a list to be sent into space on the Canadian Space Agency's Near Earth Object Surveillance Satellite (NEOSSAT) mission in 2010. 10,955 people registered their names.

2.6 National Lecture Series

The Galileo Lecture Series (GLS) was organized and funded by CASCA. It enabled communities large and small to bring top researchers (who are also excellent public speakers) from Canadian institutions to present their outstanding science in an engaging 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 widely advertised competitions for communities to apply to enjoy GLS lecturers were held by CASCA, resulting in twenty-two official GLS events. The venues ranged from established urban science centres to high-schools in the Arctic. Many GLS lecturers voluntarily gave additional talks in other venues and/or communities based upon their GLS presentations.

FIGURE 8: GALILEO LECTURE IN PANGNIRTUNG, NUNAVUT

FAAQ Lectures: 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://www.faaq.org/2009/conferences.htm).

FIGURE 9: A "CONFÉRENCE GALILÉE" PRESENTATION

2.7 Canadian Astronomy Image Collection

Canadian astronomers, both professional and amateur, produce a wealth of superb images that we wished to share with Canadians, who primarily see images from international sources. A national group of astronomers and visual artists set out to solicit and select the best Canadian images. These were made available for use without cost for educational purposes during IYA and access continues for Beyond IYA activities. The image gallery can be seen at http://www.galaxydynamics.org/iya2009 and throughout the report in the side margins.

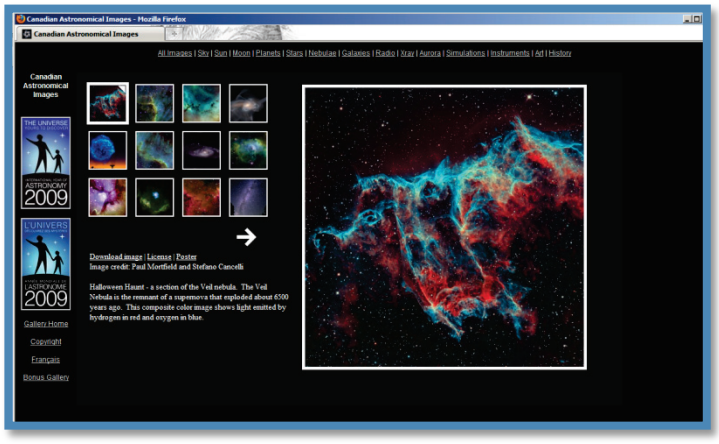
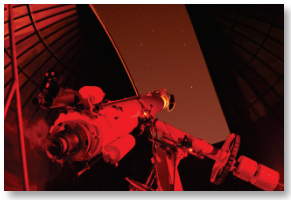


FIGURE 10: CANADIAN ASTRONOMY IMAGE COLLECTION WEB SITE

3 SUCCESSES



3.1 Partnership of three organizations

IYA in Canada was made possible by a strong collaboration between three respected societies: the RASC, the FAAQ and CASCA. Each organization has a proven track record of designing and implementing successful programs in every art of the country. Their national EPO partnership was so successful that their commitment to continued collaboration has become a legacy of IYA in Canada; this will ensure that the impact of IYA is felt for years to come.

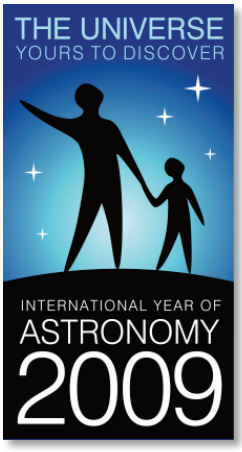
Founded in 1868, the ***Royal Astronomical Society of Canada*** (RASC) (www.rasc.ca) is made up of more than 4,000 enthusiastic, knowledgeable amateurs, educators and professionals. In addition to many national services, their 29 Centres offer local programs and services in every province of Canada.

The **Fédération des astronomes amateurs du Québec (FAAQ)** (www.faaq.org) has brought together amateur astronomers for 33 years. They have more than 1,800 members in 47 clubs and related institutions; every astronomy club in Québec is a member. More than 8% of members are primary and secondary school students.

The Canadian Astronomical Society / La Société Canadienne d'Astronomie (CASCA) (www.casca.ca) has brought together professional astronomers since 1971 and is devoted to the promotion and advancement of knowledge of the universe through research and education. Most of their members work in Canadian universities and colleges or at federal laboratories.

3.2 2008 IYA launch in Québec schools

An FAAQ-led effort produced a lively poster jam-packed with information about astronomical events and activities occurring in 2009. It was distributed to every school in the province in fall 2008, thus stimulating teachers and their students to prepare for a lot of fun during IYA. Moreover, the winter edition of the e-zine, *Plui de Science,* published by the Québec Société pour la promotion de la science et de la technologie, was dedicated to launching IYA in Canada (see http://www.spst.org/pluiedescience/0109/index.html).



