

UNIT 5

SPACE-BASED ASTRONOMY ON THE INTERNET

Introduction

Activities in the previous units centered on the problems caused by Earth's atmosphere, the nature and uses of the electromagnetic spectrum, visible and infrared radiation collectors, and the imaging process. Once students gain a basic understanding of the nature and methods of space-based astronomy, the only thing left is to do space-based astronomy. This requires obtaining images to study.

Fortunately, obtaining images is very easy to do through the many astronomy Web sites available on the Internet. The list below provides several excellent resources. It must be remembered, however that Web site addresses sometimes change but old addresses will have a forwarding message leading the user to the new site. Furthermore, most sites link to other sites and the actual resources available on-line are much greater than shown here.

NASA maintains extensive Web sites related to astronomy. On the Office of Space Science site there are links to many astronomy spacecraft Web sites. Missions that have flown or are currently operating, such as the SOHO, Voyager, or Galileo missions will have many images to retrieve.

Unit Goal:

Students will use data found on Internet Web sites to investigate astronomical objects.

National Education Standards:

Mathematics

Connections

Science

Evidence, models, & explanation

Structure of the Earth system

Earth is the solar system

Technology

Understand relationships & connections among technologies & other fields

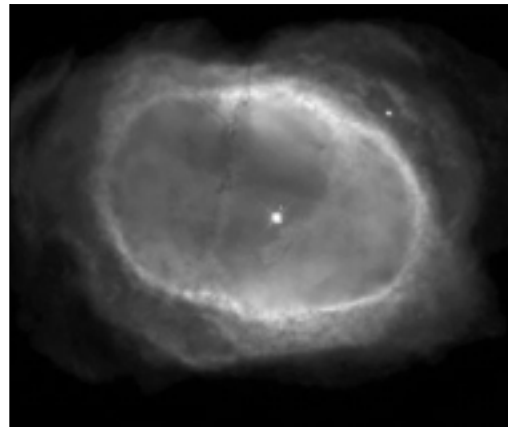
Understand cultural, social, economic, & political effects of technology

Understand, select, & use information & communication technologies

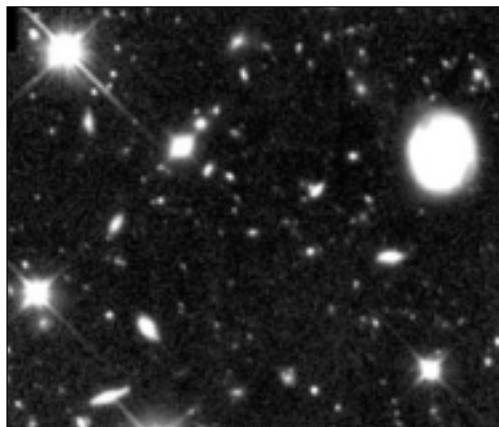
Teaching Strategy:

Using the Internet, students may retrieve Hubble Space Telescope and Compton Gamma Ray Observatory images as well as pictures from many other satellite observatories. The objects in the images can be examined by unaided visual inspection and compared to pictures taken of the same objects by ground-based observatories. However, the advantage of using computers to retrieve the images is that the same computers can be used to analyze the image with image processing programs. The images can be opened in public domain programs such as NIH Image (for

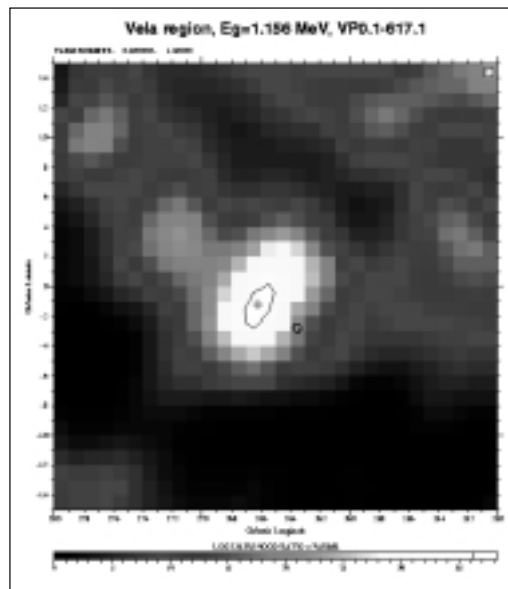
the Macintosh), Scion Image (for Windows-based computers), and various commercial image manipulation programs. These programs permit students to change the colors of selected parts of the image in order to enhance the contrast and reveal structures that might not be visible to the unaided eye. Measurement tools can be used to determine the size of objects if the distance to them is known, measure the relative brightness of stars, map distributions of objects, and so on.



