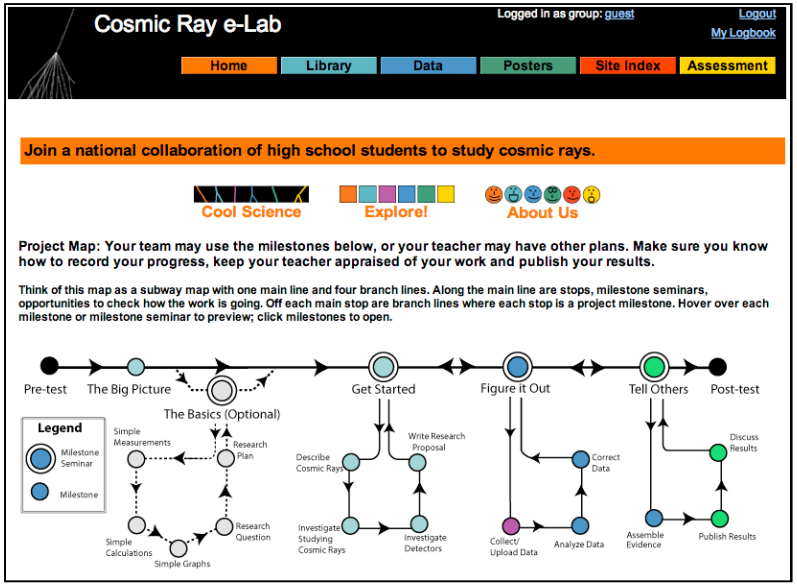
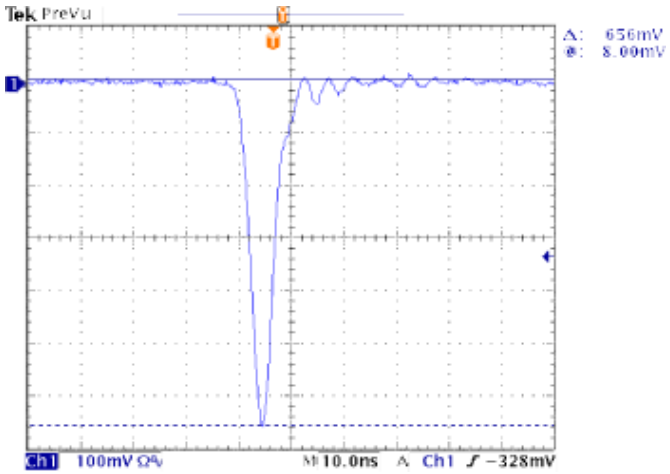
The Thinking Behind an e-Lab

A Marriage Between
High School Physics & Grid Computing

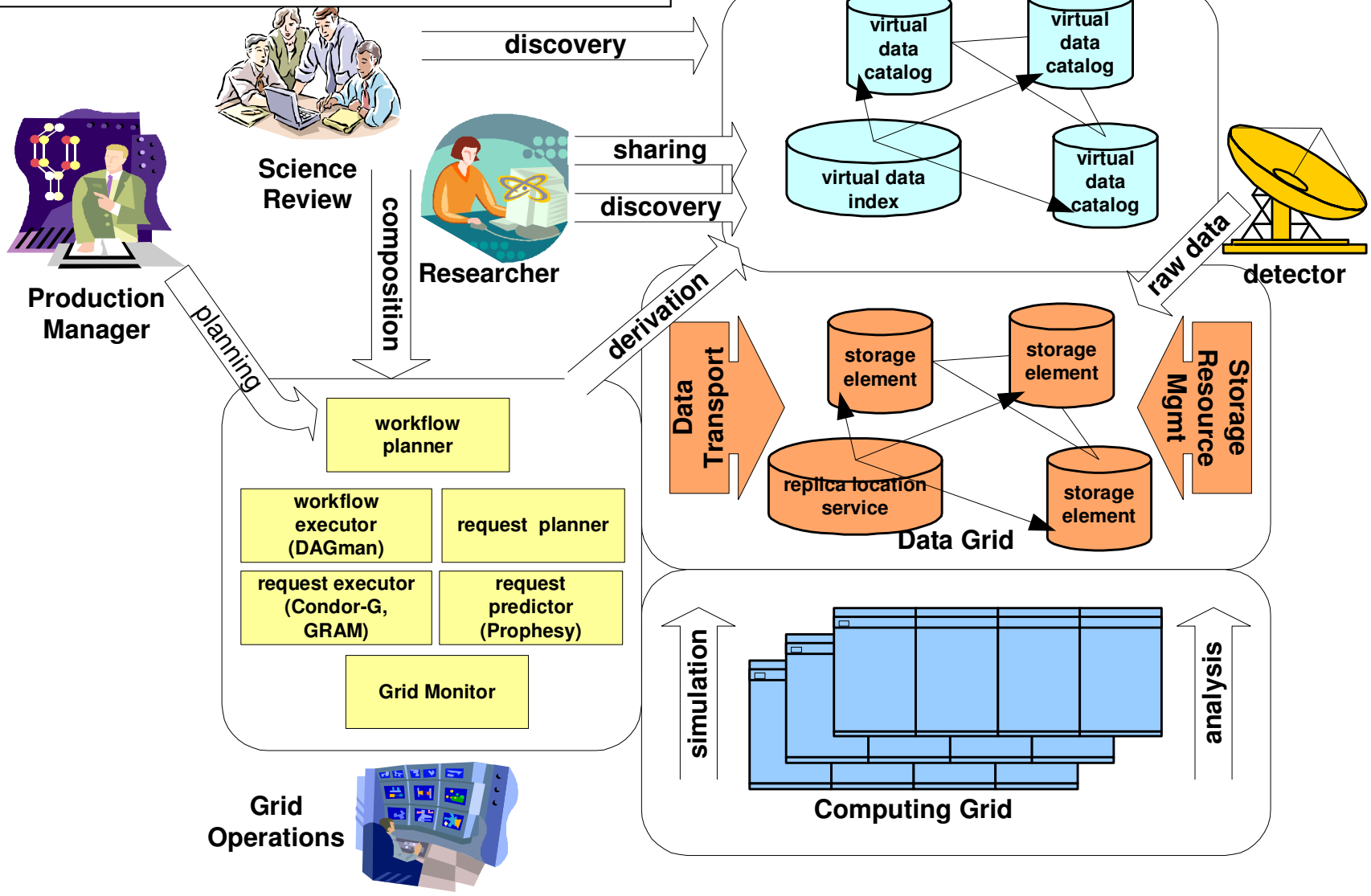


Marge Bardeen
Fermilab

Have cosmic ray data.
Would like to share.
Let's do shower studies.



