Name of Project: Competitive Program For Science Museums and Planetariums Plus Opportunities for NASA Visitor Centers and Other Informal Education Institutions (CP4SMP+)
Competed in 2011and Awarded in 2012 via NASA Research Announcement (NRA): NNH11ZHA004N
Number and Type of Agreements Used: 18 (grant, cooperative agreement, intra-agency transfer)
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PROJECT DESCRIPTION

The Competitive Program For Science Museums and Planetariums Plus Opportunities for NASA Visitor Centers and Other Informal Education Institutions (CP4SMP+) responds to Congressional direction to establish *"a competitive program as authorized by section 616 of PL 109-155 for science museums and planetariums to enhance programs related to space exploration, aeronautics, space science, Earth science or microgravity."* In Fiscal Years 2008, 2009, and 2010, Congress reallocated the NASA's Office of Education budget request in order to fulfill this direction. In Fiscal Year (FY) 2008, Congress also established: "*To the extent possible, NASA is urged to use education funds to address the educational needs of women, minorities, and other historically underrepresented groups*."

In FY 2008 and FY 2009 NASA issued separate NASA Research Announcements (NRAs), which shared the title: ***Competitive Program for Science Museums and Planetariums (CP4SMP).*** CP4SMP is authorized by PL (Public Law) 109-155 SEC. 616. MUSEUMS: "*The Administrator may provide grants to, and enter into cooperative agreements with, museums and planetariums to enable them to enhance programs related to space exploration, aeronautics, space science, earth science, or microgravity*." A total of 13 projects were selected for award using the FY 2008 funds. The FY 2009 NRA (also known as the call for CP4SMP proposals) NNH09ZNE005N specified "Should Congress continue funding CP4SMP in FY 2010, NASA may select FY 2009 proposals for funding rather than open a new competition." A total of 18 projects were selected for award using FY 2009 and FY 2010 funds from the proposals received under the FY 2009 NRA number: NNH09ZNE005N. Between FY 2008-FY 2010, Congress also reallocated the Office of Education's budget to establish a Visitor Center (VC) initiative. Congress directed NASA Visitor Centers to support the development of educational activities in science, technology, engineering, and mathematics (STEM). In 2011, a revised solicitation, ***Competitive Program For Science Museums and Planetariums Plus Opportunities for NASA Visitor Centers and Other Informal Education Institutions (CP4SMP+)***, was released. No funding was available for awards in FY 2011. In FY12, 18 projects, including 7 NASA Visitor Centers, were selected for FY 2012 funds. Short abstracts of these 18 projects and other selections are available at https://informal.jpl.nasa.gov/museum/Exploring/index.cfm?FileName=Overview.

PROJECT GOALS

The basic goal of the CP4SMP+ project is to establish NASA's flagship investment in Outcome Goal 3: Build strategic partnerships and linkages between STEM formal and informal education providers that promote STEM literacy and awareness of NASA's mission. Specific grant-level objectives include but are not limited to:

- Promote life-long learning in America by students, educators, families, and retirees, using NASA-themed STEM concepts and missions via non-formal and informal education.

- Encourage, inspire and engage large and diverse audiences via NASA's contributions to everyday life within the Congressionally-defined technical areas (NASA-themed space exploration, aeronautics, space science, earth science, or microgravity, or combinations of these themes).

- Improve understanding of NASA's missions, contributions to STEM disciplines, and STEM careers, including faculty in pre-K-12 and higher education settings.

- Link and engage providers of informal and formal education, including institutions of higher education, particularly HBCUs, Tribal Colleges, and other minority serving institutions using NASA content through pilot projects that enable educators, parents, retirees, or community leaders to carry the NASA content back to their households, school, after school groups, summer camps, 4-H communities, etc.

PROJECT BENEFIT TO OUTCOME (1, 2, OR 3)

CP4SMP+ primarily addresses Outcome 3 and supports outcomes 2 and 1 of the NASA education strategic coordination framework. In sum, the three outcomes require the Office of Education to fund activities that 1) establish strategic partnerships, 2) contribute to the development of the STEM workforce, and 3) attract and retain students in STEM disciplines needed to achieve NASA strategic goals.

The CP4SMP+ funding opportunity supports NASA's education goal to engage educators and students both in and outside the classroom, as well as learners of all ages in science, technology, engineering and mathematics (STEM) related to NASA missions and careers. The CP4SMP+ project is uniquely positioned among NASA's competitive grant and cooperative agreement broad agency announcements because all NASA missions in exploration, aeronautics, science or space operations are eligible for support. CP4SMP+ also contributes to informal education more broadly by making NASA's remarkable resources--facilities, missions, data, images, and employees, including internationally known engineers and scientists-- more broadly known. CP4SMP+ grants are expected to encourage inquiry-based or hands-on education or learning focused on NASA's contributions to the STEM disciplines.

