Explore. Learn. Inspire.

National Radio Astronomy Observatory

Field Trip Planning Guide

NRAO

What are the origins of life on Earth?

How old is the Universe?

How big is the Universe?

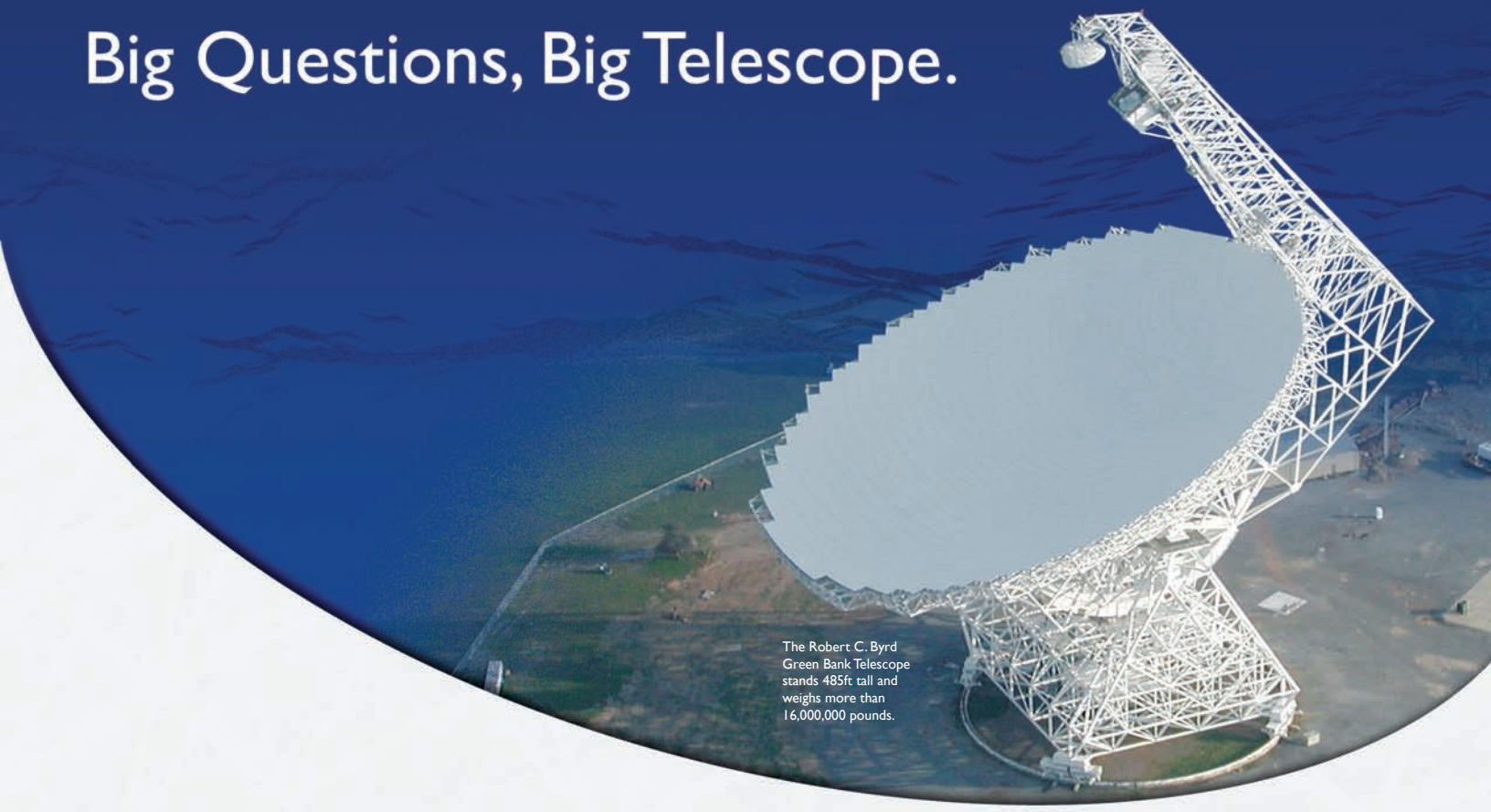
What's dark energy?

What's a Black Hole?

What happens when a Star dies?

Are we alone?

Big Questions, Big Telescope.



The Robert C. Byrd Green Bank Telescope stands 485ft tall and weighs more than 16,000,000 pounds.

Experience science in action when you and your students visit the National Radio Astronomy Observatory (NRAO). Astronomers from around the world harness the awesome power of the Robert C. Byrd Green Bank Telescope (GBT) to answer mankind's biggest cosmic questions. More than just a tour, a field trip to the NRAO might just inspire your students to join the next generation of scientists and engineers.

Rich in educational programs and activities, with inexpensive on-site lodging and dining, the Green Bank Science Center can assist you in building a visit lasting a few hours to a few days.