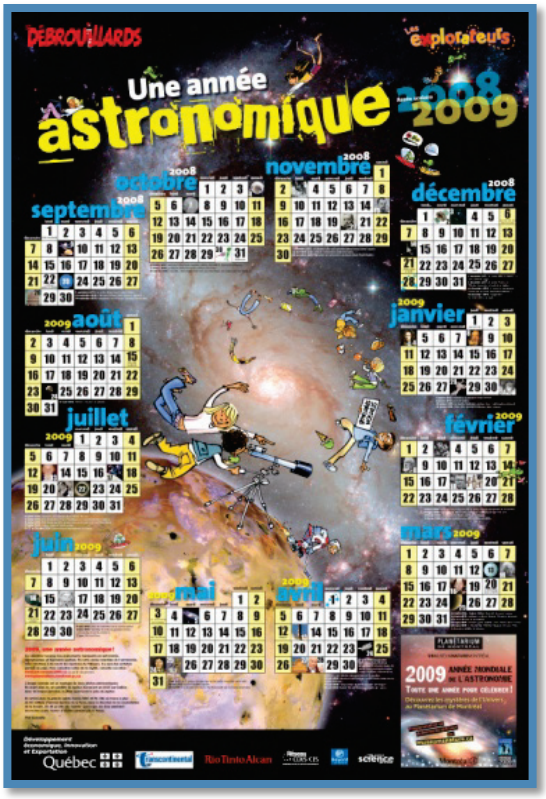


FIGURE 11: FAAQ POSTER

3.3 IYA media launch with Muin video

Canadian IYA opening celebrations occurred January 8 at the Canada Science and Technology Museum in Ottawa, which hosted a media event with the premiere presentation of a beautiful new IYA video. The Mi'kmaq legend of *Muin and the Seven Bird Hunters* was broadcast to school children over the Aboriginal Educational Television Network. This beautiful animation of the traditional story was brought to life through the loving efforts of Elders and a Cape Breton University artist who worked throughout 2008 to prepare its release on our website in the first days of 2009. (It may now be downloaded from our archive, iya.astrosci.ca, or from Cape Breton Universityhttp://msit.capebretonu.ca/). Their goal is to encourage other First Nations to share their traditional knowledge in similarly accessible ways. (See Section 5, as well.)

In the same timeframe there were opening activities throughout Canada. As an example, the long-established Toronto astronomy EPO network organized a January 10 IYA kick-off at the Ontario Science Centre. Two dozen organizations participated in a day full of blockbuster lectures and displays, bolstered by the Mayor's official IYA Kick-Off Day proclamation.

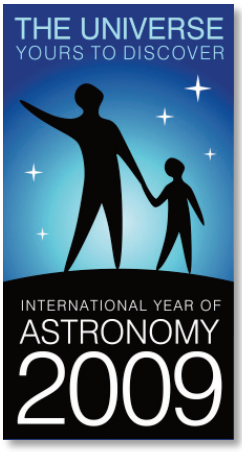


FIGURE 12: MUIN MEDIA LAUNCH

3.4 Sidewalk astronomy and other Galileo Moment opportunities

One of the most enduring methods of engaging the public is to go to where they are and offer them a chance to look through a telescope. Many Canadians had never had a chance to do this before, and the "ah ha!" moment of wonder and delight that ensued opened the door to astronomy for many. During IYA members of the RASC and FAAQ doubled their usual number of viewing events and school visits. Independent clubs also put on many similar events. They set up their telescopes outside lectures and cultural events to enhance the experience for attendees. "Star Busking" groups of "guerilla astronomers" spontaneously set up at busy downtown locations, shopping malls, etc., whenever conditions were good. Galileo Moments at viewing events were hard earned by tireless, enthusiastic volunteers to whom IYA's success owes so much.

In several cities, (e.g., Victoria, Calgary, Toronto, Kingston, Montréal, and Halifax), a coalition was created to pool resources and support each other when putting on IYA events. Coalitions included professional and amateur astronomers, academics, science centres and/or planetarium staff. In smaller centres throughout Canada, a single person sometimes took on IYA for their area, reaching out to schools and the broader community with great effect.

Observatories on university and college campuses frequently opened their doors for open houses across the country, allowing the public to look through bigger telescopes. Independent of the Galileo Lecture Series, Canadian professional astronomers gave many lectures throughout Canada, while encouraging their graduate students to engage the public, often in very ingenious ways.

FIGURE 13: SIDEWALK ASTRONOMY

3.5 Number and nature of IYA events

The greatest success story of IYA in Canada was the huge number of events that occurred across Canada's vast geography, the amazing variety of those events, and the impressive number of volunteers who made them happen. Event organizers were encouraged to register all of their events on our website's event database, although not all events were registered or reported. The database used seven categories of events: Astronomy Talk, Cultural Event, Education / Training, Exhibition, Observing, Planetarium Show and a general Other Activity. Events could be further classified by language, kid-friendly, private or public, free or ticketed, underserved audience and Aboriginal audience. The following chart shows what percent of each category occurred:

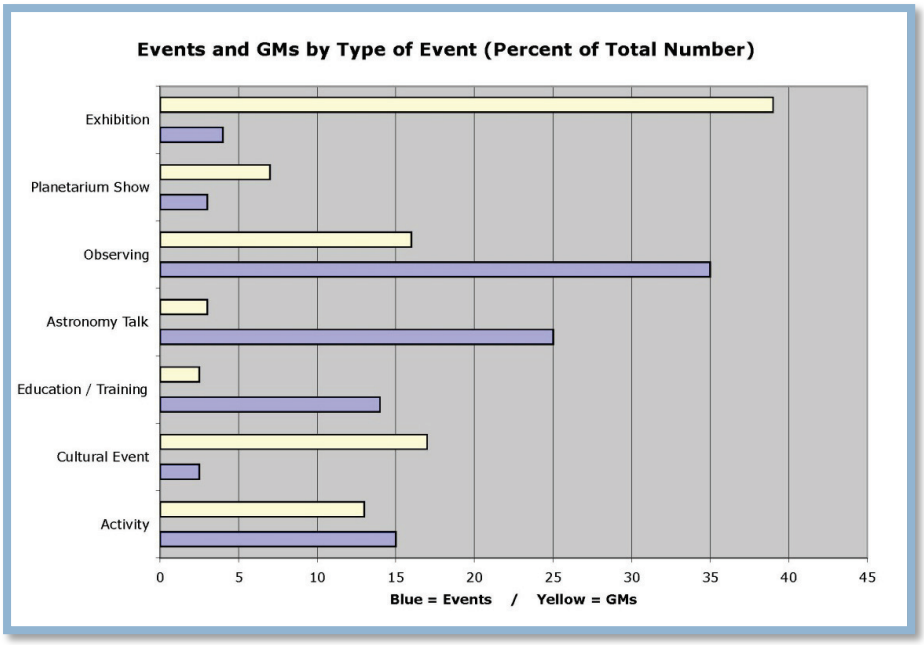
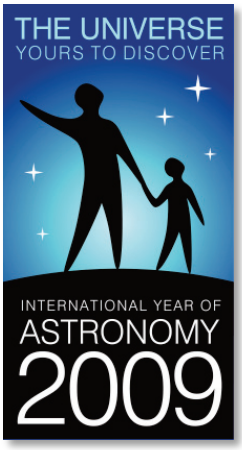


