



# Satellite Imaging



**You Be The Scientist**

Elizabeth City State University

Aileen M. Seshun - November 2001 - May 2002



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## Administration

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### **New Plans/Suggestions for YBTS**

We now have a realistic picture of the challenges of this project, which includes the technology challenges. The YBTS program as we have implemented it through the Network Resources and Training Site is an after school enrichment program targeting grades 6-8. The key to success appears to be the design of a schedule, which promotes the successful understanding of satellite imagery, career information, and NASA's earth science mission. These are the larger program goals. Receiving the real time satellite data is just one of the objectives. With that firmly in mind, the project can proceed. I will continue to work on identifying a source of support for the technology through our own in-house personnel, GSFC personnel, and personnel (still to be identified) in VA/NC.

Linda Hayden informed me Tuesday evening (11/1/01) when I was at ECSU that we have to develop a theme for every month, keep records of the meetings, & progress according to a very specific plan. Continuation phases of the project will be as described below.

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#### **GOALS: YBTS with Satellite Imagery in EZ/EC Communities**

- Understanding of satellite imagery concepts
  - Sharing with students information on careers critical to NASA's overall mission
  - Sharing with students and educators information related to NASA's earth science enterprise
  - Support for and participation in NASA's existing earth science education projects and events.
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Here are a few suggestions for the focus for each month, but remember with the various meetings throughout the month, you will embellish with activities & projects appropriate to the theme. Please look over the list & let's try to come up with an agenda for the year, which will please everyone. I NEED your suggestions. I will compile them & return them to you for final selection.

- I will be glad to help with any of the activities, such as creating Q & A cards for the videos.
- I will send the URLs soon to which we can ass as we go along. Please send me any appropriate URLs you use or new ones you have found or find along the way.

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#### **• Administration - Monthly Miscellany**

- Update team web pages
  - Continue to add new photos of group activities/events
  - Continue to add interesting links
  - Add descriptions of activities/events/reports/drawings/contests/etc.
- Student Reports for Adjunct Trainer need to be completed & submitted on a monthly basis
- Have someone in student group maintain a list of the websites & include short descriptions with a rating from 1 to 5 / Design as a form to add to your web page
- Have students work for funding (community, local businesses, grant \$) to have an overnight at the VASC (include making/testing rockets, time in the AeroZone, etc.) – Fayetteville & Brawley might want to check with museums, which are closer

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**Suggested monthly themes:**

- **November** YBTS Missions & Goals
  - Echo the Bat: light, electromagnetic spectrum - use worksheets
  - **Infrared** video - create a Q & A on cards (have students select before film & tell them it will be their responsibility to review it with class after video)\*
  - Adventure of Echo the Bat with worksheets
- **December** Introduction to Remote Sensing & Satellites:
  - URLs to browse (have simple quizzes): Exploratorium, Observatorium- Learning without Touching, Third from the Sun, The Space Place, etc.
  - Research satellites: design or create a copy of one or make-believe
  - Video: **GOES**
  - Visit to VASC on Saturday, Dec. 15 - Let's plan some pre-visit activities to match our theme for the month & form class teams & assign each group a topic to review & take notes regarding Dec. themes as well as future themes (make the visit a productive as well as one visit)
- **January** Visualization of Satellite Imagery
  - Use Scientific Inquiry
  - Interpret NASA Lithographs in Teams (2 per team): Predict, analyze, verify using data on reverse sides of lithos, compare with Atlas maps, modify hypotheses, share findings with class C
  - Students in Teams of 3 to 5 per team complete 12 GVAR imagery projects from the list of projects at <http://coolspace.gsfc.nasa.gov/outreach/background/index.html> Activities which work well together:

1 - 5	3 - 4 - 10	8 - 9
2 - 11	6 - 7	(See Activity Descriptions.doc)
- These activities will require some modification since we no longer work with the GVAR software

  - SuperLooper Activities
- **February** Meteorology - Study Weather
  - Weather: clouds, temperatures - graph results for the month (compare with partner YBTS schools)
  - URLs: ww2010, Globe for clouds, Cloud Boutiques, etc.
  - Video: **Dance of Sky & Sea**
  - GVAR **&/or** SuperLooper Activities
- **March** Study Principles of Aviation & Rockets
  - Build & fly gliders, helos, and rockets
  - Record distances, heights, modifications, etc. & graph results
  - Conduct team competitions for which team design activities on their own / Have every team member try their own & record / Have every team try every other teams creation
- **April** Study Space Station & Shuttle Missions
  - Try experiments: plants, Glove Box experiments, etc.
- **May** NASA Careers in Math & Science (mathematics, computer science, geosciences, engineering, and physics)
  - Each student selects 3 & research in depth the current preference
  - Include short description of current preference
  - What academic subjects would be required to be studied
  - How many years of school &/or training

- Colleges & universities offering courses
- List possible scholarship & internship opportunities
- Internet options: Web Chats, NASA Quest, AstroVenture, NASA career video, Women of NASA

\* Do same for all videos - I can make up Q & A suggestions that you can print out, cut, & distribute to the students before the video.

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• **Subscribe or Register to:**

- NASA Connect - <http://connect.larc.nasa.gov> (to register)
- NASA "why?" Files - <http://edu.larc.nasa.gov/dl.html> (no subscription)
- WON (Women of NASA) - Send a message to: [listmanager@quest.arc.nasa.gov](mailto:listmanager@quest.arc.nasa.gov) / Leave the Subject line blank, & in the Message body, type: ***subscribe updates-won***
- NASA Quest / AstroVenture & NASA Ames Education Technology Team Updates
- Mark calendar for webcasts
- Check with school computer technicians to verify webcasts will be possible

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**New URLs**

Check out this site & scroll down to 'Types of Satellites' to see Polar orbiting & Geosynchronous satellites spinning around the earth.