Have Virtual Data Grid. Need user feedback.



Create a“Virtual Data Workstation” for High School Teachers & Students

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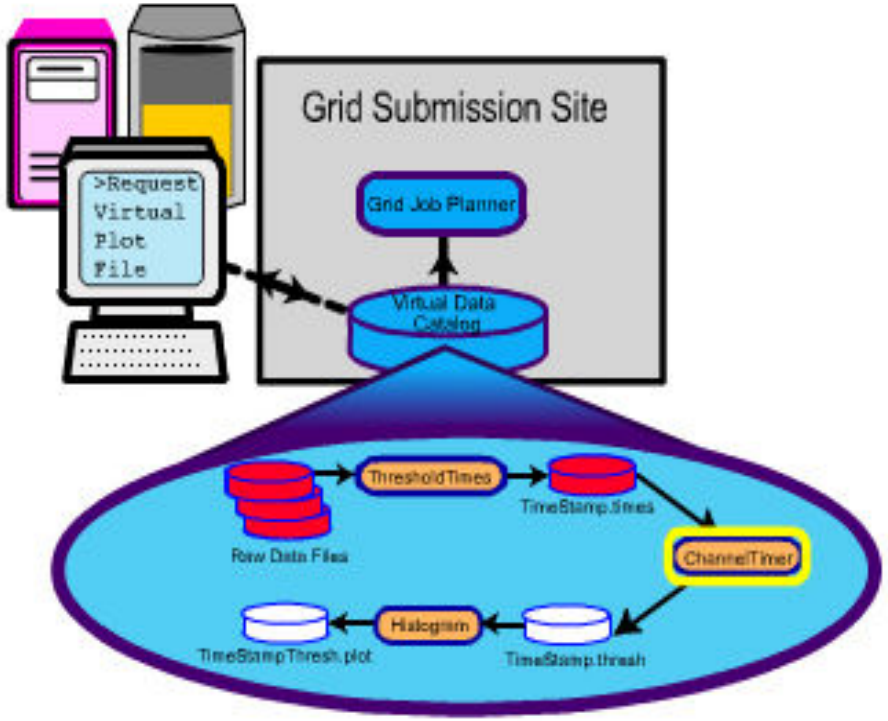

a place to:

ses.

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tools to install.

What Should the Workstation Look Like? Ask the Teachers!

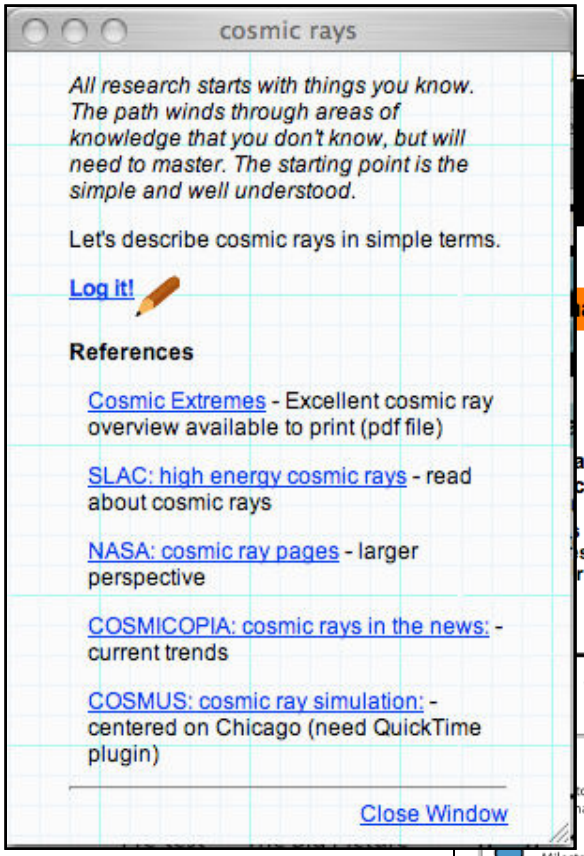
- Tie-ins to “big” science questions & research data
- Inquiry-based online student investigations
- Hands-on element—cloud chamber, cosmic ray detector“One-stop shopping”
- Browser-only access
- Support materials
- Standards-based (inquiry/research, process)
- . . . plus a host of suggestions for student pages