PROJECT ACCOMPLISHMENTS

The 2011 CP4SMP+ NASA Research Announcement was released on 31 March 2011 and proposals were due 29 June 2011. Sixty-three (63) proposals were received in total. Fifty (50) proposals from 28 states and the District of Columbia came from museums, science centers and other institutions of informal education. These 50 proposals requested amounts ranging in value from about $150,000 to $1.25 million. Participating organizations include museums, planetariums, Challenger Centers, aquariums, and other institutions of informal education. These 50 proposals were reviewed through a merit-review process, which included consulting with experts external to NASA. NASA's Office of

Education, Office of Communications, Office of the Chief Technologist, and Mission Directorates collaborated to solicit and review the grant applications. All awards have a maximum five-year period of performance. NASA could elect to make a full or partial selection of a proposal. Awards were subject to receipt of high-quality proposals and Congressional appropriation of funds in FY 2012.

In addition, 13 proposals were received from NASA Visitor Centers, Centers and non-profit NASA Center partners. These proposals were reviewed internally by experts at NASA Headquarters. Awards were made to seven NASA Visitor Centers. The selected NASA visitor centers are located in Alabama, California, Maryland, Mississippi, Ohio, Texas, and Virginia. The seven visitor center projects have a maximum five-year period of performance and range in value from approximately $200,000 to $900,000.

All 31 previous CP4SMP grants were made in prior fiscal years, although two of the FY 2010 cohort awardees began their period of performance in FY 2011. Two awards (Adler Planetarium and Miami Science Museum) from the FY 2008 cohort were completed during the FY 2011 period. In FY 2012, the following were completed: four projects from the FY2008 cohort (Castle Challenger Learning Center, Hiller Aviation Institute, Morehead Planetarium, and the Seattle Aquarium Society); one project from the FY 2009 cohort (National Mining Hall of Fame and Museum); and one project from the FY 2010 cohort (Thanksgiving Point). Periods of performance ranged from one to five years. Highlights from the results of these grants are listed in the *Project Partners* section below.

In June 2012, JPL and Stennis Space Center convened a reverse site visit with the NASA Shared Services Center (NSSC). The visit was held at Infinity, the visitor center for Stennis Space Center. Attendees included CEOs or high-level executives from the FY 2008- FY 2010 cohorts, as well as the Technical Officers for these grants, representatives from the NASA Visitor Centers, and representatives from NSSC, the NASA Office of the Inspector General, and the NASA Office of Equal Opportunity and Diversity, and NASA Office of Communications.

PROJECT CONTRIBUTIONS TO APG MEASURES

NASA Education FY12 Annual Performance Goal (APG) 6.4.1.1 (ED 11-9) stated: "420 museums and science centers across the country actively engage the public in major NASA events." This APG was achieved by the Museum Alliance, a free-of-charge nationwide network of professionals at more than 550 science centers, planetariums, museums, aquariums, zoos, observatory visitor centers, NASA visitor centers, Challenger Centers, nature centers and park visitor centers. Created and managed by JPL, the Museum Alliance serves members in all 50 states, DC, Puerto Rico, and Guam, as well as nearly 20 other countries. All eligible CP4SMP+ awardees are required to participate in the Museum Alliance.

IMPROVEMENTS (e.g. project management, efficiencies, etc.) MADE IN THE PAST YEAR

The NASA/JPL team was able to accomplish both the review and selection of proposals in conjunction with planning and implementation of a Reverse Site Visit for awardees and technical officers, demonstrating clear communications and definition of roles, as well as effective business processes.

Grantees at the Site Visit developed action plans for future collaborations with NASA, NASA Visitor Centers, and other grantees and partners. Evaluation of the Site Visit indicated significant improvement over the inaugural PI meeting in 2009. JPL continued development of a community of practice comprising the CP4SMP+ awardees to help them navigate NASA policies and processes including use of the NASA emblem, review of communications materials, educational product review, grants processes and resources, and reporting requirements. JPL developed a spreadsheet system to streamline data collection for reporting requirements for OEPM and other requests. JPL also convened an informal gathering of opportunity with grantees who were attending the Association of Science-Technology Center annual conference in Baltimore, MD. JPL manages communications through a listserv for CP4SMP+ awardees and the CP4SMP+ Technical Officers at the NASA Centers. JPL has also developed and maintains a CP4SMP+ Community website which includes answers to frequently asked questions for both awardees and technical officers, as well as copies of materials presented at the reverse site visit.