[http://daac.gsfc.nasa.gov/CAMPAIGN\\_DOCS/atmospheric\\_dynamics/ad\\_education/remote.htm](http://daac.gsfc.nasa.gov/CAMPAIGN_DOCS/atmospheric_dynamics/ad_education/remote.htm)

Here's another wonderful RS site: <http://www.comet.ucar.edu/nsflab/web/remote/index.htm> I love the remote sensing exercise. This would be a great project for the students. Have them collect in-situ sensors graphics & remote sensors graphics from the Internet or magazines at home. Glue/paste them on stiff paper & mount with Velcro so they can be moved into the appropriate boxes that they would first draw on a big poster board. Check it out & see what you think. This way different children could try their hand at making the right choices. If they are pasted onto the poster board it will be a static display & not a continuous learning tool.

# November    YBTS Missions & Goals & Introduction

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**Echo the Bat:** light, electromagnetic spectrum - use worksheets

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## **Navigating Echo the Bat website**

Look at Home Page & discuss routing (stay with me / turn over mouse when asked)  
Next, click on *Adventures of Echo the Bat* (OR read from the Echo Po-Up Book)

Note: The Pop-Up Book has some Activities of it's own.

SKIM the story / Do NOT Begin the Adventure / Back out address to return to  
Home Page (delete *intro/intro12.html* from URL above)

[imagers.gsfc.nasa.gov/](http://imagers.gsfc.nasa.gov/)  
[imagers.gsfc.nasa.gov/intro/story.html](http://imagers.gsfc.nasa.gov/intro/story.html)

[imagers.gsfc.nasa.gov/](http://imagers.gsfc.nasa.gov/)

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## **Teacher's Guide or Student's Guide**

[imagers.gsfc.nasa.gov/teachersite/index.html](http://imagers.gsfc.nasa.gov/teachersite/index.html)

### ***Unit I - Understanding Light*** (Click on *Understanding Light*)

1 Lesson - Primary Colors of Light

Activity 1 - Have students work on the Birds & Bats Venn Diagram

Activity 1B - Review 'Interesting Facts about Light'

Activity 1C - Have students create hand shadows (see copy)

Activity 2 - Primary Colors of Light worksheet & RGB Color Board (a MUST DO)

Click on ***IMAGERS color mixing page at***

& practice mixing the colors / Then complete Venn Diagram of Primary Colors

[imagers.gsfc.nasa.gov/teachersite/UL1.htm](http://imagers.gsfc.nasa.gov/teachersite/UL1.htm)

Handouts (Venn Diagram Exercises)

Handout

Handout

Handouts (Primary Colors worksheet)

[imagers.gsfc.nasa.gov/color/title.html](http://imagers.gsfc.nasa.gov/color/title.html)

Return to Teacher's Site

Return to Teacher's Site

2 Lesson - What Color Is It? (Show color paddles (or cellophane) with flashlights)

3 Lesson - Electromagnetic Spectrum (Radio, Microwaves, IR, Visible)

Scroll down & click on ***IMAGERS - Electromagnetic Spectrum Web Site***

Activity 3, 4, 5, & 6 - Slinky, prism, Liquid Crystal IR Detector, & Wavestown worksheet

Activity 7 & 8 - IR video -

a) Create a Q & A: On 3 X 5 cards (have students select before film & tell them it will be their responsibility to review it with class after video) OR

b) Online quiz - do as a Pre-Test & Post-Test (before & after film) \*

Activity 9 - Have students work on the Infrared Light & Visible Light Venn Diagram

Handouts (Venn Diagram Exercises)

Activity 10 - URLs to cover (See Remote Sensing Interactive URL List): a) The Exploratorium & b) NASA's Observatorium

[imagers.gsfc.nasa.gov/teachersite/UL3.htm](http://imagers.gsfc.nasa.gov/teachersite/UL3.htm)

[imagers.gsfc.nasa.gov/ems/ems.html](http://imagers.gsfc.nasa.gov/ems/ems.html)

Handouts (Wavestown worksheet)

[school.discovery.com/quizzes10/ybts/IRQuiz.html](http://school.discovery.com/quizzes10/ybts/IRQuiz.html)

[www.exploratorium.edu/exhibits/f\\_exhibits.html](http://www.exploratorium.edu/exhibits/f_exhibits.html)  
[observe.ivv.nasa.gov/nasa/education/gis/opening.html](http://observe.ivv.nasa.gov/nasa/education/gis/opening.html)

Note Resources

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## Unit II - Remote Sensing (definition)

1 Lesson - What are we looking at? (pennies in grass)

Activity 11 - Draw keyboard (paper cup, any object) from eye level (kneel down to look at keyboard) & when standing up & draw keyboard while looking down at it / Discuss differences

Activity 12 - Look over the Perspective Pictures

Click on **Back button** instead of Return to Teacher's Site

2 Lesson - What are satellites?

Activity 13 - Look over Pictures of Satellites & point out the six main components (or subsystems) that satellites require (students can build satellites)

Click on **Back button** instead of Return to Teacher's Site

3 Lesson - Adventure of Echo the Bat

Click on **Content Map** of all the areas that Echo visits (check later)

Next click on **Student's Site** & then click on **Echo** (check other areas later)

NOW change URL

Click on appropriate browser for your computer / Read text / Click on

**ACCEPT YOUR MISSION**

Activity 14 - Work in pairs: 1 at computer & other marking 10 locations on the map

