

International Year of Astronomy 2009 Cornerstone Projects: What's Available for You

Stephen M. Pompea,¹ Andrea Schweitzer,² Susana Deustua,³ Douglas Isbell,⁴
Richard Tresch Fienberg,⁵ Douglas N. Arion,⁷ Constance E. Walker,⁸
Pamela L. Gay,⁹ Denise A. Smith,¹⁰ Carmen A. Pantoja,¹¹ Megan Watzke,¹²
and Kimberly Kowal Arcand¹²

¹*National Optical Astronomy Observatory, 950 N. Cherry Avenue, Tucson AZ
85719, USA*

²*IYA 2009 Project Office and Little Thompson Observatory, Berthoud CO
80513, USA*

³*Space Telescope Science Institute, 3700 San Martin Drive, Baltimore, MD
21209, USA*

⁴*Lawrence Berkeley National Lab, 1 Cyclotron Road Berkeley, CA 94720, USA*

⁶*American Astronomical Society, 2000 Florida Ave. N.W., Suite 4000,
Washington, D.C. 20009, USA*

⁷*Department of Physics, Carthage College, 2001 Alford Park Drive, Kenosha,
WI 53140, USA*

⁸*National Optical Astronomy Observatory, 950 North Cherry Avenue, Tucson,
AZ 85719, USA*

⁹*Southern Illinois University Edwardsville / Astronomy Cast, Department of
Physics, Box 1654, Edwardsville, IL 62026-1654, USA*

¹⁰*Space Telescope Science Institute, 3700 San Martin Drive, Baltimore, MD
21209, USA*

¹¹*University of Puerto Rico, Department of Physics, P.O. Box 23343, San
Juan, PR 00931-3343, USA*

¹²*Chandra X-ray Center/Harvard-Smithsonian Center for Astrophysics, 60
Garden Street, MS 70, Cambridge, MA 02138, USA*

Abstract. The International Year of Astronomy (IYA) commemorates the 400th anniversary of Galileo's historic observations of the night sky. IYA is officially recognized by the United Nations Educational, Scientific and Cultural Organization (UNESCO) and is being celebrated in 141 countries. The IYA2009 program established 12 Cornerstone Projects. The U.S. has played an important role in many of these programs. These national and global projects focus on a variety of topics vital to the success of IYA. This paper summarizes some progress from national and international organizers of the cornerstone projects.

1. Goals of the International Year of Astronomy

The International year of Astronomy 2009 established overarching goals when it created the slogan “The Universe: Yours to Discover” and professed an ambitious goal: “To offer an engaging astronomy experience to every person in the country, nurture existing partnerships and build new connections to sustain public interest.”

IYA 2009 was conceived to honor the 400th anniversary of the first use of an astronomical telescope by Galileo Galilei in 1609, and has evolved into an engaging series of worldwide programs. Sponsored by the International Astronomical Union (IAU) and endorsed by the U.S. House of Representatives, UNESCO and the United Nations, IYA 2009 aims to stimulate worldwide interest in astronomy and science, especially among young people and underserved populations. More than 110 countries and agencies are participating in this global event. IYA is more than just celebrating astronomy’s achievements during a single year; it is also about building sustainable programs that will continue on into the future (Pompea and Isbell 2009).

To achieve the goals summarized above, the project relied on the establishment of key cornerstone projects. Some of the projects are for the United States only. However, most of the projects (e.g., Galileoscope, Dark Skies Education, From Earth to the Universe, New Media) have strong U.S. leadership and international impact and audiences. The goals for IYA2009 were to establish a grassroots set of project-based efforts to improve astronomy education or astronomy communication. Due to lack of philanthropic support due to the financial recession, IYA2009 relied on volunteer and mostly unpaid leadership. It is not unusual for a dedicated volunteer to be a project leader, a project worker, and a project evaluator. In many cases, this volunteer also was writing proposals to try to obtain a minimal amount of funding for the project. In the most successful projects, there was often some congruence between IYA2009 and the volunteer’s day job and the person’s long-term professional goals.

Funding for IYA2009 was obtained through a proposal to the National Science Foundation from the American Astronomical Society, in order to organize a project office. The project office is directed by S. Pompea in Tucson and managed by A. Schweitzer in northern Colorado, under the leadership of project Principal Investigator K. Marvel in Washington DC. The NSF project Co-PI’s are Susana Deustua (STScI), Jim Manning (ASP), D. Isbell (Lawrence Berkeley National Lab) and S. Pompea (NOAO). Isbell also serves as the U.S. Single Point of Contact for the project and coordinates the U.S. project with the international project office at the European Southern Observatory.