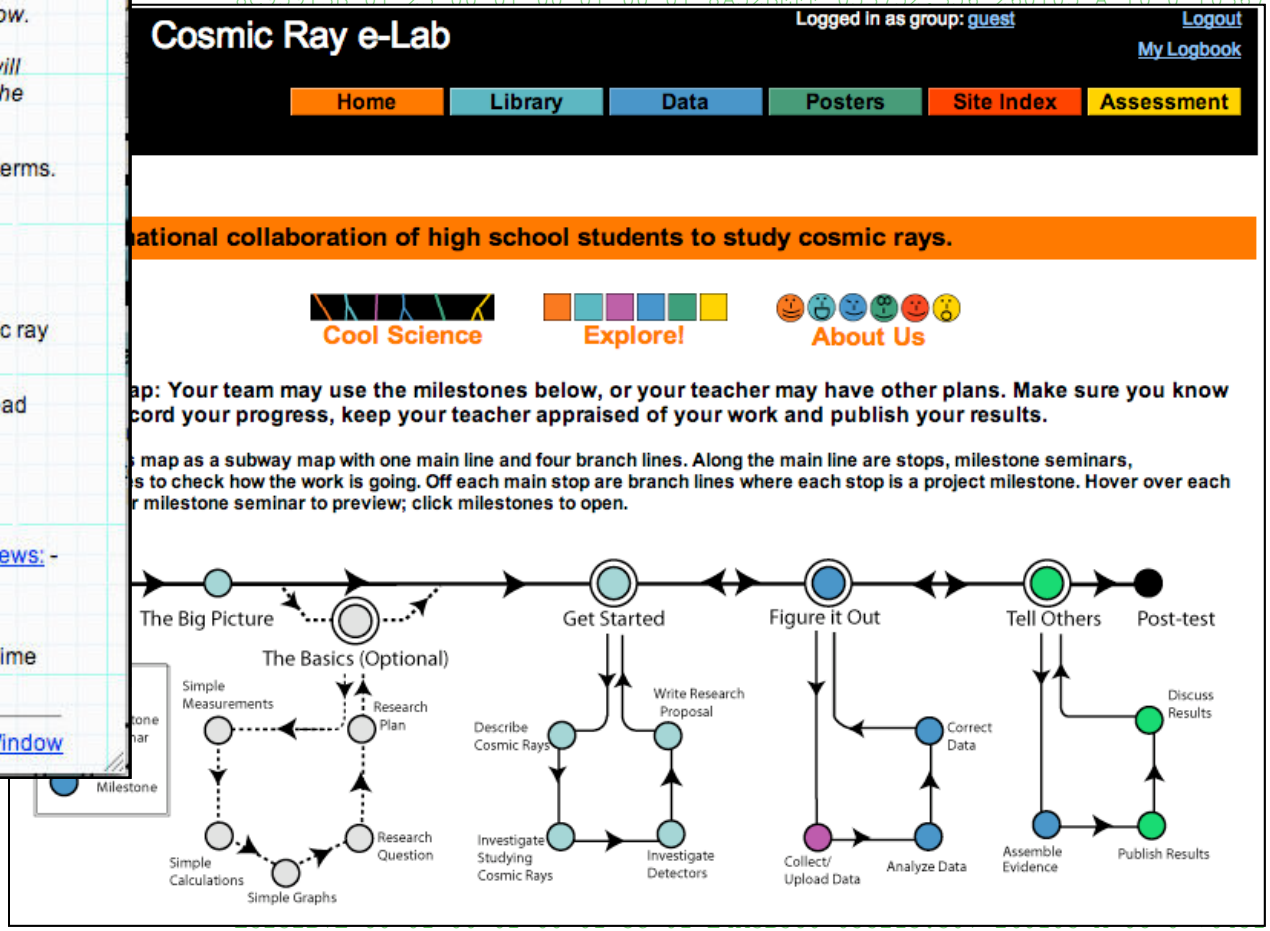
High School Workstation Requires Educational Scaffolding—a new beast!

- How to section for teachers
  - Background—science & pedagagy
  - Resources—tests, rubrics . . .
  - Assistance—helpdesk, news box, place to share
- Guided-inquiry implies *student guide*
- Less complicated data interface
- Easy way to share results
- Ways to communicate with peers & scientists
- . . .
- Registration

Our solution—an electronic laboratory that supports student-led, teacher-guided investigations.

629E49DA AE 3C 00 01 2E 32 00 01 629638C4 053736.356 260105 A 09 0 +0389
8C0E16A5 80 01 00 01 39 01 36 01 8A52BEFF 053752.356 260105 A 10 0 +0367
8C0E16A6 00 01 00 01 01 27 01 2F 8A52BEFF 053752.356 260105 A 10 0 +0367
8C95913A AD 01 27 34 00 01 33 3F 8A52BEFF 053752.356 260105 A 10 0 +0367
8C95913B 01 23 00 01 00 01 00 01 8A52BEFF 053752.356 260105 A 10 0 +0367