Learn & Explore

Our field trip activities are mapped to State and National Science Standards! As you plan a field trip for your students, use the data below to assist in choosing the activities that suit your classroom goals best.

Most activities are designed for groups of 20. Please plan for a longer stay if you bring a large group, we will need to rotate smaller groups through more than one activity. Plan to spend a minimum of 2 hours with us to accomplish the NRAO tour, exhibit hall scavenger hunt, and a stop in the gift shop. Radio Astronomer For A Day, *highly recommended* for students ages 10 and up, requires an overnight stay.

NRAO Field Trip Activities

Exhibit Hall Concept Quest

Group Size: 40+ Suitable for 3rd Grade and up.
Duration: 30 – 40 minutes per group.

- Students complete a scavenger hunt to answer science questions as they interact with our astronomy exhibits.

Hands On Universe

Group Size: 20 Suitable for 5th Grade and up.
Duration: 90 minutes per group.

- HOU integrates science, mathematics and technology in the context of exciting astronomical explorations. Students use image processing software to analyze astronomical images.
- The West Virginia Department of Education endorses HOU as a means of integrating relevant technology into the science curriculum, and as a way to add astronomy to your courses.

Radio Astronomer For A Day

Group Size: 5 – 30 Suitable for 5th graders and up.
Duration: Minimum of 24hours including one overnight stay.

- Students working in research teams investigate cosmic objects with the NRAO's 40ft diameter radio telescope. During an overnight stay, students learn how to operate the telescope and complete inquiry-based projects, becoming, in fact, radio astronomers. RAFAD is a truely unique intensive real life scientific experience.

Be An RFI Detective

Group Size: 20 Suitable for all ages.
Duration: 40 minutes per group.

- Students search the Science Center for sources of man-made radio waves – fun!

Exploring Our Solar System

Group Size: 20 Suitable for all ages.
Duration: 20 minutes per activity.

- Pick and choose from a variety of fun activities: Scale Model Solar System hike, Make a Pocket Solar System, Solar Viewing (weather permitting), Worlds in Comparison, Moon Phase activities.

StarLab

Group Size: 20 Suitable for all ages.
Duration: 40 minutes per group.

- Constellations and celestial motions presentation under an inflatable planetarium balloon.

Standards Grades 4 - 8: Physical Science, Earth Science & Physics, 21st Century Skills

Key	Standards Met
	Nature of Science
	Content Standards
	Application of Science Standards
	Standards for 21st Century Learning

Full Science Standard Details here:
www.gb.nrao.edu/epo/standards.pdf

Students at the controls of the 40ft radio telescope.

Plan Your Trip

Make the Green Bank Science Center the home base of your next educational field trip. Student groups visiting the Green Bank Science Center may stay in the NRAO Bunk House, *pictured above*. The NRAO Bunk House can accommodate up to 60 students (30 girls and 30 boys.) The 60 unit dormitory is affordable ($5.00/night per student - with a minimum of $150.00/night) and comfortable. Students bring their own sleeping bags and linens. Chaperones stay in separate but attached bedrooms. Meal options are available. Bus driver accommodations may be arranged on-site or nearby.
When you call, please have this helpful information ready:

1. The date(s) you'd like to visit.

2. Total number of students, teacher(s) and chaperones in your group. We recommend 1 chaperone per 10 students.

3. Select activities you would like to do while you're visiting NRAO.

4. Plan meals, if applicable.

5. Reserve observatory accommodations, if applicable.

- To begin planning your NRAO field trip contact:
  phone: 304-456-2164 or email: gbt-tours@gb.nrao.edu

Glenville State students at the 40ft telescope.

Group Meals

Day-Trips

- If you are planning a day-trip, dining at our **Starlight Café** is ideal. If your group is large, or you have time constraints, you should pre-order your lunches. Your best options are pizzas, or box lunches. Starlight Café menu and the box lunch order form are on our website (www.gb.nrao.edu/epo/scicenter/before.html).
  For more information, call 304-456-2361.

Overnight Trips

- If you stay overnight in our economical Bunk House, meals should be arranged at the **Observatory Cafeteria**. Meals for student groups include: breakfast ($5.00), lunch ($7.00) and dinner ($8.00).
  Please bring your tax exempt documentation if you are a school or non-profit group.

Galaxy Gift Shop

- Stocks a variety of logo memorabilia as well as t-shirts, books, games, kits and postcards. Budget at least 30 minutes for your group to shop. Gift Bags are available for groups who don't have time to shop, only $3 and must be pre-ordered.

Don't miss the Galaxy Gift Shop at the Science Center.

Area Attractions

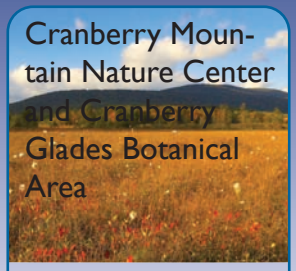
An overnight stay on the NRAO site presents your students with opportunities to experience some outstanding educational programs in the area. Astronomy, geology, history, literature, nature, skiing and snowboarding are all just a phone call away!