FIGURE 14: APPROXIMATELY ONE THIRD OF THE GMS CAME FROM A FEW LARGE VENUES LIKE SCIENCE CENTRES WITH ANNUAL ATTENDANCE OF OVER A MILLION, WHO PUT ON SHOWS LASTING SEVERAL MONTHS. THE BALANCE OF THE GMS WERE EARNED BY THE DOZENS OR HUNDREDS AT GRASSROOTS-LEVEL EVENTS



IYA had a special focus on children and youth, and on reaching out to non-traditional and underserved audiences. According to the database, 70 % of events were free and 69 % were kid-friendly. The *Cool Quotes* (Appendix 3) illustrate the variety, creativity and success of the events.

3.6 How were we doing? IYA mid-year survey report

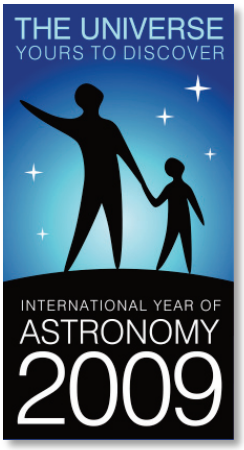
In August we sent a nine-question IYA Mid-Year Survey to 324 liaisons to gauge how those most intimately involved judged it was going and what mid-course corrections might be needed. The 39% response rate is indicative of a high level of interest and ownership, particularly since the survey fell during the late summer when many respondents were away from work and work e-mail. The responses showed that the people creating IYA events and programs were generally satisfied and did not offer suggestions for major changes during the remaining months. The survey report can be found in Appendix 4.

3.7 Postal stamps and commemorative coin

Drawing on the wealth of spectacular Canadian astronomical images, artists at Canada Post designed two lovely stamps depicting observatories (DAO and CFHT) important to the development of modern astronomy in Canada. Six million stamps and 300,000 souvenir sheets were printed. Supporting material relied on gorgeous images from the Canada-France-Hawaii Telescope. The stamps were officially unveiled during 100 Hours of Astronomy when school children sent mail to observatories around the world using the stamps.

The Royal Canadian Mint's stunning sterling silver $30 IYA commemorative coin was issued in July. The Mint held launching events for the 10,000 coins at TELUS World of Science (Edmonton) and Griffith Observatory (Los Angeles) in early August.

FIGURE 15: COMMEMORATIVE STAMPS AND COINS



3.8 Communicating astronomy through theatre

IYA in Canada was enriched and made more widely accessible by embracing new ways of presenting science to the general public.

Galileo Live!, the first live planetarium show to be co-produced by planetaria across Canada, was experienced by 32,814 people attending 579 presentations during its ten-month run. *Galileo Live!* successfully proved that a planetarium program can combine both science and the arts, and be funded and staged nationally.

A new, full-length play, **The Moons of Jupiter**, by a University of Victoria playwright, portrayed the family dynamics between Galileo and his children, particularly two daughters secluded in a Convent in Florence, and drew parallels between the family dynamics and Galileo's scientific work.

FIGURE 16: GALILEO LIVE! AND THE MOONS OF JUPITER PERFORMANCES

3.9 Parks

Canada is renowned for its wealth of wild open spaces, which are prime dark sky locations for viewing the heavens. Early in 2009 Edmonton initiated an annual Winter Light Festival with star parties at Elk Island National Park and Coronation Park. The Canada Council of Parks gave special attention to IYA, with the result that there were 246 events across Canada on Parks Day, July 18, and many more ran throughout the summer. The new educational activities were well received and will now be part of the regular repertoire. In addition, connections were made between individual parks and their local astronomy centre or club, providing the means for ongoing collaboration.

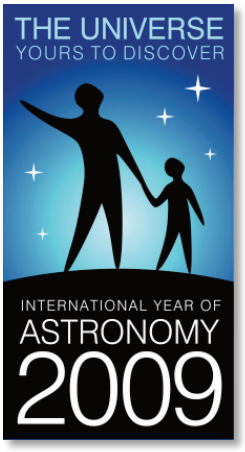
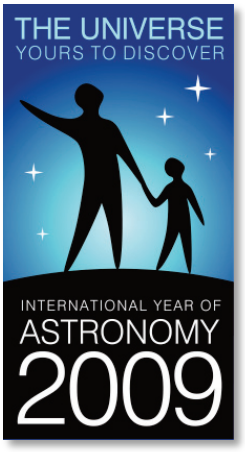


FIGURE 17: PARKS CANADA

3.10 National Science and Technology Week (15-25 October)

Under the theme, "Exploration and Discovery: Past, Present and Future," the 2009 National Science and Technology week stimulated IYA activities throughout Canada, as can be seen at http://science.gc.ca/default.asp?lang=En&xml=6CC62559-5FDA-4016-8BC3-BA59917A7B77. Science centres in particular organized many events during this period. Many cultural events bridging astronomy, art, music, and theatre occurred, bringing science to a much broader audience than in previous years.

FIGURE 18: NATIONAL SCIENCE AND TECHNOLOGY WEEK POSTER



3.11 Quantum to Cosmos Festival: Ideas for the Future

During National Science and Technology Week, the Perimeter Institute organized the largest and most comprehensive science outreach event ever held in Canada, in association with IYA. While attendance at on-site events was 39,137, they estimate that more than 1,000,000 around the world have participated through a combination of live, on-line streaming, TV programs, archived versions, and derivative material.