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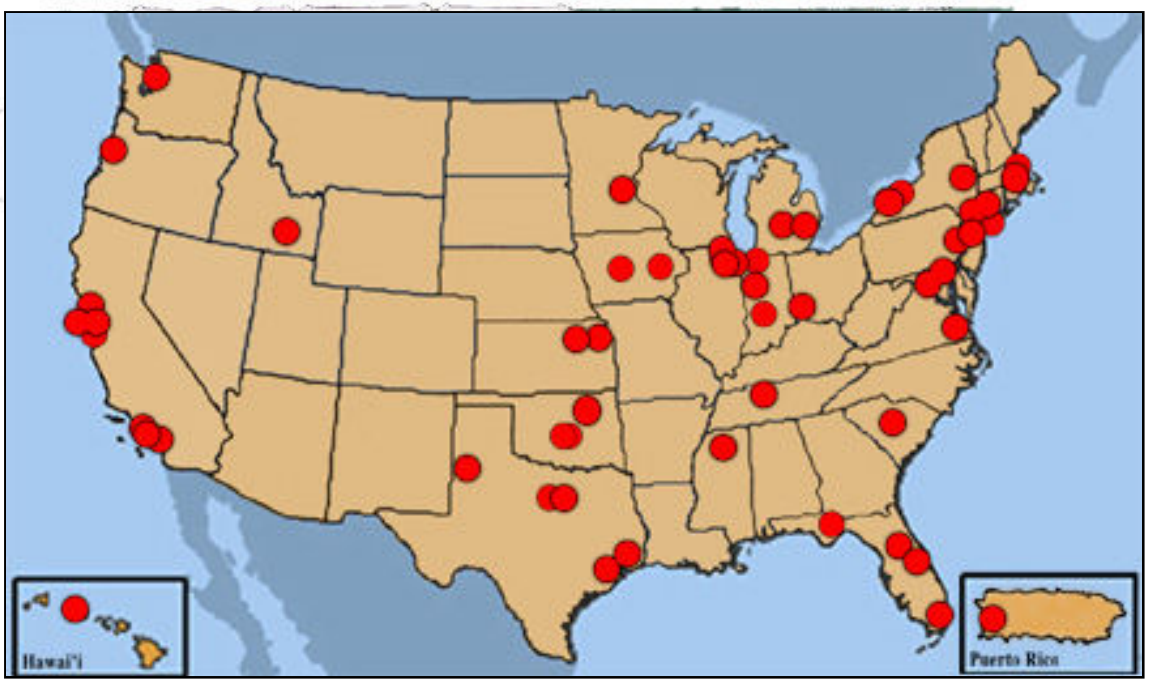
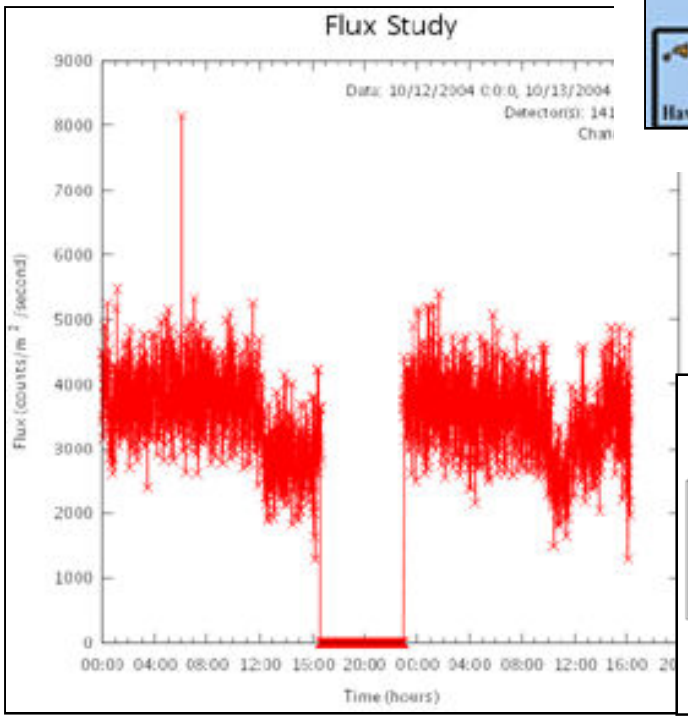
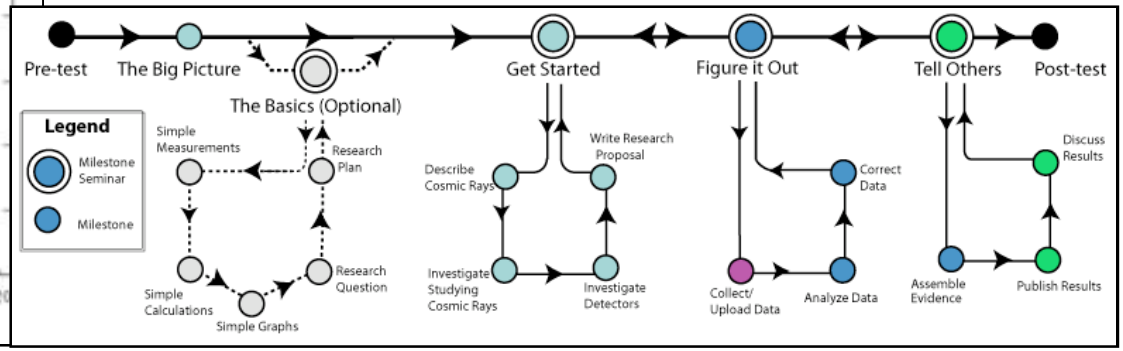
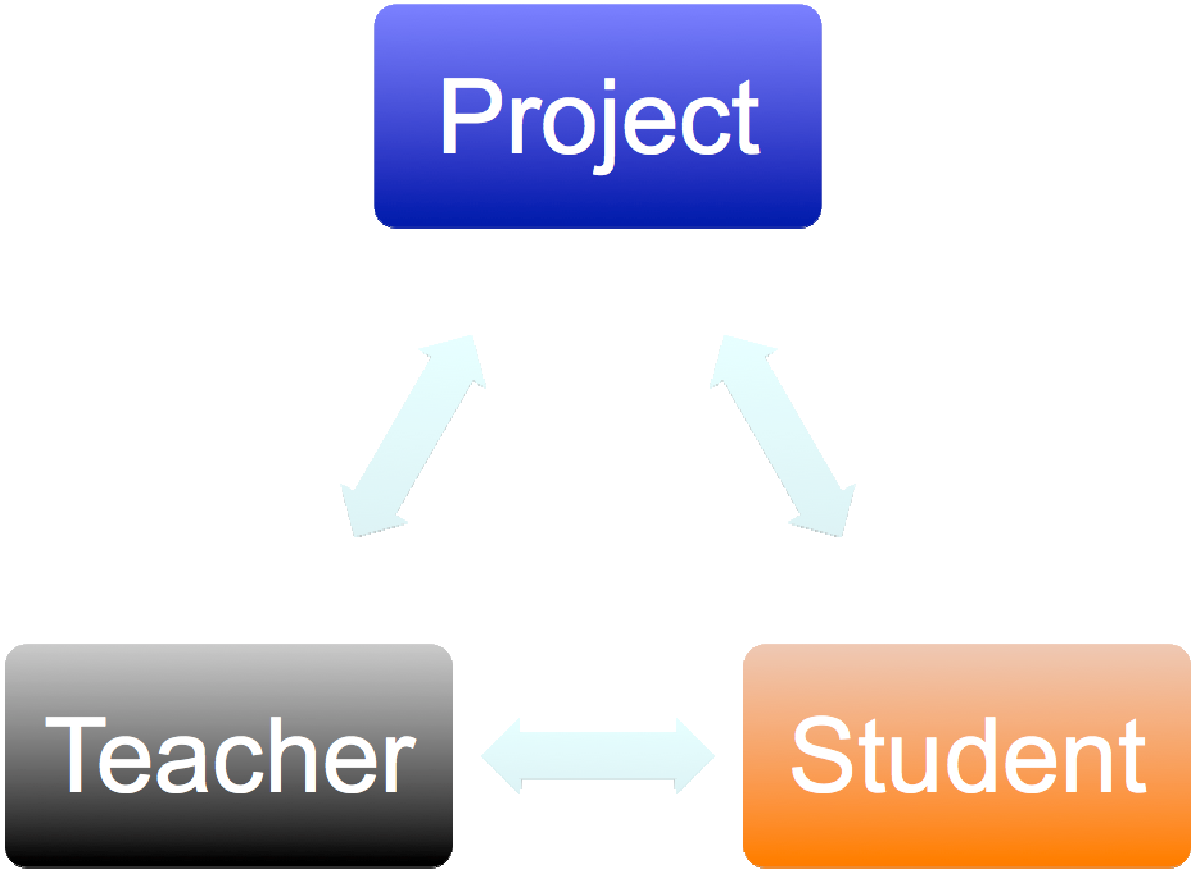