PROJECT PARTNERS AND ROLE OF PARTNERS IN PROJECT EXECUTION

Most of the still-active FY08 cohort of awardees have completed the third year of their award and submitted their third annual reports, as required by NASA grant policies and regulations, and all FY09 cohorts have submitted their second annual reports. All of the FY10 cohort has submitted their first annual reports, although most are in the development stage and not reaching visitors directly yet. Following the OEPM guidelines for how numbers are to be collected and reported, the reported total number of visitors reached by all projects with reporting periods ending in FY12 is given in the following table.

No. of Programs	Higher Ed Students	K-12 Students	K-12 Educators	Adults	Others
22	166	45,568	4,604	4,289	862,116

Highlights from these reports include these exhibit and show openings:

- **NNX09AL79G (FY 2008 Cohort):** ExplorationWorks! in Helena MT, hosted the grand opening of the Women in Aerospace exhibit, the third of three new exhibits in their 4-year *Montana's Big Sky Space Exploration* project. It features a prototype of the BioSuit for future Mars expeditions and a display on women who have contributed to aerospace. Dr. Dava Newman, a graduate of a local high school and now on the faculty of MIT and helped to invent the BioSuit, advised project and exhibit design. Astronaut Cady Coleman served as the keynote speaker for the Women and Scientists Luncheon for middle and high school girls interested in pursuing STEM careers, and spoke on "Living on the ISS" at a Distinguished Space Speakers event. Local coverage of the event is available at http://helenair.com/news/local/astronaut-space-suit-designer-help-introduce-new-explorationworks-exhibits/article_a5be03ea-b452-11e1-b6ce-0019bb2963f4.html

- **NNX10AD95G (FY 2009 Cohort):** The new "Nature Research Center" wing of the North Carolina Museum of Natural Sciences in Rayleigh NC opened its doors for 24 solid hours to celebrate its

grand opening. NASA demonstrated virtual tours of the Solar System, cloud-based citizen science opportunities, games, and *NASA Discovery Kiosks* in the event.
http://naturalsciences.org/programs-events/grandopening
The new wing features NASA-funded exhibits on Earth and space science, including *Beyond Our Planet* http://www.flickr.com/photos/naturalsciences/7008557421/in/set-72157630050237368
The museum held a host of special events featuring NASA content and personnel, including Astronomy Days 2011 that attracted over 15,000
http://www.flickr.com/photos/naturalsciences/sets/72157626649406787/ ,
a live shuttle launch of the Discovery's final mission filling all 265 seats of the auditorium, a Vesta Fiesta, and Darwin Day Festival. Webcasts of NASA Extreme Environment Mission Ops and Desert Research and Technology Studies were offered to children of migrant workers and students enrolled in low-performing K-12 schools.

- **NNX10AL16G (FY 2010 Cohort):** Children's Museum of Indianapolis opened its suite of exhibit and programming for *Curious Scientific Investigators (CSI): Flight Adventures* in February 2012. A total of 6680 visitors attended opening day, which included demos of the components and impersonators of famous aviators.
http://www.childrensmuseum.org/flightadventures
The multi-media planetarium show, featuring a young girl wanting to learn to fly who learns some of the science behind it, is shown daily in the SpaceQuest Planetarium during the week and three times daily on weekends. Local PBS affiliate WFYI produced a documentary given as a DVD to educators at museum workshops along with a CSI: Flight Adventures Unit of Study for grades 3-6 developed by the museum.
http://www.childrensmuseum.org/flightadventures-teachers
https://www.wfyi.org/IndianaExpeditions/WingsOverIndiana.asp
An exhibit displays aircraft models coupled with interactive Flight Discovery Stations including an opportunity for visitors to virtually construct a plane and fly it. Utilizing its existing SciencePort ® infrastructure, the Museum also created a high-quality, on-line family learning experience focusing on the science of flight.
http://www.childrensmuseum.org/scienceport
A Museum Apprentice Program supported 35 teens ages 13-18 in learning hands-on activities and experiments related to flight. Two will be selected to travel to NASA Dryden Flight Research Center to present individual projects they developed.

- **NNX10AK12G (FY 2010 Cohort):** Initiating its *Future Space: Engaging the Public After Shuttle* project, the Louisiana Art and Science Museum in Baton Rouge, LA, completed and released its first planetarium show *We Choose Space*. 24 minutes long, it has been seen by 9388 students, teachers, and the public in portable planetariums in the Houston area where it was produced by a project partner at the Houston Museum of Natural Science, and by 6192 people in the HMNS Burke Baker Planetarium. It is offered for licensing through www.spaceupdate.com, and available for preview online at http://tinyurl.com/wechoosespace . Focusing on human spaceflight after the Space Shutle, *We Choose Space* is the first planetarium show told completely by astronauts (Tom Jones, Scott Parazynski, and Gene Cernan) and a famous reporter (Walter Cronkite), and to use fisheye photography from inside the ISS. An educator guide, created by a master's student in Science Teaching, accompanies the show.