FIGURE 19: QUANTUM TO COSMOS FESTIVAL

3.12 Astronomy posters

The National Research Council updated their popular Canadian Skies poster, with its 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% increased in web hits, and distributed 1,100 RASC-FAAQ Star Finders.

The Canadian Space Agency produced a new, bilingual educational poster, Secrets of the Night Sky, to commemorate IYA. By emphasizing Canada's contributions to space astronomy missions, the poster nicely complements NRC's poster. Since distribution began in June, students, teachers and the public received 6,300 copies. Together these posters are reaching hundreds of thousands of young Canadians, providing another strong IYA legacy.

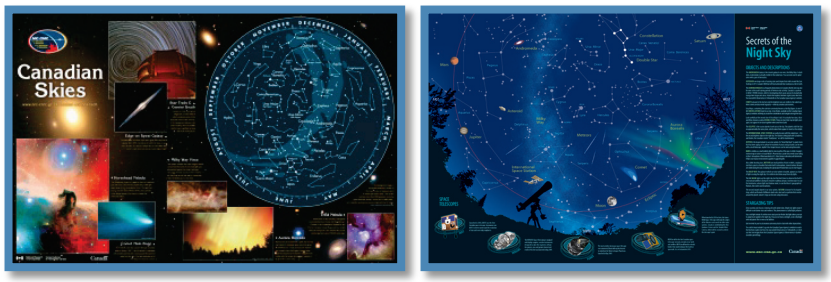
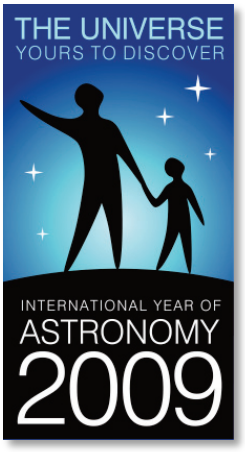


FIGURE 20: ASTRONOMY POSTERS (NRC AND CSA)



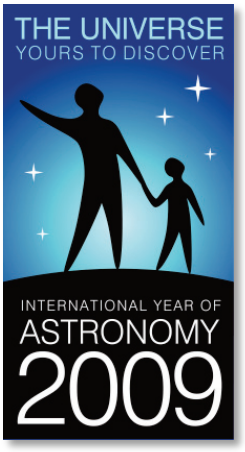
3.13 Cool Cosmos and Embedded Universe

This public transit campaign from the University of Toronto's Dunlap Institute created quite a buzz in Canada's two largest cities. Each "ad" in the series of five showed an intriguing image with a catchy tag line that piqued viewers' curiosity. CoolCosmos' unconventional approach was aimed at the vast majority of people for whom the science of astronomy doesn't enter daily life, reminding them about our cosmic connections. Three thousand ads were displayed, many for months, on Toronto's public transit vehicles, which provide over 35 million rides each month. It is estimated that at least several hundred thousand riders actively engaged with the ads; 50,000 bookmarks with the same designs were distributed; and the website had nearly 100,000 hits. A French version, with large display ads, was mounted at five busy metro stations in Montreal, in collaboration with Centre de Recherche en Astrophysique du Québec.

A professional-quality blog by a distinguished science journalist, "*Embedded Universe, Reports from a journalist working among astronomers,*" with associated podcasts, "*The Universe in Mind*," was also launched through the Dunlap Institute as part of their IYA contributions. These efforts continue as we transition to Beyond IYA and are available at http://www.di.utoronto.ca/journalist/.

FIGURE 21: COOL COSMOS

3.14 The Magic of Lanterns: Traditional Chinese Astronomy

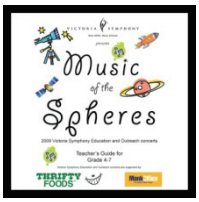


In collaboration with the Planetarium, Montréal's Botanical Gardens created a unique IYA event that drew large crowds from 11 Sept. through 1 Nov. Lanterns inspired by classic images from Chinese astronomy and instruments from the Beijing Ancient Observatory allowed visitors to explore the mythological and scientific dimensions of traditional Chinese astronomy and how it compares with Western science. Every Thursday evening FAAQ members provided telescopic viewing opportunities.

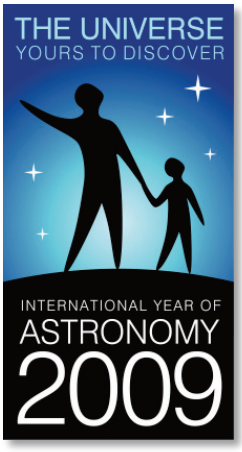
FIGURE 22: TRADITIONAL CHINESE ASTRONOMY

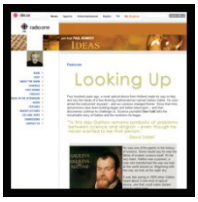
3.15 Heavenly arts and entertainment

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.



Many musical groups and orchestras in Canada presented programs during the year touching upon astronomy and its history. Canadian physicist Diane Nalini, a talented jazz vocalist, issued her fourth CD whose songs all invoke astronomical imagery. Holst's perennial favourite *The Planets* was heard on stages throughout Canada, creating opportunities for informal astronomy education. The University of Toronto's Opera School produced Haydn's *Il Mondo della Luna*. The Victoria Symphony's educational program, *Music of the Spheres* was presented both on Vancouver Island and in Toronto, and integrated astronomy with lively astronomy-themed music appealing to kids. Canada's world renowned Tafelmusik Baroque Orchestra created *The Galileo Project*, an imaginative program celebrating IYA through music, stunning images, choreography, and theatrical narration. An exemplary illustration of the deep historical, societal, scientific, and aesthetic dimensions of astronomy, *Galileo Project* performances are continuing well beyond 2009, in other countries and languages. 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 in a curriculum-appropriate and engaging manner for young people.