This session was designed to provide practical advice on how the IYA2009 programs can be used immediately and in the long-term after 2009. Some, but not all of the cornerstone projects gave presentations describing what the project can provide to a variety of audiences. These audiences include:

- Astronomy education practitioners
- Astronomy communicators
- Astronomers who participate in teaching and outreach
- Museum and planetarium professionals
- Curriculum developers

- Interested members of the public
- School children of various ages
- Teachers of all grade levels
- Artists with an interest in astronomy
- Parents encouraging their children to have an interest in science
- Librarians and library patrons

This is not an exhaustive list. It is interesting that there is such a wide variety of projects and audiences for these projects.

2. Projects and Contributions

Each of the IYA2009 projects is described in detail elsewhere in this volume, so we will not repeat the goals, approaches, and achievements here. It is, however, worth noting a few key achievements of these projects, which were described by the presenters.

2.1. IYA Project Office Resources

The IYA Project Office has identified the needs of various audiences and has created strategic resources that can help these audiences connect with IYA2009 and additional resources created in specific projects. These “Get Involved” resource sheets have proved to be enormously valuable to the diverse audiences served by IYA2009. The areas of interest for these “Get Involved” sheets include:

- How Teachers Can Get Involved in IYA
- How Small Science Centers Can Get Involved in IYA
- How the Public Can Get Involved in IYA
- How Professors and Scientists Can Get Involved in IYA
- IYA2009 Astrophotography Opportunities
- How Planetaria, Science/Visitors Centers & Observatories Can Get Involved in IYA
- How Homeschool Families Can Get Involved in IYA
- How Graduate Students Can Get Involved in IYA
- How Families Can Get Involved in IYA
- How Amateur Astronomers Can Get Involved in IYA

2.2. New Media Projects

“New Media” projects support an important goal of IYA 2009: reaching out to the growing number of virtual communities and exposing them to the wonders of astronomy. The New Media group (which encompasses the 365 Days of Astronomy podcasts, the virtual Citizen Science program and the Second Life Island) has been of critical importance to IYA 2009 because it presents the opportunity to effectively reach millions of people worldwide through this relatively new form of outreach (Gay et al., 2006, 2007, 2009).

One of the projects which has contributed to reaching these new audiences is *Astronomy Cast*, an Internet radio show that first started in August of 2006. Since its 10th day it has been in the top 25 of the Science & Medicine section of the iTunes Music Library. Each month over 300,000 shows are downloaded by listeners throughout the world. Similarly *Star Stryder*, a blog focused on astronomy, plays an important role in addressing academia, the scientific method, the boundary between science and religion, and the life of an astronomer. The *Portal to the Universe* and *365 Days of Astronomy* podcast are also important vehicles. These award-winning programs (including the Parsec Award) have greatly expanded the reach of IYA2009. Other important internet-based projects include the highly successful Galaxy Zoo project, an online citizen science project involving more than 200,000 volunteers. These volunteers now have made more than 100 million morphological classifications of galaxies drawn from the Sloan Digital Sky Survey (SDSS). The project has shown that volunteer classifiers (collectively) are as good as or better than professionals at classifying galaxies, given an intelligent application of their aggregate work.

2.3. Programs in Puerto Rico

The Puerto Rican activities have involved a strong coordination effort across the island. These include the 100 Hours of Astronomy (April 2–5) as well as a large variety of family events. The effort also has heavily involved the amateur societies as well as academics. A working group is meeting monthly and is planning further activities in 2010. One area of emphasis has been materials and activities for the visually impaired and blind. Some of the key achievements include the creation of a space on the web to share materials with teachers and students (Club Galileo), teacher workshops with Galileoscopes, and the publishing of a book with the presentations of the Apollo 11 discussion panel (“Llegamos en Paz para toda la Humanidad”).

Another IYA2009 event combined music and astronomical imagery. The Puerto Rico Symphony Orchestra under the direction of Roselín Pabón performed in concert “The Planets” with each movement accompanied by a presentation of images of the planets which the public could view on screens set above the musicians. The images were from the “From Earth to the Universe” (FETTU) cornerstone project and from various NASA missions. The superb performance of the orchestra with the lighting effects and the selected images were designed to convey the emotions of each movement and transport the audience into the cosmos. The concert took place at the Rafael Mangual Coliseum at the Mayagüez campus of the University of Puerto Rico on Saturday October 10th, 2009. About 400 members of the public enjoyed the collection of images “Life of Stars” from the FETTU project, displayed at the entrance of the coliseum. In this family event, children and adults of all ages enjoyed the program. Members of the “Sociedad de Astrónoma del Caribe” (amateur astronomy association) and members of the “Starry Messengers” (college level student volunteers for IYA2009-Puerto Rico)

greeted the public as they arrived and distributed commemorative lithographs of the planets, prepared with images from the FETTU collection and with information about the planets. Among the invited guests was Dr. Orlando Figueroa, past Director of the Mars Exploration Mission (NASA), and who is currently the Director of Applied Engineering and Technology at NASA Goddard Space Flight Center. This very successful event was organized by the IYA2009-Puerto Rico node, the Puerto Rico Space Grant consortium and the University of Puerto Rico, Mayagez campus