IF time is short, we may stop after only 2 or 3 sightings & move on to worksheet

Activity 15 - Work in pairs: 1 measure distances between points & other fill out worksheet

[imagers.gsfc.nasa.gov/teachersite/RSi.htm](http://imagers.gsfc.nasa.gov/teachersite/RSi.htm)

[imagers.gsfc.nasa.gov/teachersite/RS1.html](http://imagers.gsfc.nasa.gov/teachersite/RS1.html)

[imagers.gsfc.nasa.gov/teachersite/RS2.html#tips](http://imagers.gsfc.nasa.gov/teachersite/RS2.html#tips)

[imagers.gsfc.nasa.gov/teachersite/RS3.htm](http://imagers.gsfc.nasa.gov/teachersite/RS3.htm)

[imagers.gsfc.nasa.gov/teachersite/content.html](http://imagers.gsfc.nasa.gov/teachersite/content.html)

[imagers.gsfc.nasa.gov/adventure/setup.html](http://imagers.gsfc.nasa.gov/adventure/setup.html)

Begin the Adventure

Handouts (map & location worksheet)

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## Specific URLs for this Topic

Electromagnetic Spectrum Quiz (only 4 questions)

[imagine.gsfc.nasa.gov/cgi-bin/print.pl](http://imagine.gsfc.nasa.gov/cgi-bin/print.pl)

Visible & Infrared Imagery

[octopus.gma.org/surfing/sensing/imagery.html](http://octopus.gma.org/surfing/sensing/imagery.html)

Remote vs. In-situ Sensing: Sensing Interactive Exercise (click & drag items into correct categories)

[www.comet.ucar.edu/nsflab/web/remote/114.htm](http://www.comet.ucar.edu/nsflab/web/remote/114.htm)

Nature of an Image - description of multi-spectral images (R, G, B)

[www.nr.usu.edu/Geography-Department/rsgis/Remsen1/lee3/imgnatr.html](http://www.nr.usu.edu/Geography-Department/rsgis/Remsen1/lee3/imgnatr.html)

General Wave Motion (great info)

[www.school-for-champions.com/science/waves.htm](http://www.school-for-champions.com/science/waves.htm)

A Global View of the Earth : Curriculum Materials for Echo the Bat

[tpwww.gsfc.nasa.gov/landsat7/teacherkit/index.html](http://tpwww.gsfc.nasa.gov/landsat7/teacherkit/index.html)

Lesson 2 - Landsat-7 TM Image Interpretation

[tpwww.gsfc.nasa.gov/landsat7/teacherkit/html/lesson2.html](http://tpwww.gsfc.nasa.gov/landsat7/teacherkit/html/lesson2.html)

(wonderful set of 10 mystery images - worksheet can be printed)

[tpwww.gsfc.nasa.gov/landsat7/teacherkit/html/lsn2wk2.html](http://tpwww.gsfc.nasa.gov/landsat7/teacherkit/html/lsn2wk2.html)

Landsat Program

[geo.arc.nasa.gov/sge/landsat/landsat.html](http://geo.arc.nasa.gov/sge/landsat/landsat.html)

NASA Observatorium Image Gallery

[observe.ivv.nasa.gov/nasa/gallery/image\\_index.shtml.html](http://observe.ivv.nasa.gov/nasa/gallery/image_index.shtml.html)

NASA Explores - HDTV: Coming Soon to a Television Near You

[www.nasa.explores.com](http://www.nasa.explores.com)

- K-4: Lesson 1 - Reflect or Absorb & Lesson 2 Coding an Image

- 5-8: Lesson 1 - Tasty Pixels & Lesson 2 - Imagery Activity
- 9-12: Lesson 1 - Binary Code & Lesson 2 - Digital Versus Analog

NASA Explores - Mapping the Earth from Space

- K-4: Lesson 1 - Relief Maps & Lesson 2 - Making a Topographical Map
- 5-8: Lesson 1 - Shuttle Orbits & Lesson 2 - Reading Topographical Maps
- 9-12: Lesson 1 - Map Makers

[www.nasa.explores.com](http://www.nasa.explores.com)

## **Complete YBTS Meeting Report Work on YBTS School Website**

- \* Do same for all videos - I can make up Q & A suggestions that you can print out, cut, & distribute to the students before the video.

## December Introduction to Remote Sensing & Satellites:

### **Echo the Bat - Lesson 2:** Remote Sensing

- Activity 1, 2, 3 - Digital Artwork - Pixels
  - Forms teams of two
  - Fold square 16ths & practice sending & receiving (write letters across top & numbers down the
  - Use Echo worksheets to send & receive (write letters across top & numbers down the left side
- Activity 4 - Binary Code Exercise

Handout paper left side [like Excel])  
Handout Echo digital art worksheets [like Excel])

### **URLs to browse** (most have simple quizzes):

- Observatorium
  - Better Living through Geopyspatial Analysis - An Introduction
  - Remote Sensing - A Non-Contact Sport: A Tutorial
  - NASA Observatorium Education - Remote Sensing Basics (PowerPoint Quiz to match)  
RS Asses.ppt - Print out as a handout (or can do on computer if able to print completion
  - Learning without Touching
- Exploratorium - Third from the Sun
  - Activity 5 - Quiz: three visuals to identify
- The Space Place - Spacey Things to Do
  - Activity 6 - Telling a Pine from a Maple Tree ... from Space / Adjust color imaging of trees
  - Activity 6B - the IR Matching game
- Activity 7 - What is Remote Sensing?
- Possible Activity 7B - Mission to Planet Earth
- Research satellites:
  - Activity 8 - design or create a copy of one or an make-believe
  - Remote Sensing: the online guides / Click on Satellites
- GOES & NOAA satellites
  - Look over GOES & NOAA booklets
  - GOES Bands
  - The GOES System
  - Satellite Imaging Channel Categories
- Video: GOES
  - Activity 9 - Video quiz
  - Activity 10 - VCP Inventory
- Interpreting IR Imagery / Read & click on 'Go on to interactive exercise' button
- Visible Earth