Many national or regional hosts prepared radio programs broadcast by Radio Canada and CBC linking IYA with broader cultural themes, in addition to excellent local and national spots focused on upcoming IYA events. At the beginning of the year, CBC's national science correspondent Bob McDonald highlighted IYA on *The National* and *The Sunday Edition's* Michael Enright interviewed physicist and chanteuse Diane Nalini about IYA. On 26 March the Esprit Orchestra broadcast a world premiere of Big *Bang*, a work commissioned by CBC from Andrew Staniland. Throughout the year RCI's *Annees Lumiere* featured Québec professional and amateur astronomers discussing IYA and astronomy activities in the province. During the afternoon commute hours, journalist Andrew Fazekas addressed astronomy topics in weekly local CBC broadcasts in English and French. In October award winning science journalist Dan Falk's two-hour examination of Galileo's impact, *Looking Up,* was featured on CBC. Archives ensure continued access to many of the national programs.

3.16 Astronomical exhibitions

Science centres mounted major exhibitions that generated opportunities for Canadians of all ages to engage their minds in fun way. For example, Québec City's Museum of Civilization hosted an extremely popular exhibition, *Extraterrestrials. What if?* that attracted >422,000 during its seven-month run.

FIGURE 23: ASTRONOMY EXHIBITIONS

An international IYA Cornerstone supported creation of large public image exhibitions, *From the Earth to the Universe* (FETTU), to capitalize on the power of astronomical images to make people curious about the universe. Many organizations mounted image displays using large format printed images, including science centres, art galleries, libraries and shopping malls. An exhibition, **"L'Astronomie et les Hommes,"** was made available by the FAAQ during IYA. The response was excellent and, as a result, the display travelled to 21 different cities during the year. It will continue to be available during 2010.

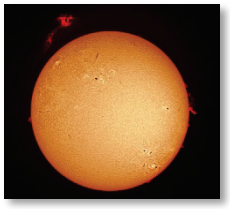


FIGURE 24: PUBLIC IMAGE EXHIBITIONS

In Victoria three FETTU exhibits used wide-screen LCD monitors provided by Sony Style, which allowed a larger number of the beautiful images to be exhibited at two major shopping centres and the Airport.

FIGURE 25: FETTU IN VICTORIA

3.17 Children's science book

Award winning Canadian children's science popularizer Jacob Berkowitz highlighted IYA during book tours for his 2009 book about the search for habitable planets around other stars.

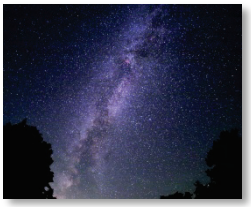


FIGURE 26: OUT OF THIS WORLD BY JACOB BERKOWITZ

3.18 Gemini Contest

To mark IYA2009, and to encourage young people to participate in science activities, the Canadian Gemini Office organized a contest for Canadian high school students. The prize? One hour of Gemini imaging time.

Four astronomers reviewed proposals from almost 50 students from Nova Scotia, Quebec, Ontario, Manitoba and Alberta to select the winner: Émilie Storer, from Collège Charlemagne, Pierrefonds, Québec. Her selected target was the Owl Nebula.

Well known to amateur astronomers but, surprisingly, not often imaged by large telescopes, this nebula neatly fills the whole field-of-view of the Gemini Multiple Object Spectrograph. The image was captured at Gemini North in 2009, and the final image was presented to the winner during a ceremony held on March 25th, 2010 in Montréal. A link to Gemini's story about the contest: http://www.gemini.edu/node/11431.

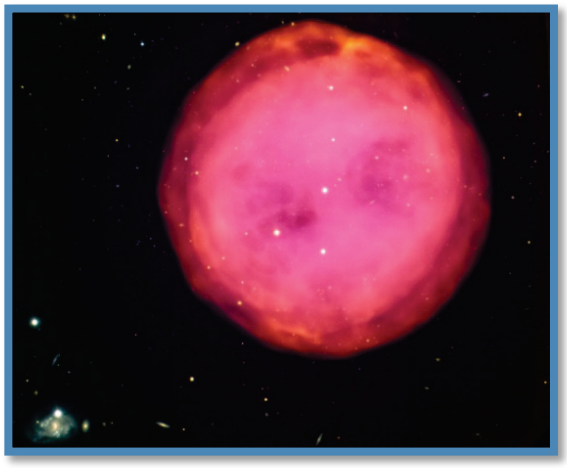
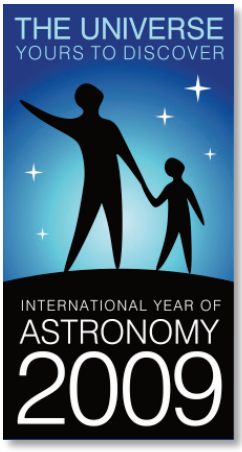
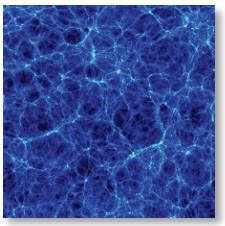


FIGURE 27: GEMINI CONTEST IMAGE OF M97





4 LESSONS LEARNED - CHALLENGES

4.1 Accessing electronic audiences

Our volunteers designed, implemented and maintained an attractive, bi-lingual web site that provided the envisioned functionality (Section 2) and received 48,000 visits (33,000 unique visitors) from nearly every country on earth. Experience showed that the public didn't use the national website's database to find IYA events or news as much as we had anticipated. Local clubs, media, and websites proved to be effective at providing information about IYA activities in their areas, and we shared national news and perspectives of upcoming IYA programs via the liaisons network (Section 2). However, creation of the national events database was remarkably worthwhile. The Galileo Moment counter measuring the cumulative event attendance proved a simple yet exceptional way to communicate IYA's cumulative success as the year progressed.

