Baltimore Project ASTRO

TOWSON UNIVERSITY

PROJECT ASTRO

ASTRONOMICAL SOCIETY OF THE PACIFIC

MARYLAND SCIENCE CENTER

SPACE TELESCOPE SCIENCE INSTITUTE

Jennifer Scott *Towson University*

What is Project ASTRO?

- Launched by Astronomical Society of the Pacific in 1994, now operating in 18 networked but independently supported sites across the country.

- Astronomers are linked with local teachers and students to bring inquiry-based astronomy activities to classrooms.

- Since 2008, Baltimore Project ASTRO has been a partnership between Towson University, the Maryland Science Center, and the Space Telescope Science Institute.

Project ASTRO: 20 Years and Flourishing

By Andrew Fraknoi, Brian Kruse, Rommel J. Miranda, Theresa Moody, and Wil van der Veen.

Volunteer outreach astronomer Brandon Lawton and educator Victoria Mathew work together to cook up a comet at a Project ASTRO professional development meeting. Courtesy Rommel Miranda.

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Our Volunteers

baltimoreprojectastro.org

Partnering educators in public schools in:

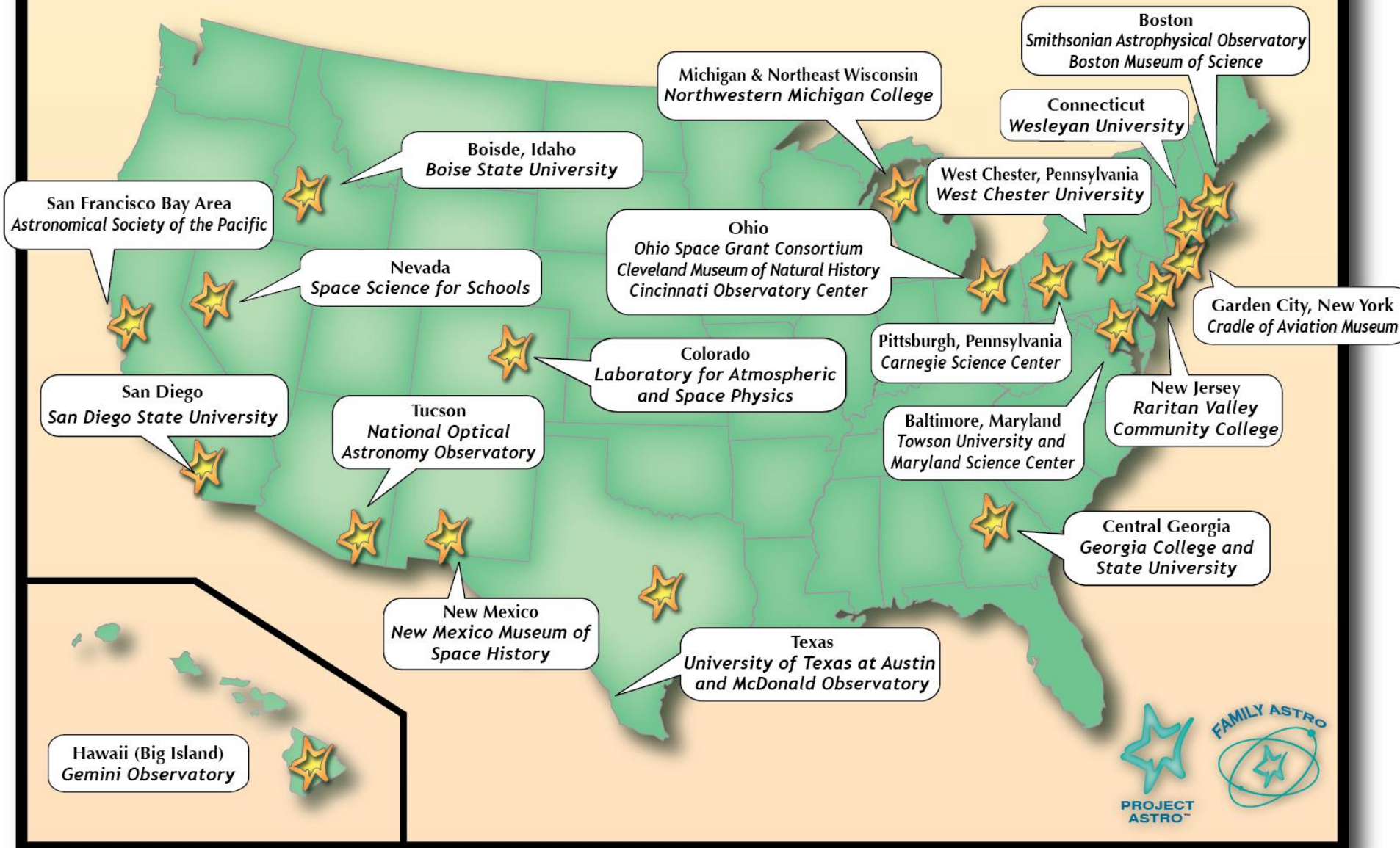
- Baltimore City
- Baltimore County
- Harford County
- Howard County
- PG County