[observe.ivv.nasa.gov/nasa/education/gis/opening.html](http://observe.ivv.nasa.gov/nasa/education/gis/opening.html)

[observe.ivv.nasa.gov/nasa/education/reference/main.html](http://observe.ivv.nasa.gov/nasa/education/reference/main.html)

Handout or complete of computer AND print out

[observe.ivv.nasa.gov/nasa/exhibits/learning/learning\\_0.html](http://observe.ivv.nasa.gov/nasa/exhibits/learning/learning_0.html)

[www.exploratorium.edu/learning\\_studio/landsat/](http://www.exploratorium.edu/learning_studio/landsat/)

[spaceplace.jpl.nasa.gov/eol\\_1.htm](http://spaceplace.jpl.nasa.gov/eol_1.htm)

[spaceplace.jpl.nasa.gov/spacepl.htm](http://spaceplace.jpl.nasa.gov/spacepl.htm)

[education.ssc.nasa.gov/ltp/LessonPlans/WhatIs.htm](http://education.ssc.nasa.gov/ltp/LessonPlans/WhatIs.htm)

Handout & [http://ericir.syr.edu/Projects/NASA/module1\\_a.html](http://ericir.syr.edu/Projects/NASA/module1_a.html)

[ww2010.atmos.uiuc.edu/\(Gh\)/guides/rs/home.rxml](http://ww2010.atmos.uiuc.edu/(Gh)/guides/rs/home.rxml)

NOAA & Raytheon Booklets

Handout (GOES Bands.doc)

Handout (GOES Instruments.doc)

Handout (ChannelTableW.doc)

Video - GOES

Computer

Handout (VCP SatImagery MS.doc)

[cimss.ssec.wisc.edu/wxwise.satir](http://cimss.ssec.wisc.edu/wxwise/satir)

[visibleearth.gov](http://visibleearth.gov)

- Activity 11 - Flashcard Exchange / Click on Middle School 6-8, then Science, then click on Remote Sensing  
Next click on Card Viewer to see the cards (Q & A) or Card Printer to print them in different formats
- Remote Sensing Background Q & A *for Teachers*

Handout from [www.flashcardexchange.com/index.jsp](http://www.flashcardexchange.com/index.jsp)

[squall.sfsu.edu/m101/lab9.html](http://squall.sfsu.edu/m101/lab9.html)

### Visit to VASC on Saturday, Dec. 15

Let's plan some pre-visit activities to match our theme for the month & form class teams & assign each group a topic to review & take notes regarding Dec. themes as well as future themes (make the visit a productive as well as one visit)

### Send a question on RS weekly to each school or put on school website

- Have someone at each school compile (with answers) & respond to submitted answers from other schools
- Play RS Jeopardy via email
- Supporting interactive websites (see Remote Sensing URLs.doc)
  - Interpreting IR Imagery
  - Amazing Space
  - AstroVenture (careers)
  - The Observatory
  - Earth View

[cimss.ssec.wisc.edu/wxwise/satir](http://cimss.ssec.wisc.edu/wxwise/satir)

[amazing-space.stsci.edu](http://amazing-space.stsci.edu)

[astroventure.arc.nasa.gov/is/fact\\_sheets.html](http://astroventure.arc.nasa.gov/is/fact_sheets.html)

[observe.ivv.nasa.gov/nasa/education/gis/opening.html](http://observe.ivv.nasa.gov/nasa/education/gis/opening.html)

[www.fourmilab.to/cgi-bin/uncqi/Earth](http://www.fourmilab.to/cgi-bin/uncqi/Earth)

### Specific URLs for this Topic

How Satellites See by Christina Wilder (Univ of CA - Berkeley)  
 NASA Satellites & Electromagnetic Spectrum Lesson Plan & Activities  
 Guess where this is? Quiz (Click on Quiz)  
 What is Imaging Radar? (Read first 3 paragraphs / Click on 'Click Here to See Animation')

[cse.ssl.berkeley.edu/lessons/indiv/wilder/details.html](http://cse.ssl.berkeley.edu/lessons/indiv/wilder/details.html)

[cse.ssl.berkeley.edu/lessons/indiv/wilder/summary.html](http://cse.ssl.berkeley.edu/lessons/indiv/wilder/summary.html)

[southport.jpl.nasa.gov/education/reference.html](http://southport.jpl.nasa.gov/education/reference.html)

[southport.jpl.nasa.gov/desc/imagingradarv3.html](http://southport.jpl.nasa.gov/desc/imagingradarv3.html)