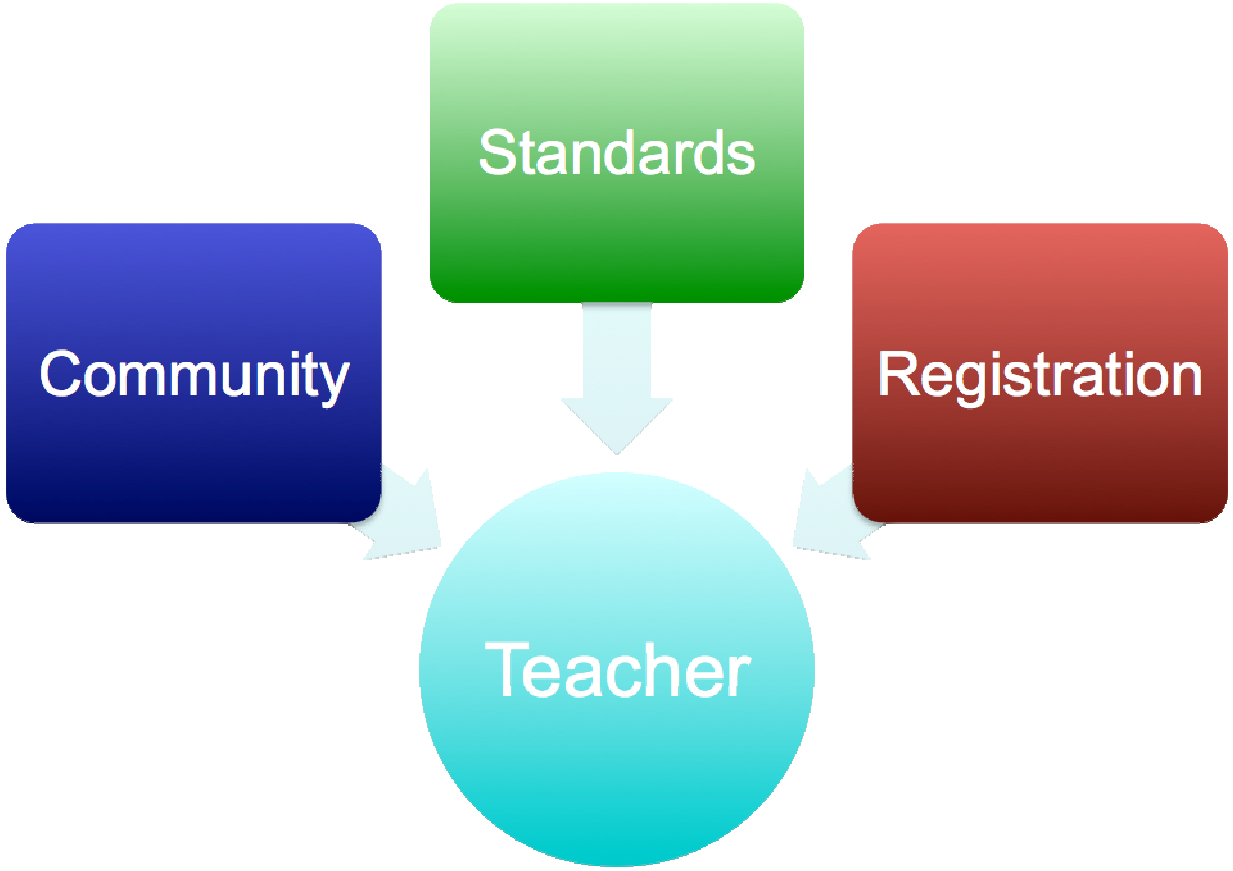
The Original: Cosmic Ray e-Lab



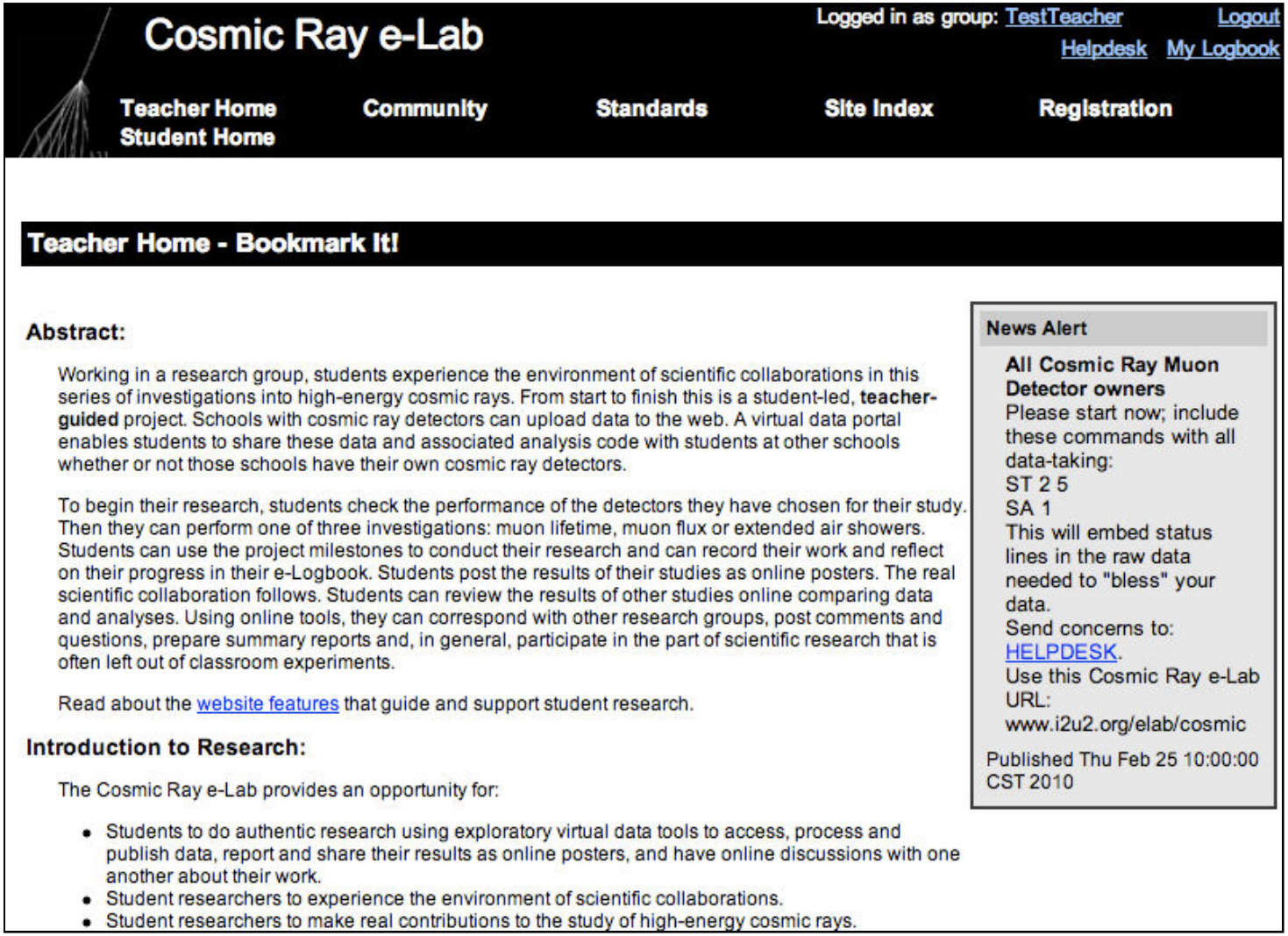
The View from 40,000 Ft.