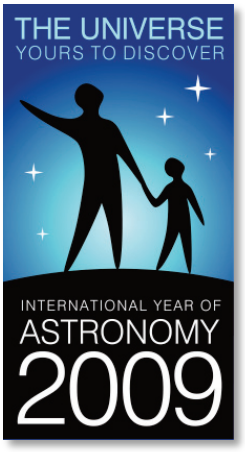
During planning stages the EC and AB recognized the importance of new media for communication, e.g., blogs, social networking sites, twitter, etc. An IYA FaceBook group was started, but languished from lack of attention (it needed an enthusiastic champion). Initial graduate student enthusiasm for IYA blogs unfortunately fared a similar fate. See Appendix 5 for a more detailed analysis of lessons learned about communications.

Along with our national IYA website, we also established list servers for relevant groups which represent a legacy for *Beyond IYA* communications. We used these to distribute a weekly update to our various liaisons describing upcoming Canadian activities, as well as international IYA activity news provided by the IAU IYA Secretariat.

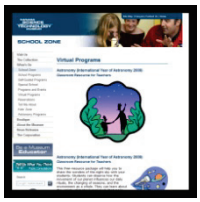
4.2 Communications

Given the requirement that we gave ourselves to communicate nationally in both official languages, it would have been more effective and efficient to have a fully bilingual program manager and SPoC. Within our constraints, achieving these goals proved to be unrealistic, and we are grateful for the volunteers who ably assisted with translations. Nonetheless, planning future activities of this scale where communicating in both official languages is essential, we would stress the importance of a bilingual program manager.

4.3 School Astronomy Kit



Our 2007 vision of the Astronomy Kit was for a single, engaging, dynamic resource, conforming to curricula throughout Canada that would help teachers with a subject that often daunts them. A team of volunteers spent many hours developing concepts and consulting with teachers, who indicated a preference for a physical kit accompanied by web resources. We came to realize that a physical kit was beyond our volunteers' capacity. In hindsight two requirements appear to have been necessary to pull this ambitious goal off: a) a champion with broad experience in developing such material and time to focus on it, and b) a realistic business model and budget, such as might have come from partnering with a company early in the development process.



A wonderful addition to materials available for teachers and students was provided by the Canada Science and Technology Museum. They developed and released an outstanding bi-lingual Astronomy Exploration Guide for teachers that may be downloaded from: http://www.sciencetech.technomuses.ca/english/schoolzone/virtual_astronomy.cfm.

4.4 Galileoscope

We had hoped to facilitate at the national level in Canada the purchase and distribution of the international Galileoscope (https://www.galileoscope.org/gs/) cornerstone project for, e.g., use in the Astronomy Kit or large-scale spring-summer outreach. Aspects of the adopted business model, delivery delays (it was mid year before the first orders started to arrive) and customer service meant that few organizations felt able to place orders. Nonetheless, the Galileoscopes that made it to Canada during IYA were well received and their quality and strong EPO potential likely will result in many more being ordered for Beyond IYA activities.

4.5 Co-ordination vs. Control

We determined early in the process that in a country as large as Canada with two languages and 6 time zones that a national committee cannot control what will take place. The best we could hope for would be to build a coalition to deliver IYA at the local level (but let them do it their own way without interference). We could also motivate participation, attempt to coordinate activities, provide good communication links and updates, and to do things that work well on a large scale (e.g., develop and distribute materials). This model proved to be extremely successful.

4.6 National Media Impact

While very appreciative of occasional one-off national media events, we were not successful in gaining any significant sustained attention from the national media. Several press releases were sent out to mark national scale events, but these were largely ignored by the media. Thankfully, by most accounts the media provided excellent coverage at the local level. See Appendics 6A and 6B for a partial—but very long—list of media coverage, with links.

5 LEGACY PROJECTS

All event planners were encouraged to consider how to leave impacts lasting well beyond 2009, which our volunteers and collaborators really took to heart! Already we have evidence of increased efforts to engage the public, especially through public viewing opportunities. Successes involving some of the larger legacy components connected with education–formal as well as informal–are described in slightly greater depth to reflect their central roles in Beyond IYA in Canada.

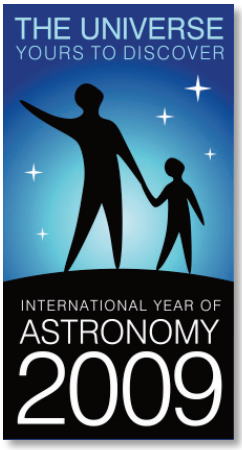
5.1 Dark sky preserves

RASC volunteers with the support and cooperation of Parks Canada were hard at work well before IYA preparing guidelines for creation of Dark Sky Preserves (in areas remote from urban centres, including national or provincial parks) and Urban Sky Parks (with diminished, astronomy-favourable lighting for enhanced enjoyment). The goal of Dark Sky Preserves is to promote the reduction in light pollution, demonstrate night-time lighting practices, improve the nocturnal environment of wildlife, protect and expand dark observing sites for astronomy, and provide accessible locations for the general public to experience the naturally dark night sky.

Those multi-year preparations resulted in four new Dark Sky Preserves being added in 2009 to the seven previously recognized ones:

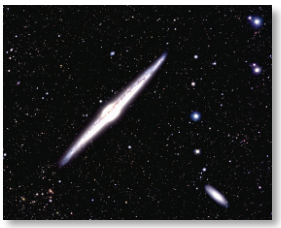
- Kouchibouguac National Park Dark Sky Preserve, NB
- Bruce Peninsula National Park and Five Fathoms National Marine Park Dark Sky Preserve, ON
- Mt. Carleton Provincial Park Dark Sky Preserve, NB
- Grasslands National Park Dark Sky Preserve, SK.