## Complete YBTS Meeting Report Work on YBTS School Website

## January      Visualization of Satellite Imagery

### Start Adventure of Echo the Bat

- Activity 1 - Begin the adventure - Click on Echo's picture & ACCEPT YOUR MISSION [imagers.gsfc.nasa.gov/student.html](http://imagers.gsfc.nasa.gov/student.html)
- Activity 2 - Work with the map of Arizona - Record sightings of Echo on map  
- Calculate the distance that Echo flies in kilometers & then miles) - see Answer Sheet  
Handout of Arizona map  
Handout of 'Distance' sheet
- **Note:** Teachers Review the 'Links to Interactive Story Content' in Teacher's Guide [imagers.gsfc.nasa.gov/teachersite/content.html](http://imagers.gsfc.nasa.gov/teachersite/content.html)
- Different Habitats: How can we find a forest in the satellite image? [imagers.gsfc.nasa.gov/adventure/habitats.html](http://imagers.gsfc.nasa.gov/adventure/habitats.html)
- Activity 2B - Interpreting Satellite Images [imagers.gsfc.nasa.gov/teachersite/rs\\_stdnt.html](http://imagers.gsfc.nasa.gov/teachersite/rs_stdnt.html)  
Choose 2 pictures & work in teams of 2 / Complete worksheet Interpreting Satellite Images  
Handout from litho packet

### Use Scientific Inquiry

- Collect the Data
- Organize the Data
- Analyze the Data
- Display the Data

### Interpret NASA Lithographs in Teams (2 per team):

- Activity 3 - Where in the US is this? (See handout) - Use as a lead in [southport.jpl.nasa.gov/cgi-bin/als/southport/juess.cgi?score](http://southport.jpl.nasa.gov/cgi-bin/als/southport/juess.cgi?score)
- Review EarthKAM website for activities & info on how to interpret images  
*Teacher's Guide* (lots of great information & activities) [www.earthkan.ucsd.edu/](http://www.earthkan.ucsd.edu/)  
[www.earthkam.ucsd.edu/public/educators/resources/curriculum/](http://www.earthkam.ucsd.edu/public/educators/resources/curriculum/)
- Our Location on Earth - Latitude & Longitude  
- Optional Activity 3B - Compass Lesson - Geography on the Net [www.relatedata.com/mystars/course/latlng.shtml](http://www.relatedata.com/mystars/course/latlng.shtml)  
[www.angelfire.com/fl/complexx/index.html](http://www.angelfire.com/fl/complexx/index.html)
- Activity 4 - Predict, analyze, verify using data on reverse sides of lithos, compare with Atlas maps, modify hypotheses, share findings with class
- Activity 5 - Send teams Internet images to explore & describe & compare to what originating team determined (could use a simple email form) / First send image, ask for description, then send website, so students can see how close they came to correct analysis **OR** Compare interpretations of lithographs  
- Exploring Earth from Space (lithographs) NASA lithographs  
- Echo the Bat (Images of Arizona - Echo Teachers/Students' Sites &/or from the Pop-Up Book) Echo printouts & Echo Pop-Up book  
- Our Mission to Planet Earth (lithographs) NASA lithographs

***Following Activities are to be Covered on an 'Either/Or Basis' - Those with GVAR would do the SuperLooper Activities (SL Kickoffs-June.doc) & those without would do the GVAR Activities (Activity Descriptions.doc) with Modifications.***

### GVAR Activities / Projects

- Work on activities in teams / Maybe several teams to accommodate working on the grouped activities in a single class period or two

- Share results with partner school via Email &/or Fax (what did each do differently, what learn from each other, share suggestions, OR each school do one activity of a group, & send results to the other school to review, but not to do themselves)
- Students in Teams of 3 to 5 per team complete 12 GVAR imagery projects from the list of projects. See list included in packet.
- Activities which work well together:
 

1 - 5	3 - 4 - 10	8 - 9
2 - 11	6 - 7	(See attached groupings & descriptions)
- Karen Steele has offered to have her group work on a few of the following: 5 3 10 6 8

**Note:** These activities will require some modification since we no longer work with the GVAR software

### SuperLooper Kickoff Plays

- For those with access to GVAR software - See notes

### For Teacher - See ONR Intro Notes

- ONR Intro Notes - Topics for discussion
- Image Interpretation

Agenda & URLs.doc (pgs. 1T & 2S)

### Specific URLs for this Topic

- Satellite Interpretation Tutorials / Image Examples
- Time Labels on Satellite Images & Weather Maps
- Geostationary Satellite Server
- Earth Images from Space
- Eyes in the Sky (Short image quiz)
- CCRS Visual Interpretation & Analysis (Short image quiz)

[orbit-net.nesdis.noaa.gov/arad/fpdt/tutor.html](http://orbit-net.nesdis.noaa.gov/arad/fpdt/tutor.html)  
[squall.sfsu.edu/m101/satlab/BQ/UTC\\_info.html](http://squall.sfsu.edu/m101/satlab/BQ/UTC_info.html)  
[www.goes.noaa.gov/](http://www.goes.noaa.gov/)  
[spacelink.nasa.gov/Instructional.Materials/Curriculum.Support/Earth.Science/Earth](http://spacelink.nasa.gov/Instructional.Materials/Curriculum.Support/Earth.Science/Earth)  
[observe.ivv.nasa.gov/nasa/exhibits/eyes\\_sky/remote\\_main.html](http://observe.ivv.nasa.gov/nasa/exhibits/eyes_sky/remote_main.html)  
[www.ccrs.nrcan.gc.ca/ccrs/eduref/tutorial/indexe.html](http://www.ccrs.nrcan.gc.ca/ccrs/eduref/tutorial/indexe.html)

### Complete YBTS Meeting Report Work on YBTS School Website



## February      Meteorology - Study Weather

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### Weather: clouds, temperatures