Teacher Pages

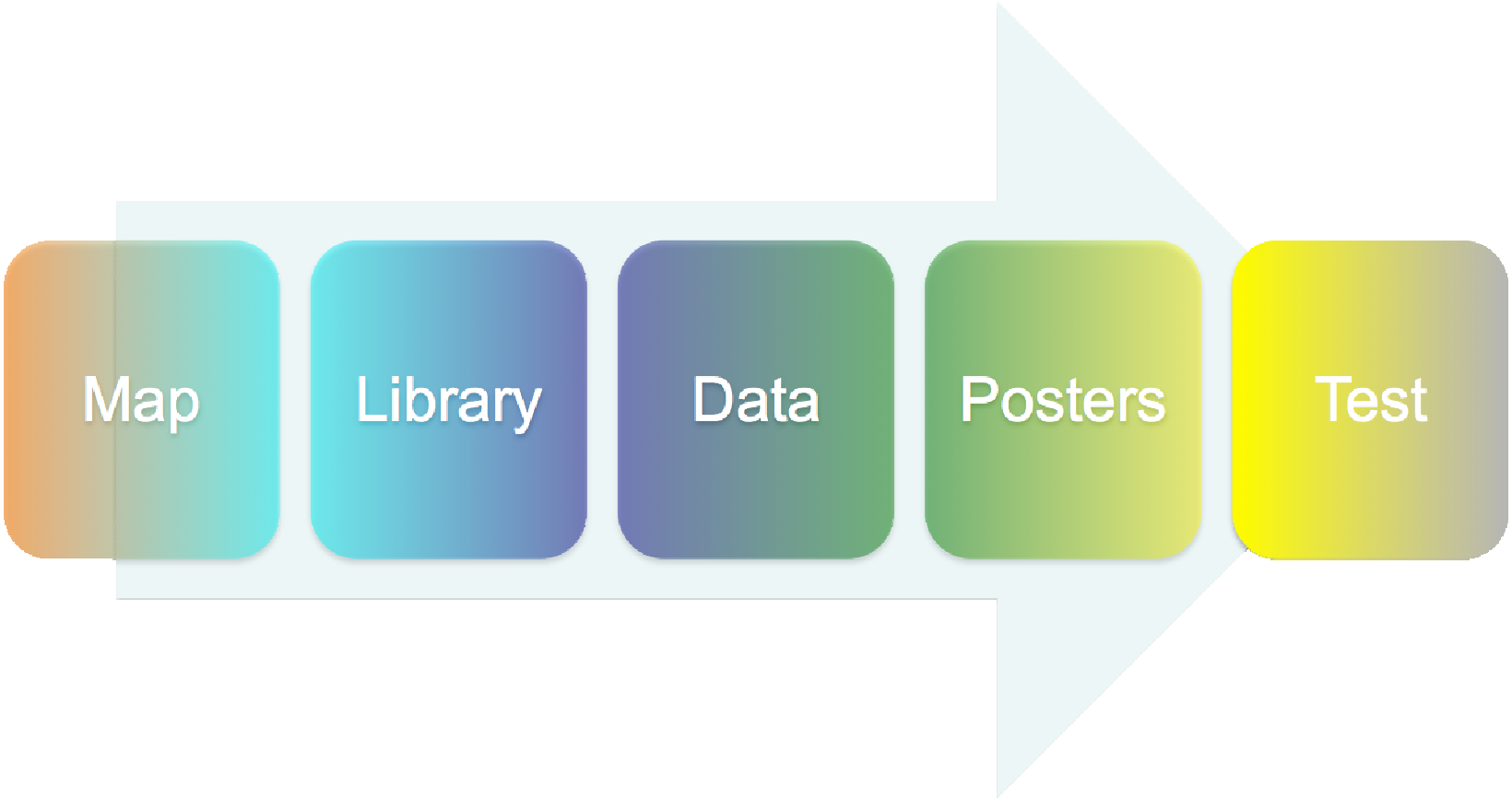


Teacher Pages

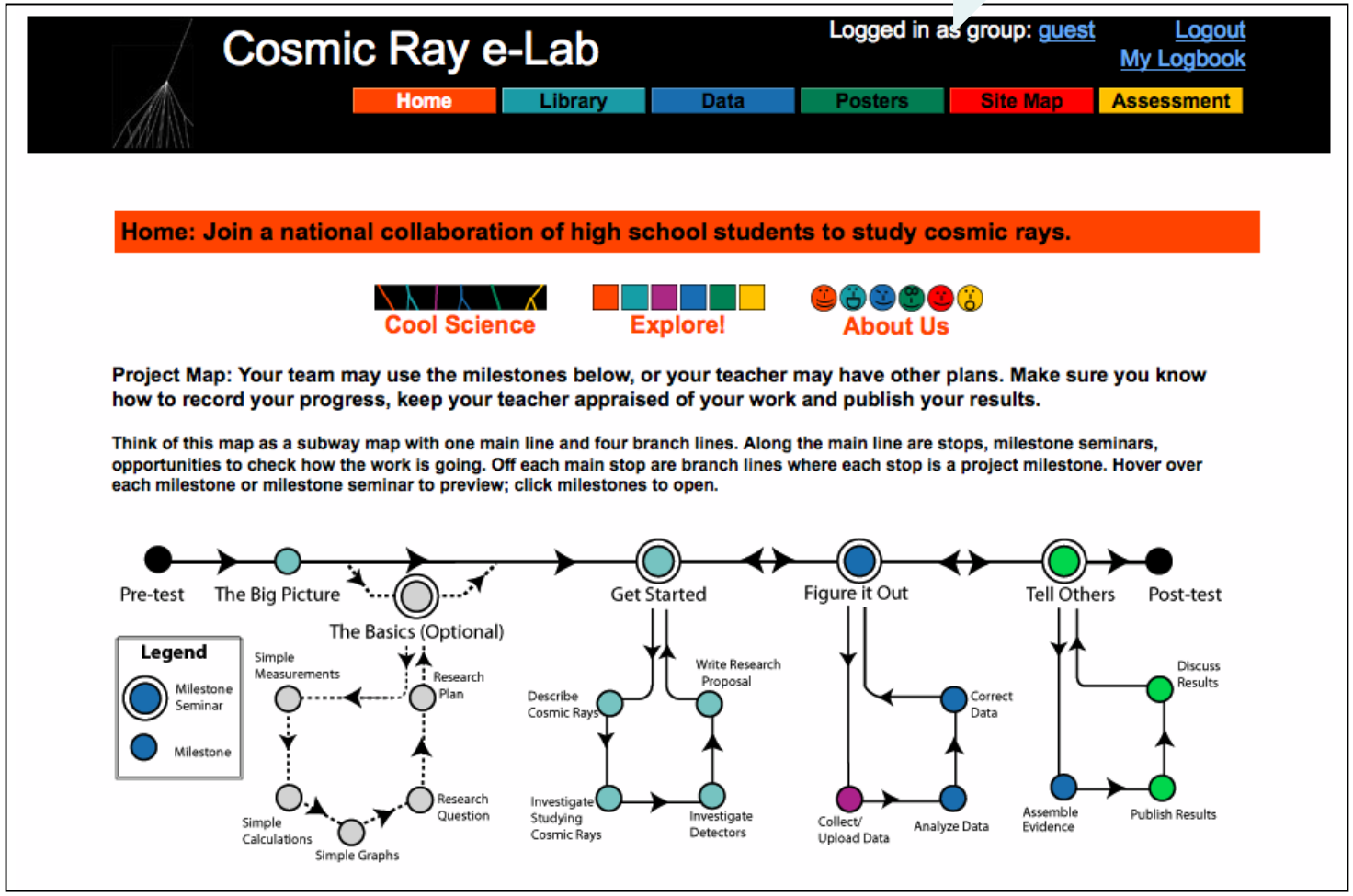


M. Bardeen, EPPOG, April 2010

Student Pages



Map | Library | Data | Posters | Test