In the long-term, the establishment of links with Hispanics in continental U.S. is critical as Hispanics lag every other major population group in attaining college degrees. The organizational effort for IYA2009 for the Puerto Rican node goes beyond Puerto Rico, and also includes Jamaica, the Dominican Republic, and even the Academic Arab College in Haifa, Israel.

2.4. NASA Programs

The NASA program provides opportunities for youth and adults to make their own observations of the universe. It also provides professional development experiences for educators and an array of community-based activities. Of particular note have been the *IYA Discovery Guides*, which are enormously useful to the various IYA2009 audiences. The *Discovery Guides* contribute in significant ways as they:

- Build on the contributions and excitement of the Night Sky Network, NASA missions, and ASP partners
- Provide an activity for each NASA topic of the month
- Provide a finding chart for each NASA object of the month
- Provide articles and links

NASA has also provided observing experiences for the public using the MicroObservatory network. The MicroObservatory network has 5 telescopes that are automated and weather-proof. They are controlled via the Internet, using an intuitive web interface. Over one-half million images have been taken since 1998, by users in all 50 states. The telescopes are 6-inch Maksutov-design reflectors which have the capability to take images through B, V, R, I, and neutral density filters. The CCD detector has 650 x 500 pixels at a scale of 5 arc-seconds per pixel. The field of view is 1 degree by 0.75 degree.

During IYA 2009 there have been many opportunities for professional development sponsored by NASA. Professional development is provided through pre-launch workshops for middle and high-school teachers, in collaboration with the Kepler mission and through the *NASA Faculty Institutes in Earth and Space Science Education*. The Afterschool Universe program also provides trainings for informal educators.

One of the most exciting NASA projects is *Visions of the Universe: Four Centuries of Discovery*, which is traveling to 55 libraries nationwide during 2009–10. NASA has also provided downloadable materials for educators in conjunction with this project. *Visions of the Universe* represents an exciting collaboration with the American Library Association and has many possibilities for expansion to other libraries and their audiences.

Finally, NASA has created an exciting set of events connected with the unveiling of images from the Great Observatories. These are spectacular multi-wavelength views

from the Hubble Space Telescope, Spitzer Space Telescope, and Chandra X-ray Observatory. The large-scale prints of the center of our Milky Way Galaxy were unveiled nationwide in November 2009. Similarly an image was unveiled at the start of IYA2009 at the Long Beach AAS meeting.

2.5. Dark Skies Education Programs

The Dark Skies Cornerstone project has as its goal to raise awareness of the value of dark skies and the importance of its preservation (Walker et al., 2008a and 2008b). This is done in a variety of ways that are highly accessible:

- New Technology (website, podcasts, social networking, Second Life)
- Educational Materials (Great Switch Out, a traveling exhibit, brochures, posters, CDs, DVDs, educational kit)
- The Arts (e.g., a photo contest)
- Events (Earth Hour, International Dark Sky Week, World Night in Defense of Starlight, Dark Skies Discovery Sites, Sidewalk Astronomy, Nights in the Parks)
- On-Going Citizen Science Programs (5 star hunting programs & Quiet Skies)
- Establishment of Dark Skies Communities (Starlight Initiative, International Dark Sky Communities)

Educational materials have been created or consolidated for most of these programs. Some of the educational materials that are widely available include:

- The Great Switch Out: A Homeowner's Guide to Quality Outdoor Lighting (from IDA-the International Dark-Sky Association)
- Downloadable posters, brochures and displays on the effects of light pollution on health, wildlife, energy, astronomy, safety and glare control (IDA)
- A planetarium program for small and portable domes to advocate dark skies and to introduce participants to outdoor lighting issues.
- A 2 DVD set with videos, activities, songs, PowerPoints, images and other ancillary materials

Additionally a teaching kit is also available. It includes light-shielding demonstration equipment, a digital Sky Quality Meter, and DVDs and CDs of activities and other materials. Some of the key events already held or being held and available to all to participate in are:

Earth Hour, March 28, 2009, 1 billion people in over 4100 cities & iconic landmarks in 87 countries turned off non-essential lights, conserving energy while allowing the public to see the dark skies from cities. Hosted by the World Wildlife Fund.