- Review Weather Basics (See handout) [www.usatoday.com/weather/wcloud0.htm](http://www.usatoday.com/weather/wcloud0.htm)
- Clouds & weather - Go outside:
  - Discuss weather & clouds & the browse appropriate websites
  - Discuss clouds simply (how to describe without proper name)
  - Estimate cloud cover
  - Determine temperature outside
  - Record all information
  - Return inside
- Observe Cloud Types [archive.globe.gov/sda-bin/wt/ghp/tg+L\(en\)+P\(atmosphere/ObservingCloudType\)](http://archive.globe.gov/sda-bin/wt/ghp/tg+L(en)+P(atmosphere/ObservingCloudType))
- - Activity 1 - Print cloud pictures in **color**/ cut out & make cards (side one with cloud & side 2 with description) [askeric.org/Virtual/Lessons/Science/Meteorology/MET0003.html](http://askeric.org/Virtual/Lessons/Science/Meteorology/MET0003.html)
- Activity 2 - Clouds in a bottle
- Weather Meteorology Atmosphere/Internet - Atmosphere:  
Activity 3 - Interactive Downloads (work in teams & report to others) [www.eoascientific.com/prototype/newcampus/atmosphere/atmosint.html](http://www.eoascientific.com/prototype/newcampus/atmosphere/atmosint.html)

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### Weather logs

- Activity 4 - Keep a weather log between the participating cities & have the students compare records & graph comparisons
- Fayetteville      Portsmouth (or Norfolk)      Elizabeth City      Other [www.wunderground.com/](http://www.wunderground.com/)
  - Graph results for the month (compare with partner YBTS schools)
  - Gather info from other YBTS cities & use chart (handout) or one of own design
- URLs: Review GOES imaging websites (see Remote Sensing URLs.doc)
  - Introduction to Clouds [www.usatoday.com/weather/wcloud0.htm](http://www.usatoday.com/weather/wcloud0.htm)
  - USA Today [www.usatoday.com/weather/wfront.htm](http://www.usatoday.com/weather/wfront.htm)
  - ww2010, Globe (for clouds, Cloud Boutiques, etc.) [ww2010.atmos.uiuc.edu/\(Gh\)/wx/usrgd/home.rxml](http://ww2010.atmos.uiuc.edu/(Gh)/wx/usrgd/home.rxml)
- Video: *Dance of Sky & Sea*
  - Activity5 -Have students complete Quiz [school.discovery.com/quizzes10/ybts/SeaSky/html](http://school.discovery.com/quizzes10/ybts/SeaSky/html)
- Activity 6 - Make weather cards (image on 1 side & description on other) See handout of samples
- Activity 7 - Basic Thinking Skills - Analogies Handout
- Activity 8 - Collect newspaper Weather Maps to use for recording & graphing

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### Keep track of storms or weather alerts

- Activity 9 - Track storms or weather alerts & how they are different in each city
- Hurricane      Tornado      Flood warnings      Air pollution      Excessive heat
- Measure storm distances traveled & speed

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### Review Interactive Weather URLs

See handouts

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**Install Weather Bug from Wavy 10**

[www.weatherbug.com](http://www.weatherbug.com)

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**Books & Miscellaneous**

- Activity - NASA Connect - Measurement, Ratios, & Graphing: Safety First (GAME) \_Use in place of some of the above activities
- OR
- Activity - NASA Connect - Data Analysis & Measurement: Ahead, Above the Clouds
  - Discovery Channel Weather: An Explore your World Handbook ISBN 1-56331-802-4
  - The Weather Book by Jack Williams - USA Today ISBN 0-679-7766506

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**Other Materials for this Topic**

NASA Looking at Earth from Space (thick red book)

**Complete YBTS Meeting Report  
Work on YBTS School Website**



## March Principles of Aviation & Rockets

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### Basics of Aviation

- Gravity, Lift, Thrust, & Drag
- *Learn to Fly* (basics of flight & parts of an airplane & cockpit controls)

Handouts  
Handout

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### Famous Scientists

- Newton
- Bernoulli

Handout

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### Aviation Websites

- Plane Math
- K-8 Aeronautics

[www.planemath.com](http://www.planemath.com)  
[wings.ucdavis.edu](http://wings.ucdavis.edu)

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### Activities

- Build & fly
  - Gliders: Kuderia & Kimoto Flyers & Ring Wing Gliders (have students design their own)
  - Whirlybirds or Helos
  - Rockets
- Record distances, heights, modifications, etc. & graph results
  - Conduct team competitions for which team design activities independently
  - Have team members try their own aircraft & record
  - Have every team try every other teams creation
- Soaring Aloft: Inference & Problem Solving

Handout  
Handout  
Handout

Handout

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### Specific URLs for this Topic

Curriculum Bridges: Nature (Aviation)

[wings.ucdavis.edu/Curriculums/Nature/nature\\_links.html](http://wings.ucdavis.edu/Curriculums/Nature/nature_links.html)

**Complete YBTS Meeting Report**  
**Work on YBTS School Website**



## April    Space Station & Shuttle Missions

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### Space Shuttle

- Space Shuttle Flights
- Review Space shuttle & Rocket picture
- See Living in Space NASA book with many activities - choose any
- NASA Explores - Mapping the Earth from Space
  - 5-8: Lesson 1 - Shuttle Orbits

[www.jpl.nasa.gov/srtm/missionoverview.html](http://www.jpl.nasa.gov/srtm/missionoverview.html)  
[spaceflight.nasa.gov/spaceflight.nasa.gov/shuttle/archives.sts-99/index.html](http://spaceflight.nasa.gov/spaceflight.nasa.gov/shuttle/archives.sts-99/index.html)

Handout  
Request from ERC at VASC  
[www.nasa.explores.com](http://www.nasa.explores.com)

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### International Space Station

- Learn what countries are working together
- Learn about different compartments / experiments / astronauts / living conditions
- Review Space Station Environmental Regenerative Flow Diagram
- Activity - Make a Spacelab Model
- Track the Satellite in your night sky

Handout

Handout

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### Space Colonies

- Activity - make colonies using plastic picnic plates
- Perform experiments: plants, Glove Box experiments, etc.