We also work with several private and parochial schools.

Our astronomer partners have represented:

American Meteor Society
Applied Physics Laboratory (JHU)
Carnegie Institution of Washington, Department of Terrestrial Magnetism
George Mason University
Harford County Astronomical Society
Howard Astronomical League
Lowell Observatory
Loyola University
Maryland Science Center
NASA Goddard Space Flight Center
Robinson Nature Center
Science Magazine
Space Telescope Science Institute
Towson University
University of Maryland, College Park
U.S. Naval Observatory
Westminster Astronomical Society

Project ASTRO™ National Network



Baltimore Project ASTRO goals

- Promote active learning methods in science classrooms that engage both teachers and students and improve student attitudes towards science.

- Offer role models for students by showing them working examples of *who scientists are* and *what they do.*

- Provide professional development for teachers through workshops, in-service training, and one-to-one partnerships with local content experts.

- Provide local scientists the opportunity to get involved with improving science education in schools in their community.

Scientist Roles

- Four classroom visits per year – to the same classroom, same kids
- Help educators and students develop science skills and knowledge
- Purchase materials and co-teach hands-on activities
- Lead discussions and special projects and organize special events (field trips, star parties)
- Serve as mentors and role models while making science fun!

Astronomer Matthew Knight and students from Friendship Academy of Science, Math, and Technology in Baltimore use dough models to create a scale model of planet sizes. *[Courtesy Rennie Watson and Matthew Knight.]*

Educator Roles

- Engage students and facilitate activities and manage the classroom
- Ensure meeting of education standards

Students in Megan Gover's class were encouraged to look at different light sources with their completed spectrographs in order to learn about the spectral lines of different lights. *[Courtesy Megan Gover and Susan Benecchi.]*

- Help develop the partner's science communication and education skills
- Customize content and activities for students
- Pioneer new activities with partner
- Organize special events

The Universe at Your Fingertips 2.0 DVD-ROM

A Collection of Activities and Resources for Teaching Astronomy (on a DVD-ROM)

Edited by Andrew Fraknoi
Published by the Astronomical Society of the Pacific

Wholesale and **international orders** please contact service {at} astrosociety.org or call customer service at 1-800-335-2624.

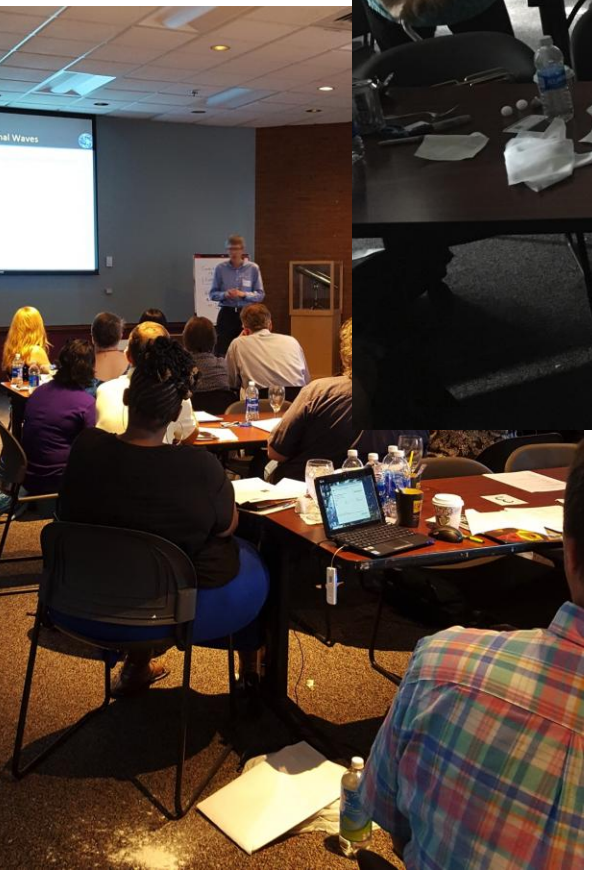
This DVD-ROM is the most comprehensive resource and activity guide for teaching basic concepts and activities in space science ever published. It includes:

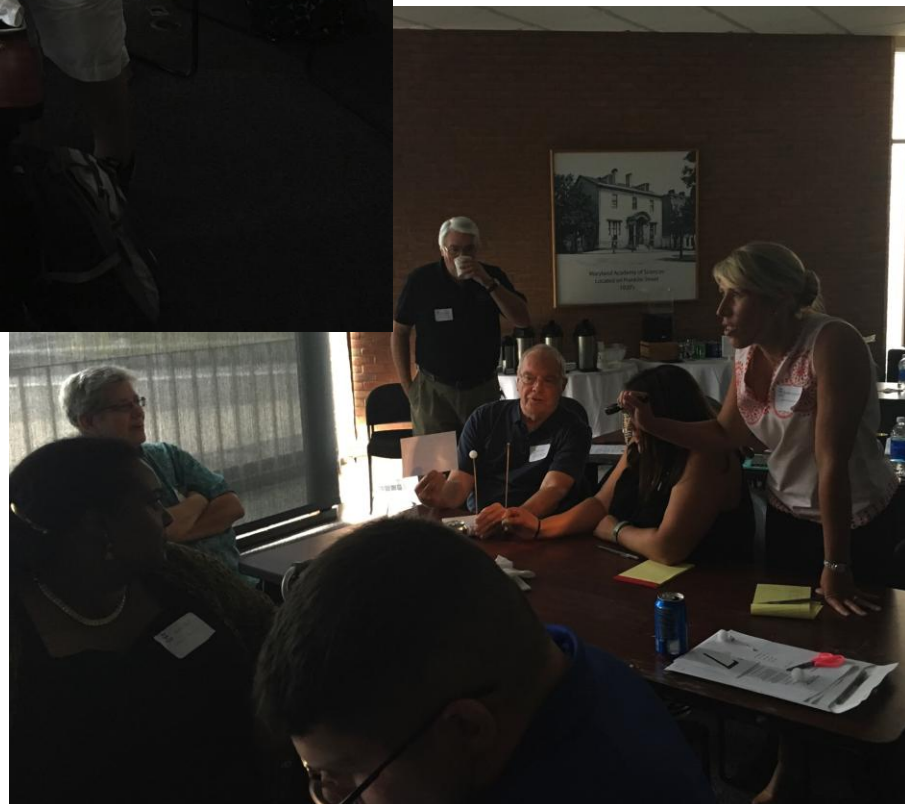
- 133 field-tested hands-on activities, from programs and projects around the US,
- 17 topical guides to to the best sources of information in print and on the web,
- 52 background articles on astronomy and education,
- 12 short videos with instructions for doing some of the most often-used activities, and
- 10 recommended sequences of activities to help students learn some of the topics most often found in the K-12 curriculum.

Baltimore Project ASTRO educators may:

- Purchase materials for Project ASTRO activities using a $100 stipend
- Reserve classroom sets of six Galileoscopes or eight SunSpotter solar telescopes
- Request free resources and kits from TU's STEM Education Resource Center.
- Schedule a Portable Planetarium event
- Schedule a visit to TU's Watson-King
- Request a science/physics magic show, given by a TU faculty member
- Request a visiting meteorite collection and activity led by a meteorite expert from the American Meteor Society

Baltimore Project ASTRO Annual Workshop





Baltimore Project ASTRO Annual Workshop Keynote Speakers

2009 **Dr. Donald Thomas**, retired NASA astronaut

2010 **Dr. Mario Livio**, noted author and Space Telescope Science Institute astrophysicist

2011 **Dr. Max Mutchler**, Space Telescope Science Institute Planetary Scientist and co-discoverer of Pluto's moons Nix and Hydra

2012 **Dr. Michelle Thaller**, NASA Assistant Director for Science Communication

2013 **Dr. Judith Lean**, Naval Research Laboratory, member of the Intergovernmental Panel on Climate Change and Nobel Laureate