Example final close-out statistics and outcomes:

- **NNX09AL35G (FY 2008 Cohort):** In San Carlos, CA, the Hiller Aviation Museum's *Aviation Adventure Center* (AAC) added two classroom laboratory-style spaces to the museum's existing Flight Sim Zone, for a full suite of aviation and STEM programs, which has been in use since October 2009. Participants in the 3 years of the NASA project numbered 18,124 school children and adult chaperones in 787 separate programs, 1365 scouts in 280 programs, 260 children in 34 after school programs, 4143 children in 780 summer day-camp programs, and 17,639 weekend and family visitors. The combined total of participants was 41,531, each of whom received intensive, hands-on programming lasting at least 45 minutes. After completion of the NASA-funded project, the facility continues in use for virtually all museum programming that involves hands-on activities, STEM instruction, aviation exploration and flight simulation. Project evaluation of Boy Scout participants in the project showed a greater facility in using math to solve an aviation problem. Over the life of the project, the Travelling Flight Science Lab (TFSL) version travelled to Evergreen Aviation Museum in McMinnville OR, Weisbrod Aircraft Museum in Pueblo CO, Frontiers of Flight Museum in Dallas TX, and New England Air Museums in Windsor Locks CT. A total of 6999 people experienced this "flight instruction," totaling 861 hours of operation.

- **NNX09AL68G (FY 2008 Cohort):** Over the 2-year lifetime of the project, Seattle Aquarium's *Exploring Ocean Science from Space (EOSS)* project provided exposure to NASA's contributions to ocean science for about 2000 teachers, almost 20,000 parent chaperones, and a potential audience of over 1.7 million visitors. The best outcomes were obtained at an area devoted to Interactive NASA Kiosks created explicitly to convey information about NASA's work, http://www.seattleaquarium.org/exhibit/NASA
  NASA data and research was also integral to several "WonderCart" movable platforms staffed by volunteers, as well as in supporting activity kits. The effects of learning about NASA's work significantly increased people's estimation of NASA's work in ocean science, even among people who already were familiar with it. Outreach activities and targeted events also reached over 19,000 families with children age 5-12, including 1245 Latino multi-generational families, as well as 725 tribal elementary students, teachers, and chaperones, and 465 middle school students exploring ocean science careers.

- **NNX10AK08G (FY 2010 Cohort):** Thanksgiving Point, a farm, garden, and museum complex in Lehi, UT dedicated to transformative family learning, completed its 2-year *NASA Blast* reaching 554,873 guests with NASA and space-related exhibits and programs, in a non-traditional museum setting. This experience consisted of the Exploratorium's traveling exhibit "Light" and locally-created exhibits on space and light: a Video Kiosk, Reading Chair and Book Case, Bounce (on reflection), Bend (refraction), Catch (absorption), Captured Shadows, and an Information Computer, as well as a large-format 3-D movie "Fly Me to the Moon". A "space garden" was created in the Farm Country section and in partnership with Utah State University, 4-H students participated in a "Space Plant Challenge" to create lunar plant growth chambers. Thanksgiving Point Gardens featured a solar system walk exhibit. 12 NASA Family Nights were held reaching an average of 200 participants each, and 22 summer day camps, classes, and scout programs reached over 650 children. Beyond the grant period, Thanksgiving Point housed

the Mars Curiosity Rover model and themed the annual corn maze around space in 2011. Since the conclusion of the project, Thanksgiving Point created an internal audience research department to study visitor behavior. The design, layout, and evaluation of the NASA Blast space was done as a student research project at Brigham Young University, available at http://scholarworks.iu.edu/journals/index.php/ijdl/article/download/1093/1297.

A complete list of the FY 2008, 2009, 2010, and 2012 Grant Selections including short abstracts can be found at the following URLs on the NASA Solicitation and Proposal Integrated Review and Evaluation System (NSPIRES):

http://nspires.nasaprs.com/external/viewrepositorydocument/cmdocumentid=192240/Selected%20Proposals%20CP4SMP%202008.pdf

http://nspires.nasaprs.com/external/viewrepositorydocument/cmdocumentid=216807/2009%20Selection%20Table.pdf

http://nspires.nasaprs.com/external/viewrepositorydocument/cmdocumentid=229483/2010%20Selection%20Table.pdf

http://nspires.nasaprs.com/external/solicitations/summary.do?method=init&solId=%7B75AAC7BF-2F69-6C73-2980-B1DCF25EA665%7D&path=closed

(see separate table for NASA Visitor Centers)