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### Specific URLs for this Topic

**Complete YBTS Meeting Report**  
**Work on YBTS School Website**



## **May** NASA Careers in Math & Science

(mathematics, computer science, geosciences, engineering, physics, etc.)

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**Review World-of Work Map**

Handout

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**Activity - NASA Explores - My Goals**

LP Handout

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**Activity - Spaceworks**

Handout

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### **Each student Select 3 Careers & Research in Depth the Current Preference**

- Include short description of current preference
- What academic subjects would be required to be studied
- How many years of school &/or training
- Colleges & universities offering courses
- List possible scholarship & internship opportunities
- Internet options: Web Chats, NASA Quest, AstroVenture, NASA career video, Women of NASA
- Create a career map for the selected career
  - Use Career Worksheets to record career research (I Want to Be Like Her & I Want to Be Like Him)
  - Include pictures, articles, & information from research just accomplished
  - Create Career Trading Cards - Check the NASA Explores Astronaut Trading Cards
  - Famous Scientist's Laws They Discovered

See NASA Superstars of Science handout for sample

Handout

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### **Specific URLs for this Topic**

AstroVenture (careers)

[astroventure.arc.nasa.gov/is/fact\\_sheets.html](http://astroventure.arc.nasa.gov/is/fact_sheets.html)

**Complete YBTS Meeting Report**  
**Work on YBTS School Website**

## **Student Notebooks Outline** (*suggested inclusions*)

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**Students create a personal notebook** to include (not every school team may be doing the same thing, but these are recommendations):

- Their application letter & acceptance
- Personal bio (suitable for web - Can use nickname on web)
- Weekly log of YBTS meetings, activities, trips
- Summaries of guests: short bio & activities
- Activities: description. Worksheets, displays, competitions, artwork.
- YBTS photos (scanned or digital)
- Personal contributions to YBTS website
- Careers (at least 3) selected for research: include short description of current preference, what academic subjects would be required to be studied, how many years of school &/or training, list possible scholarship & internship opportunities

## Worksheets, New URLs & Miscellaneous Activities for any Month

### Remote Sensing Interactive URL List

- Remote Sensing URLs2.doc
- See list of Imagery Activities which follows

### Remote Sensing / Satellite Flashcards

Select one day a month for both schools when they could be in contact with each other at the same time (I would prefer to be there, but it's not necessary)

### Create a scavenger hunt

See which school can report the most finds at the end of the meeting

### Share web pages

Ideas  
Graphics  
Games  
Quizzes  
Experiments

**Each school describe an activity or experiment** (including materials needed, directions, expected results & reasons for results - like what the summer school program students did - you missed those) for the other to perform & report on the results (light, wavelengths, electromagnetic spectrum, etc.)

From: Van Cleave's science books / Internet / any science book

**Create a game or quiz** on each school's web page to be played by the other (would have to print out & fax back or email results or comments) - or link to a neat game on the web for each school to try & then comment report back to the other

Amazing Space: [amazing-space.stsci.edu](http://amazing-space.stsci.edu)  
record wins of playing cards  
record time to complete concentration puzzle

Exploratorium: [www.exploratorium.edu/exhibits/f\\_exhibits.html](http://www.exploratorium.edu/exhibits/f_exhibits.html)  
which activity liked best - why?  
which activity liked least - why?

Observatorium [observe.ivv.nasa.gov/nasa/fun/fun\\_index.shtml.html](http://observe.ivv.nasa.gov/nasa/fun/fun_index.shtml.html)  
[observe.ivv.nasa.gov/nasa/fun/concentrate/concentration.html](http://observe.ivv.nasa.gov/nasa/fun/concentrate/concentration.html) record time to complete concentration puzzle

# Imagery Activities for YBTS

October 2001 - May 2002

<http://coolspace.gsfc.nasa.gov/outreach/index.html>

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## Nature of Student Projects

Students will work in teams & will interact during the weekly project meetings. A detailed description of each project follows. The visualization (Satellite Imagery) project has several components each of which will enhance the student's understanding of fundamental remote sensing concepts.

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## Satellite Imagery Activities:

### 1. Air Masses of the Earth

**Abstract:** This activity introduces the student to the five basic air masses that affect weather in our hemisphere. Using real-time satellite imagery, the student will then locate the probable location of these air masses and predict current movements.

**Outcomes:** The student will

- Be able to identify the five air masses that typically affect the weather in the Northern Hemisphere.
  - Be able to identify the current location of these air masses using satellite imagery.
  - Label a map of the Northern Hemisphere with the correct location of the air masses.
  - Predict where these air masses are travelling or if they are stationary.
  - Gain an introduction to fronts that relate to the boundary of air masses.
- 

### 5. Cold Fronts - A Violent Meeting

**Abstract:** This activity will cover the development of cold fronts and link their movement to the overall movement of air masses on the Earth.

**Outcomes:** The student will

- Understand the dynamic forces that create a cold front, and locate a cold front using satellite imagery.
  - Be able to indicate a cold front on a weather map.
  - Create a hypothesis and test this hypothesis using satellite interpretation.
- 
- 

### 2. Atmospheric Absorption

**Abstract:** This activity discusses the atmospheric absorption spectrum. The student will determine the extent to which each channel is affected by atmospheric absorption and form a hypothesis about which channels are most likely to make accurate surface temperature measurements. The student will then test this hypothesis by taking temperature measurements in all the infrared channels and comparing them to ground truth data from ground stations and specialized sea surface temperature satellites.