Snowshoe Mountain Resort

- Year round activities.
- Group pricing available.
- Snowshoe, WV 30 min. west of NRAO.

877-411-4FUN
www.snowshoemtn.com

Cranberry Mountain Nature Center and Cranberry Glades Botanical Area



- Educational exhibits.
- Unique habitat, plants and animals.
- Half mile handicap accessible boardwalk through an Arctic Tundra bog.
- Open spring through fall.
- Near Hillsboro, WV 50 min. from NRAO.

304-653-4826
www.fs.fed.us/r9/mnf/sp/naturecenter.html

Beartown State Park

- Unique natural area featuring massive boulders, overhanging cliffs and unusual rock formations.
- Self guided with interpretive signs or guided tours through advanced arrangements.
- Open April through October.
- Near Droop , WV 1 hr. from NRAO.

304-653-4254
www.beartownstatepark.com

Edray State Trout Hatchery

- Tour an operating fish farm.
- Learn about and see live rainbow, brook and brown trout.
- Free tours.
- Reservations are necessary.
- Edray , WV 50 min. from NRAO.

304-799-6461

Cass Scenic Railroad State Park

- Preserved 19th century logging railway town.
- Historic train rides.
- Company store gift shop and restaurant.
- Open May through October.
- School group discounted rates.
- Cass , WV 15 min. from NRAO.

1-800-CALL-WVA
www.cassrailroad.com

Droop Mountain State Park

- Official Civil War Discovery Trail site.
- Free tours.
- Guided tours available with advance arrangements.
- Open year round.
- Droop , WV 55 min. from NRAO.

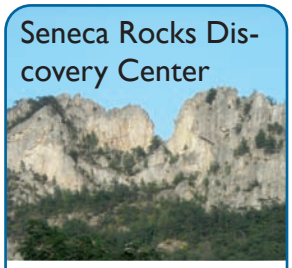
304-653-4254
www.droopmountainbattlefield.com

Pearl S. Buck Birthplace Museum

- Tour the preserved birthplace of the Pulitzer Prize and Nobel Laureate author.
- See hundreds of period artifacts.
- Open Mon. – Sat., May – Oct.
- Fee applies and reservations are suggested.
- Near Hillsboro, WV 50 min. from NRAO.

304-653-4430
www.pearlsbuckbirthplace.com

Seneca Rocks Discovery Center



- One of the best-known landmarks in West Virginia.
- Self-guided interpretive hiking trail open year round.
- Discovery Center open Apr. – Oct.
- Discovery Center features free exhibits, films and gift shop.
- Seneca Rocks, WV 1 hour north of NRAO.

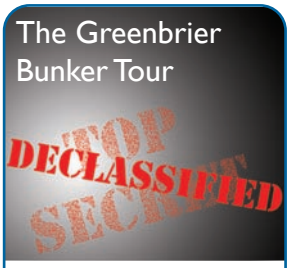
(304) 567-2827
www.fs.fed.us/r9/mnf/sp/srdc.html

Seneca Caverns

- West Virginia's largest caverns.
- Explore 1 mile of trails 165ft underground.
- Lesson Plan guides available upon request.
- Gemstone mining.
- Fee applies, reservations suggested.
- Riverton, WV 1 hr. north of NRAO.

304-567-2691
www.senecacaverns.com

The Greenbrier Bunker Tour



- Visit the former U.S. government relocation facility.
- Fee applies, reservations required.
- White Sulphur Springs, WV 1.5 hours south of NRAO.

800-624-6070
http://www.greenbrier.com/site/bunker.aspx

Area attractions information is subject to change without notice, please call in advance.

Want more for your students?

(Official White House Photo by Chuck Kennedy)

NRAO offers intensive residential workshops and programs for students and teachers:

- West Virginia Governor's School for Mathematics and Science is a 2 week science camp for rising high school freshmen, details at www.wvgovschools.org/GSMS/
- Pulsar Search Collaboratory is a **NRAO** and **West Virginia University** partnership
  - **21st Century Skills** conducting world class research in pulsar astronomy.
  - PSC students will join an international team of scientists analyzing more than 100 Terabytes of data collected by the GBT for the purpose of discovering new pulsars!
  - **Stipends, room and board for teachers and school counselors; room & board for students at all program activities.**
  - **Graduate Credit available for teachers through WVU.**

By Application only: www.gb.nrao.edu/epo/psc.shtml

Above left: Lucas Bolyard, Pulsar Search Collaboratory participant and WV high school student, discovered an anomalous pulsar with the GBT with President Barack Obama and First Lady Michelle Obama during an astronomy event on the South Lawn of the White House, October 7, 2009. Participants include: Dr. John Holdren, Office of Science and Technology Policy; Caroline Moore, the youngest person to discover a supernova.

Above: 2 students conduct a field experiment during the West Virginia Governor's School for Mathematics and Science.