2014 **Dr. John Mather**, NASA's Goddard Space Flight Center, James Webb Space Telescope Project Scientist and Nobel Laureate

2015 **Dr. Kimberly Ennico-Smith**, NASA's Ames Research Center New Horizons Deputy Project Scientist

2016 **Dr. Peter Shawhan**, University of Maryland College Park and the LIGO Collaboration

Karen Schaefer, Program Coordinator
Rommel Miranda, Co-Director
Jennifer Scott, Co-Director

Characteristics of Effective Astronomy EPO

- Champion (Formal or Informal EPO)
  - “You need someone to champion the program. Somebody with some vision and the ability to see outside the box about what can be done to be able to inspire people and all walks no matter what age...”
- Source of Funding
- Support from Partnerships, Parents, and School Administrators

Characteristics of Effective Astronomy EPO

- Engage Students
  - Active Learning
    - “Astronomy should be presented in a way that involves more than just one sense or mode of learning.”
  - Hands-on Learning
    - “Hands-on activities that kids can share in the enthusiasm and excitement of science.”
  - Inquiry-based Learning
  - Exciting, Interesting, and Fun
  - Binoculars and Telescopes
    - Explore Day and Night Sky
- Expose Students to Careers in Science
- Age Appropriate for Students
  - “The outreach program has to be carefully designed to be age and level appropriate . No lessons on space time and black holes for kindergarteners please.”

Characteristics of Effective Astronomy EPO

- Address Student Misconceptions

- Student Outcomes (Mixed)
  - “You really want to be sure you’re educating to the point where students are doing better in their work and on tests.”
  - “Improves some metric like test scores where the entire county academic scores go up.”
  - “It is not about improving test scores, it is about inspiring and engaging students.”

Characteristics of Effective Astronomy EPO

- In-depth Teacher Professional Development
  - “The successful teacher PD programs will be more in-depth.”
  - “It is not a one-time deal. It has to be sustained over time...”
- Address Teacher Misconceptions
- Focus on Strengthening Teacher both CK and PCK

Characteristics of Effective Astronomy EPO

- Involve Astronomers (Amateur/Professional)
  - “Ideally, it should involve multiple experiences with the same astronomer/leader so that a relationship can be built, and participants can feel comfortable asking questions that they might not want to ask.”
- Disposition of Astronomers
  - “A successful astronomy EPO program has astronomers that can present an exciting and fun program. However, this is not always a strong suit for professional astronomers.”
  - “Have enthusiastic astronomers involved.”
  - “Show your passion for science.”
  - “They need to have the ability to make a difficult topic understandable to all ages.”
- CK and PCK of Astronomers
  - “You have to have someone who actually knows astronomy doing this. So, it is the content knowledge of the leader doing this.”
  - “They have to be scientifically legit.”
  - “The astronomer should be an active mentor for scientific practices.”
  - “The astronomer needs to ask questions of the audience to make sure they understand what the audience knows/doesn’t know/is curious about.”
  - “They need to know how to engage an audience. Not just lecture them about what they do.”

Characteristics of Effective Astronomy EPO

- Evolve
  - “A successful astronomy EPO program is one that keeps up to date. They make sure that new concepts, emerging ideas, and different theories can be adapted and explored in a logical, scientific, and educational way.”
  - NGSS
    - “Before, it went from reading textbooks to actually doing things in astronomy. Now, there needs to be a shift from astronomers coming to the classroom to them serving as mentors for scientific practices. This is problematic because not all Project ASTRO volunteers are scientists.”

Characteristics of Effective Astronomy EPO

- Interesting Astronomy Content
  - “The content needs to be something that is of interest to the recipients. Something they have already been curious about.”
- Engage All Audiences (Informal; Family ASTRO)
  - Families
  - Public
  - “An effective program engages all audiences regardless of age and emphasizes hands-on learning.”
- Facility to Attract, Excite, and Inspire Participants
  - Observatory and Planetarium

Characteristics of Effective Astronomy EPO

- Evaluation Plan
  - “There should be ways to evaluate the effectiveness of the program.”

- Formal Research
  - “You need to find out what is going on in the classroom and determine if the program is effective.”
  - “You have to base your program on research. I think that we need to use the research to inform what we are doing.”

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