World Night in Defence of Starlight was the 1st night of the International Dark Sky Week (April 20–26, 2009)

Dark Skies Discovery Sites are in rural locations (e.g. a backyard observatory or a community park or school) where the public can learn about the importance of dark skies. Led by the Astronomical League.

Nights in the National Parks: Throughout 2009, dark sky observing (with light pollution education) will be highlighted from within 24 U.S. National Parks with near-pristine skies. (U.S. National Park Service)

Finally the GLOBE at Night program allows citizen-scientists to record the brightness of the night sky by matching its appearance toward the constellation Orion with star maps of progressively fainter stars. The measurements are submitted online and resulting maps of all worldwide observations are created. Over the last 4 annual two-week GLOBE at Night events, 35,000 measurements have been contributed from over 100 countries.

Not all of the programs deal with light pollution. The Quiet Skies program address how radio frequency interference (RFI) blinds radio telescopes at certain frequencies and includes a kit loan program to schools and museums. Participants can measure the RFI levels in their communities, enter their measurements into a database, and graphically display the results. This program is led by the U.S. National Radio Astronomy Observatory.

2.6. From Earth to the Universe (FETTU)

The FETTU astronomical image exhibitions are supporting one of the most important goals of IYA2009: reaching out to the public and exposing new audiences to the wonders of astronomy. This project has been highly successful in its worldwide implementation. The images are available to all from the web site. The goal of FETTU is to engage the public, especially those who might not think they are interested in astronomy or science. The stunning beauty of astronomical images, coupled with short and informative captions on the panels draws the public in at every location.

Globally, there have been over 250 FETTU exhibits in more than 60 countries—on every continent except Antarctica (thus far!). The venues hosting FETTU have been wide ranging—from parks to community centers to libraries to art festivals. In the United States, over 40 FETTU image exhibitions have been implemented, in high visibility and unique areas such as the Smithsonian FolkLife Festival in Washington, DC, the Tucson, Atlanta Hartsfield and Chicago O'Hare International Airports, the Benjamin L. Hooks library in Memphis, the Sunnyvale art festival in California, and Washington Square Park in Manhattan.

The FETTU program has been innovative in reaching out to all members of a community by preparing bilingual text (English/Spanish) and producing a series of traveling tactile exhibits for the visually-impaired. With images taken from both ground- and space-based telescopes, FETTU showcases the incredible variety of astronomical objects that are known to exist—planets, comets, stars, nebulae, galaxies, clusters, for example. The exhibit also shows how some of these objects look when viewed across the electromagnetic spectrum, from using ultraviolet and visible light to infrared, X-rays and gamma ray imaging.

2.7. The Galileoscope Program

The Galileoscope program was the outgrowth of programs incorporating telescope kits as powerful mechanisms for teaching astronomy and optics (Pompea et al. 2005, Pompea 2006, Pompea et al. 2007). In the Hands-On Optics Project (Pompea et al. 2008)

the value of telescope kits for formal and informal education was demonstrated, as was the need for a higher quality telescope kit that would allow detailed observations of the Moon and planets. The Galileoscope project has been highly successful with the production of over 110,000 high quality student telescope kits. It is likely that this production figure may be significantly exceeded by additional orders in early 2010.

Each telescope is designed so that students can see the rings of Saturn and observe Jupiter's Galilean satellites and equatorial bands (Fienberg and Pompea, 2008; Pompea, 2008; Pompea et al. 2008). Equally important is that there is now a significant body of educational material available for teachers and informal educators to use with the Galileoscope. These materials include an observing guide for 2009 (one for 2010 is in the works) that provides guidance on the location of the best objects to observe with the Galileoscope. It also includes an educator's guide which describes a variety of optics-related activities that can be done while assembling or using the Galileoscope. The Galileoscope assembly instructions have also been improved to address common issues that have been noted in the assembly of the Galileoscope.

Galileoscopes have been very favorably reviewed on amateur equipment web sites such as *Cloudy Nights* and by astronomy publications such as *Sky and Telescope*. Distribution is worldwide: countries such as Norway and Brazil are using Galileoscopes in great numbers in their educational programs for the International Year of Astronomy 2009. The Galileoscope is also an important educational tool in developing countries with a strong international donation program being an integral part of the project. Many Galileoscope-based star parties have been held in major urban areas. The Galileoscope was featured at the White House Star Party in October 2009 when the President looked through the Galileoscope at Jupiter and the Galilean moons.

3. Summary

The programs described for the International Year of Astronomy 2009 represent a variety of goals, audiences, general approaches, and specific implementation strategies. There is significant diversity in the projects; the common factor is that all of these projects have been highly successful in meeting their goals. Relying on volunteers and in some cases, self-financing, these IYA2009 projects represent some of the best efforts in the world in the pursuit of progressive, ambitious, and wide-spread astronomy education.

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