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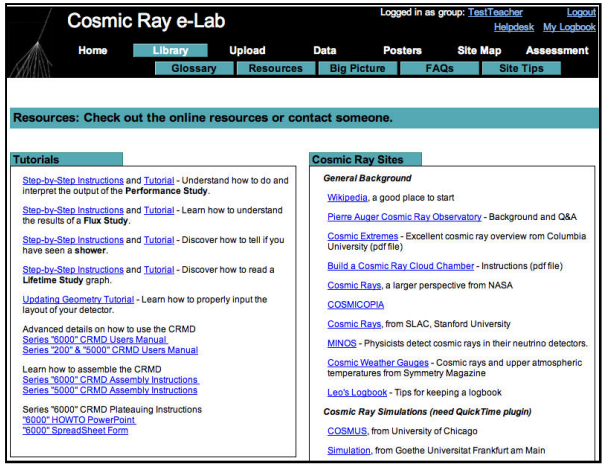
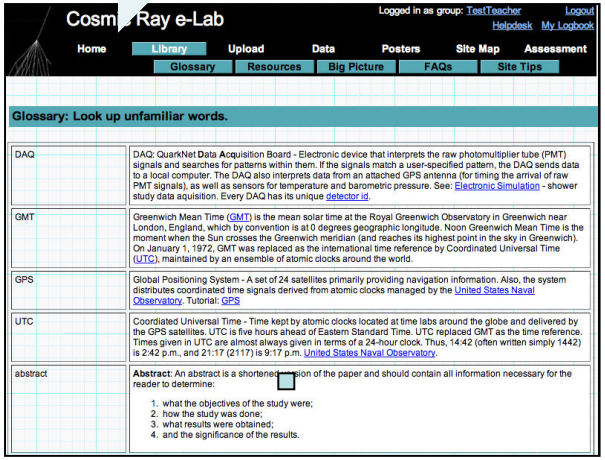
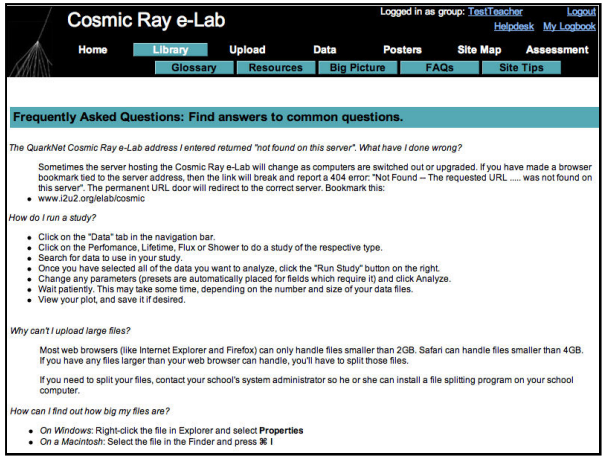