FIGURE 28: DARK SKY PRESERVES



FAAQ members also worked hard in the year leading up to IYA to prepare for dark skies promotion and education. During IYA the FAAQ pioneered free workshops, one each in Montréal and Québec City, to present outdoor lighting regulations that Québec municipalities could implement and the rationale for doing so. Letters of invitation were sent through professional associations (landscape architects, town planners,

engineers, etc.). Attendance was significantly greater than expected. Employees of different municipalities are already requesting at least two more workshops in 2010.



In addition to *Mary Lou's New Telescope*, a set of nine informative, light pollution information cards were created by Victoria's RASC Centre for education at public events and made widely available (see http://victoria.rasc.ca/LPA/Default.htm).

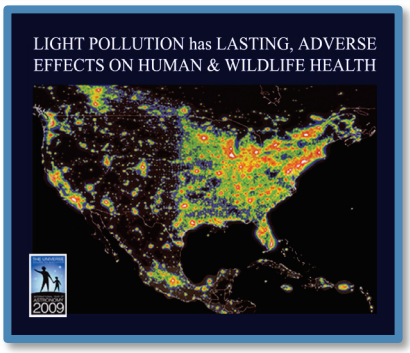
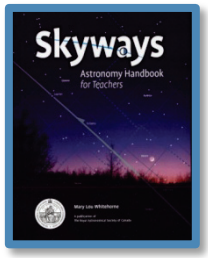


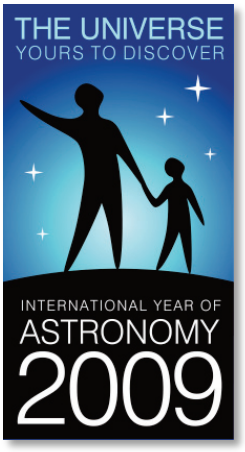
FIGURE 29: DARK SKY EDUCATION

5.2 Support for formal education

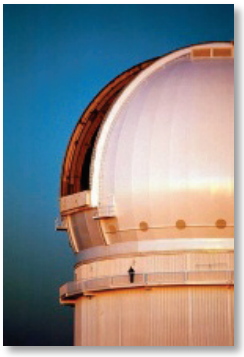
Astronomy is part of the curriculum in elementary and secondary schools in most parts of Canada, and millions of schoolchildren are exposed to astronomy in this way. But few teachers have any background in astronomy or in teaching it. A focus of Canadian IYA was to support teachers in 2009 and well beyond. CASCA maintained its education website www.cascaeducation.ca and held a teachers workshop at its annual conference. IYA volunteers delivered hundreds of in-school and after-school programs, and the RASC



updated and reprinted its "SkyWays" (www.rasc.ca/skyways/) guide for teachers (a copy was given to every school in Alberta). CSA held 31 astronomy-themed workshops (on-site, of-site, and tele-learning) for students and teachers that reached 5,778 participants, while NRC expanded its national Marsville tele-learning program. Both augmented their extensive on-line resources and contributions to National S&T Week success. Science centres and planetariums—a major source of support for teachers and students across the country—redoubled their efforts. And teachers attended and benefitted from many of the IYA events across Canada, thus multiplying the impact of



IYA on formal education.



In support of the IYA global cornerstone project "Galileo Teacher Training Program", teachers' summer institutes were held at Saint Mary's University in Halifax and at the University of Toronto. In Ontario, the secondary school science curriculum was revised for 2009, with an experienced astronomer educator playing a major role. At the 2009 Science Teachers Association of Ontario and of the *Association pour l'enseignement de la science et de la technologie au Québec* IYA was featured, resulting in an unusually large number of sessions on astronomy and space. As well, IYA collaborators distributed educational materials. These teacher training efforts will continue and intensify during the Beyond IYA years.

FIGURE 30: TEACHER TRAINING MATERIALS

5.3 Underserved youth project

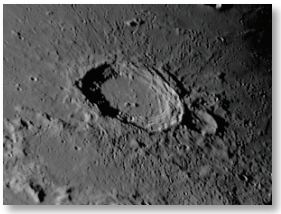
It's relatively easy to do EPO in schools, science centres, libraries and other places where one finds youth who are already in the educational system. But there are many youth who do not have access to resources, and who are not reached by regular educational channels – for example, inner-city or remote rural youth, those in hospitals and institutions, those who are new to Canada and don't speak either official language, Aboriginal youth, and so on. The 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 awarded in 2009 is enabling us to focus on Beyond IYA legacies for underserved youth in part by allowing us to hire a part-time, bi-lingual coordinator experienced in both informal and formal astronomy education.

5.4 Canadian Aboriginal legacy projects

As noted in Section 3, the Ottawa IYA opening celebrations featured the premiere presentation of the Mi'kmaq legend of *Muin and the Seven Bird Hunters* broadcast to school children over the Aboriginal Educational Television Network (available for download from our archive). This presentation symbolizes the richness and insight that comes from "two-eyed seeing," the simultaneous awareness of both western science and traditional knowledge.

Our early desire to feature Canadian Aboriginal, Métis and Inuit understanding of



astronomy alongside modern science received inspiration and guidance from innovative work in biology and ecology in the Integrative Science program of Cape Breton University (CBU) and their associated Mi'kmaq College Institute. The vision commences ith bringing Elders and youth together to share night sky stories, as demonstrated by Mi'kmaq Elders and CBU through their *Muin* video. It has been shown in many First Nations venues throughout Canada since the IYA launch both to share the Mi'kmaq approach and to encourage others from coast to coast to coast to follow suit. We further hope to encourage and support Aboriginal communities to act to preserve areas 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. This theme reinforces that Aboriginal peoples view the sky in a relationship of reciprocity with the earth. Finally, following research into effective ways of helping Aboriginal youth succeed in the education system, we seek to create visual educational pathways for Aboriginal children and youth who wish to pursue dreams to become scientists. They will show how and why one must proceed from one educational context to another as one pursues a science education, understanding that these paths should respect and include both mainstream and Indigenous knowledges.