StSci-PR98-39: Planetary Nebula NGC 3132



StSci-PR99-02: Combined Deep View of Infrared and Visible Light Galaxies



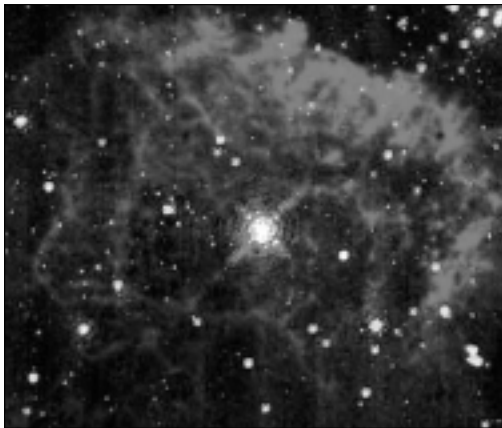
CGRO-Supernova: Supernova detected by the Compton Gamma Ray Observatory

In addition to the analysis of images, students also have access to telescopes that can be controlled remotely. Furthermore, many sites provide background information on a wide range of astronomical topics for research reports. Descriptions of proposed new spacecraft are also available as well as the research questions astronomers are trying to answer with them.

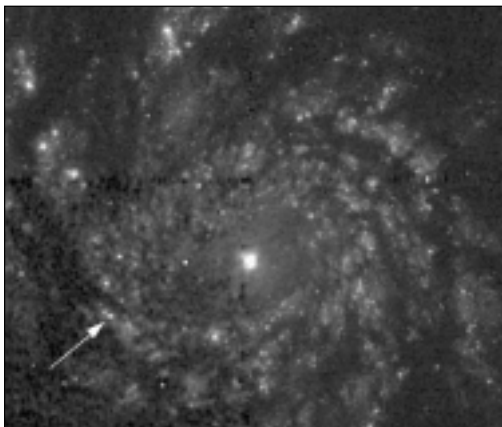
From the NASA Office of Space Science Web site comes the following list of fundamental questions they are trying to answer with their astronomy spacecraft. Some of these questions may inspire students into particular lines of research.

Fundamental Questions:

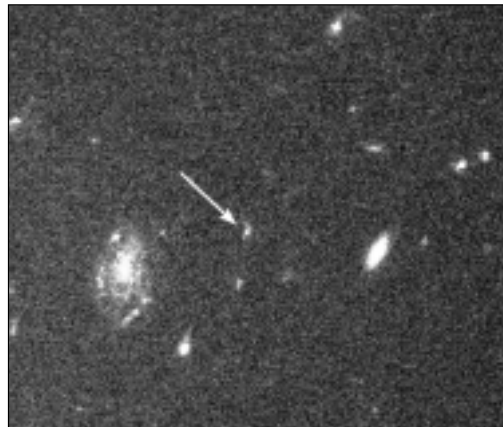
1. How did the Universe begin and what is its ultimate fate?
2. How do galaxies, stars, and planetary systems form and evolve?
3. What physical processes take place in extreme environments such as black holes?
4. How and where did life begin?
5. How is the evolution of life linked to planetary evolution and to cosmic phenomena?
6. How and why does the Sun vary and how do the Earth and other planets respond?
7. How might humans inhabit other worlds?



STSci-PRC97-33: One of the brightest stars in the Milky Way Galaxy glows with the radiance of 10 million Suns.



SN 19941: Supernova in galaxy M51



BRB 971214: Hubble Space Telescope view of the site of a gamma ray burst detected by the Keck 10-meter telescope

Deep Space Astronomy Web sites

NASA Resources

NASA Office of Space Science

<http://spacescience.nasa.gov>

<http://spacescience.nasa.gov/missions/index.html>

Planetary Photojournal

<http://photojournal.jpl.nasa.gov>

Images From High-Energy Astrophysics missions

http://heasarc.gsfc.nasa.gov/Images/pretty_pictures.html

Imagine the Universe

<http://imagine.gsfc.nasa.gov/docs/homepage.html>

StarChild Learning Center for Young Astronomers

<http://starchild.gsfc.nasa.gov/docs/StarChild/StarChild.html>

Astronomy & Astrophysics at the National Space Science Data Center

<http://nssdc.gsfc.nasa.gov/astro>

Telescopes in Education

http://learn.ivv.nasa.gov/products/k12/jpl_tie.html

Compton Gamma Ray Observatory

<http://cossr.gsfc.nasa.gov/cossr/PR.html>

Non-NASA Resources

AstroWeb

[http://www.stsci.edu/astroweb/astroweb.html](http://www.stsci.edu/astroweb/astroweb/astroweb.html)

Chandra Xray Observatory Center

<http://xrtpub.harvard.edu>

Space Telescope Science Institute

<http://oposite.stsci.edu/pubinfo>

Amazing Space Web-Based Activities

<http://amazing-space.stsci.edu>

National Astronomy Education Projects

<http://www.aspsky.org/html/naep/naep.html>

Stardate

<http://www.visionx.com/dd/main/star.htm>

Hubble Space Telescope Information

http://www.ncc.com/misc/hubble_sites.html

SEDS Messier Catalog

<http://www.seds.org/messier>

Astronomy Sites

<http://www.inlink.com/~tfc/stars.html>

NIH Image and Scion Image

<http://cipe.com/Software/Soft.html>