He/she will then quantify the deviation of the GOES surface temperature measurements from the ground truth data to confirm or negate the hypothesis.

**Outcome:** The student will

- Learn about the absorption spectrum of various atmospheric constituents
  - Use his or her knowledge about atmospheric absorption to form a hypothesis that answers the question, "Which GOES channels can be used to make surface temperature measurements?"
  - Be able to cross reference ground truth data with satellite data to quantify the accuracy achieved by various satellite channels.
- 

### 3. Climbing to New Heights

**Abstract:** This activity involves students in the process of identifying cloud types and movement from a satellite image and gathering data through a 48-hour period. Lifting mechanisms that produce clouds will be investigated and the influence of topography on cloud development will be described. This activity should follow successful completion of the basic series of website activities.

**Outcomes:** The student will

- Distinguish between the various cloud types
  - Identify areas of cloud development in a satellite image
  - Construct a loop of GOES images showing cloud formation and movement.
  - Track cloud movements over the continental United States recording changes in altitude and temperature as influenced by topography.
- 

### 4. Graphing Cloud Height vs. Temperature

**Abstract:** The student will create a data table of cloud height and temperature, using derived image channels and latitude/longitude coordinates to locate points, and create a graph of cloud height vs. temperature by plotting these points on an x-y axis. Once the graph has been created, the student must draw conclusions about the mathematical relationship between cloud height and temperature and its effect on the weather.

**Outcomes:** The student will

- Be able to use the GVAR software to locate specific points and create a data table.
  - Be able to plot a graph on an x-y axis.
  - Determine if a graph represents a direct, inverse, or nonexistent relationship between two variables.
- 

### 10. High Level Clouds - What's up?

**Abstract:** This activity will involve identifying clouds in the high level cloud group. It will cover the development of these clouds and the weather associated with the different clouds in this group.

**Outcomes:** Students will

- Be able to identify clouds in the high cloud grouping by picture identification and satellite imagery identification.
  - Classify clouds into separate groups and create a cloud library of these clouds.
  - Predict what type of weather an area had, is having and is going to have based on the types of clouds that are present.
  - Use a combination of visible and infrared imagery.
- 

## 6. The Coriolis Effect

**Abstract:** This activity will explore the causes of the Coriolis Effect and analyze how this effect determines wind movement and weather throughout the globe. Students will learn the science behind the Coriolis Effect by examining various websites and doing some hands-on demonstrations. Satellite images will then be used to analyze the global impact of this.

**Outcomes:** The student will

- Be able to describe the mechanism that causes the Coriolis Effect.
  - Be able to demonstrate the Coriolis Effect using at least two methods.
  - Be able to predict high and low pressure from the air movement in satellite images.
- 

## 7. The Diurnal Cycle

**Abstract:** This activity will introduce the diurnal cycle and its effects on the global processes that shape our earth. It begins with an introduction to the mechanisms that drive this heat cycle and continues by having students track this with real-time satellite images.

**Outcomes:** The student will

- develop a comprehensive understanding of the diurnal cycle
  - identify the diurnal cycle in film loops of infrared satellite images
  - create a surface temperature chart of various regions of the globe at different times of day.
  - create a line graph of the temperature data.
- 

## 8. Fire Detection with GOES Data

**Abstract:** This activity will allow the student to find fires that have been detected on the Internet and then find and track fires with real-time data. This activity also encompasses responses of different IR channels to sub-pixel heat sources, a fire product made by combining information from two channels, and colorizing data through the creation of a color palette.

**Outcomes:** The student will

- understand different applications of IR2 and IR4 channels
- experience the effect of combining data from multiple channels of the electromagnetic spectrum
- use Internet data to verify fires detected with GOES data
- detect fire hot spots using GOES data
- be able to distinguish between different features of an image by creating a color palette
- locate fires by detecting smoke plumes

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## 9. The Gulf Stream

**Abstract:** This activity allows students to study the Gulf Stream. In doing so, students can isolate the Gulf Stream with a color palette, track its activity over long periods of time, create loops of Gulf Stream movements, and relate to Gulf Stream activity to other environmental factors.

**Outcomes:** The student will

- be able to explain the nature of the Gulf Stream
- explain the factors that cause this phenomenon
- locate the Gulf Stream and isolate it with a color palette
- track the movement of the Gulf Stream by measuring changing distances from points on the Eastern coast of the U.S
- be able to create a loop to visualize changes in the Gulf Stream over time\*

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### Extended Activities/Outcomes

\* Review all procedures & activities to see which require a sequential approach to collecting data.

#### 1. Air Masses of the Earth

Contact a YBTS school regarding approaching weather

#### 5. Cold Fronts - A Violent Meeting

Identify a cold front & arrival time at ECSU

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#### 2. Atmospheric Absorption

None

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#### 3. Climbing to New Heights

Organize data

Explain & develop a loop

#### 4. Graphing Cloud Height vs. Temperature

Check cloud heights estimates with actual from web

Determine cloud height as a function of temperature

Check internet for another algorithm (see web site)

#### 10. High Level Clouds - What's up?

Procedure 7

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#### 6. The Coriolis Effect

Label low & high pressure symbols on a full earth image

## **7. The Diurnal Cycle**

None

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## **8. Fire Detection with GOES Data**

Determine geographical conditions

Relation of fires to El Niño

Create a false color image

Predict movement OR when rain might put fire out - check later\*

## **9. The Gulf Stream**

Track movement of Gulf Stream - check later\*

Monitor shape of GS

Research relationship between temperature & phytoplankton

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