FIGURE 31: ABORIGINAL PROJECTS

Recognizing that developing projects based upon the IYA vision with Canada's Aboriginal peoples will require a careful, natural pace, we committed to it being a process meaningful to the Aboriginal communities, as their direction, ownership, and participation is paramount in sharing their knowledges of the night skies. We are pursuing these efforts with the support of our NSERC grant and the many collaborators who engaged during IYA.

A number of other outcomes bode well for our quest for a long-term educational partnership through astronomy with Canada's Aboriginal peoples:

- Aboriginal educators at the Manitoba First Nations Education Resource Centre created a First Nations IYA calendar based (predominantly) upon Cree knowledge that they shared with some 57 First Nations schools and their 10,000 students. See: http://www.mfnerc.org/index.php?option=com_content&task=view&id=224&Itemid
- Under the auspices of the National Association of Friendship Centres, a Nova Scotia television producer teamed video camera technology and Aboriginal Youth so they could gather night sky stories from Elders across Canada appeared on a new website in March 2010(www.storiesofthenightsky.ca/).
- The Calgary IYA partnership formed a collaboration with the new *Blackfoot Crossing Historical Park* for night sky viewing and Siksika Nation story telling. Authentic native sky lore is now incorporated into TELUS World of Science programs and two "Siksika Skies" nights are planned in 2010 at the Park with additional activities at the Rothney Astrophysical Observatory.
- *Astronomy North* and the CSA initiated *The Legendary Sky Project* honouring the skies over the Northwest Territories, and announced AuroraMAX, a new virtual observatory that will broadcast the Northern Lights live and in colour, on the CSA's website, along with a range of outreach tools to help teach the science of the aurora.

The momentum already achieved in the IYA Legacy efforts bodes well for even higher levels of engagement during Beyond IYA.

6 FUNDING AND FUNDERS

Large undertakings such as IYA depend on the generosity of many, from local volunteers to national sponsors. We were incredibly fortunate for strong, highly leveraged support in cash and in kind. While it is impossible to acknowledge all who deserve to be thanked, we try to convey a sense of the support received.

In total, by January 2010 we raised slightly more than $500,000. A thorough estimate of in-kind contributions (mostly in the form of volunteer hours) indicated that they were valued at just over $4,000,000.

The following stalwart supporters were featured on every page of our website, to acknowledge their important contributions to Canadian IYA success:

- The Trottier Family Foundation provided funding for a part-time Project Manager for twenty-one months.
- The University of Calgary funded printing of the beautiful *Astro Cards*.
- Lumec, Inc. funded most of the beautiful printing of the popular children's book, *Mary Lou's New Telescope*.
- SkyNews, Canada's magazine of astronomy and stargazing, promoted IYA in each issue and on their website, with special articles, links and a photo gallery.
- The Canadian Space Agency (CSA) arranged for Astronauts Julie Payette and Robert Thirsk to carry astronomy items to space during their missions, and will send names into space on their 2010 NEOSSAT mission. From the International Space Station, Dr. Thirsk recorded a video featured on our web site encouraging Canadians to enjoy the skies during IYA.
- The National Research Council (NRC) became an IYA Organizational Associate in support of the international IYA Secretariat, updated their *Canadian Skies* poster, provided their *Marsville* program to school children throughout Canada, and provided Canada's Single Point of Contact.
- The Natural Sciences and Engineering Research Council of Canada (NSERC) granted funds to hire a part-time EPO coordinator to nurture legacy projects until 2012, and contributed to the development of *Galileo Live!*

Our partner organizations also made crucial financial and in-kind donations:

- CASCA, an IYA Organizational Associate, supported two new lecture series and (with ACURA, an association of universities) enabled the participation of two Canadian undergraduates in the international IYA launch at UNESCO headquarters in Paris. The students subsequently contributed to local IYA activities and one is preparing new astronomy activities for Girl Guides.
- FAAQ's success at fundraising enabled them to prepare and distribute diverse, excellent IYA printed materials (starting with the Fall 2008 poster), to conduct a

French language lecture series by top Québec researchers, and to mount a beautiful traveling exposition about the history of astronomy titled "l'Astronomie et les Hommes".

- The RASC leveraged funds from the late Walter Feibelman with a successful member fund raising campaign to produce the *Astro Cards, Mary Lou's New Telescope, Star Finders*, etc. The RASC was responsible for distribution logistics of most of the materials, employed and supported the Project Manager, created and hosted all the list servers, and played many other national coordination roles.

Due to the enthusiastic grassroots-level activities that went on throughout Canada, there are so many other supporters of IYA that deserve recognition! These local activities were indicative of the unprecedented level of in-kind support that enriched IYA. This included volunteer hours, committee hours, travel to more remote areas to bring astronomy to everyone, design and production of EPO materials, and translation in both official languages of EPO materials and every item on the website.

A few examples illustrate the diversity of organizations who made in-kind and/or financial contributions in support of regional activities without which IYA would have been so much less: Early Music Society of the Islands, University of Victoria Theatre Department, Victoria Symphony, University of Calgary Rothney Observatory, Lumec's support for printing Mary Lou's New Telescope, many local chapters of the RASC, University of Toronto Dunlap Institute, Toronto Symphony, Tafelmusik, Kingston Symphony, Montreal Symphony, Rio Tinto Alcan financial support to the Planétarium de Montréal for the Parks activities, the Montréal Botanical Garden, Musée de la Civilisation of Quebec City, Cape Breton University Integrative Science Program, Saint Mary's University…

To each and everyone one of you who helped make IYA the resounding success it was in Canada,

THANK YOU!

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Available at: www.astronomy2009.ca