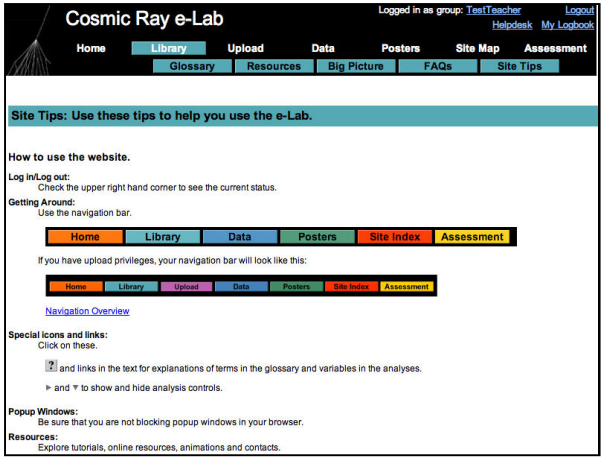
Resources



Glossary

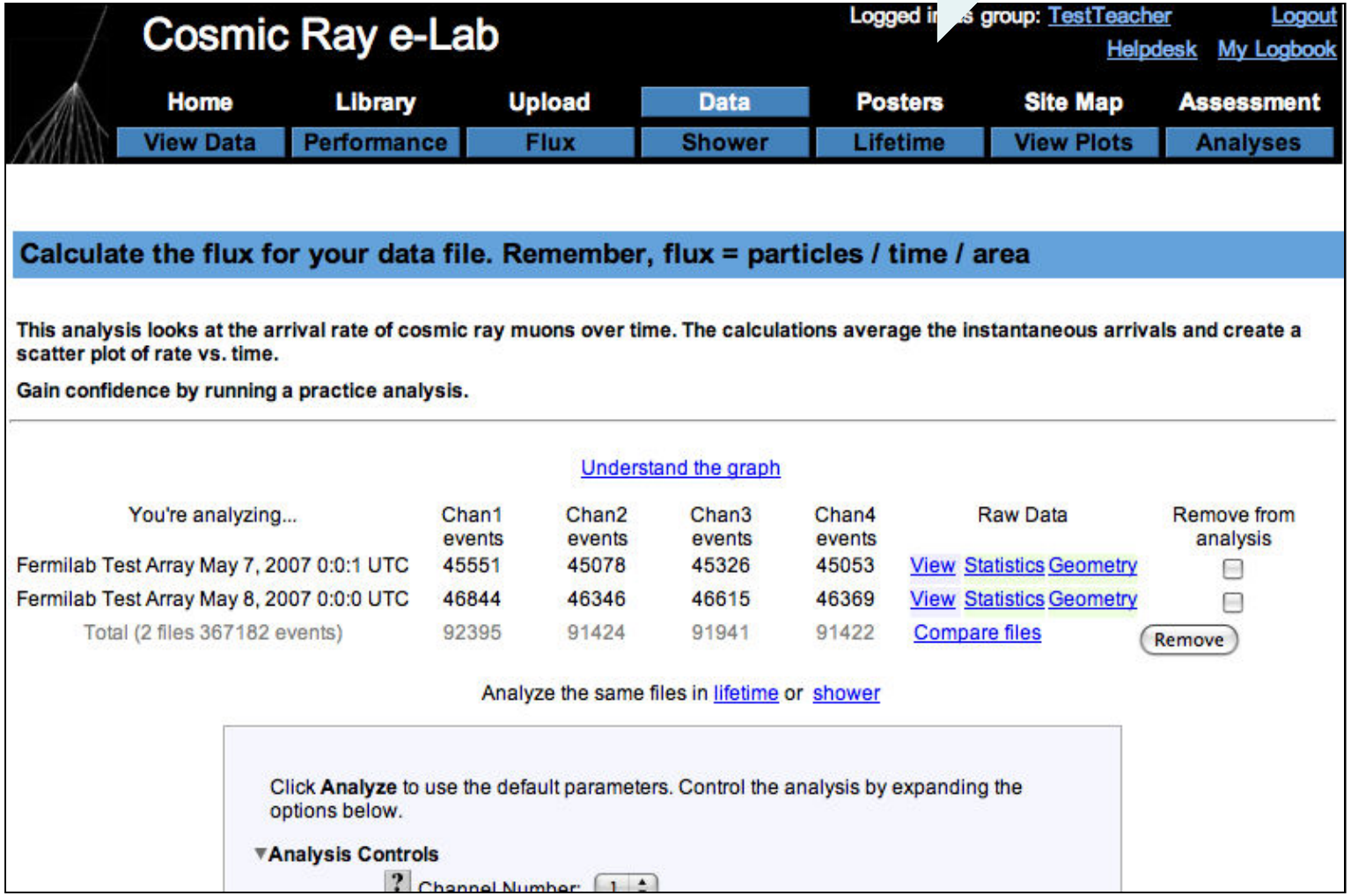


FAQs



Site Tips

Map | Library | Data | Posters | Test



Map | Library | Data | Posters | Test

Poster

Liberrty High School May 2006

Determining the Period in a Flux Study

05/27/2008

Gautham Ragunathan, Zach Sandberg, Ben Hu, Kevin Chung

Abstract

We analyzed the data collected by the Liberty High School and determined the period of the flux based on peaks and troughs of the data.

Methods and Materials

1. Look at the graph 2. Check to see whether the graph displays periodicity 2. Determine the period by tracking one cycle

Results

The period is approximately 24 hours +/- 3 hours

Figures

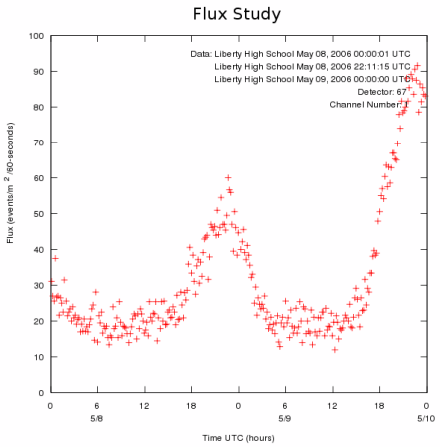


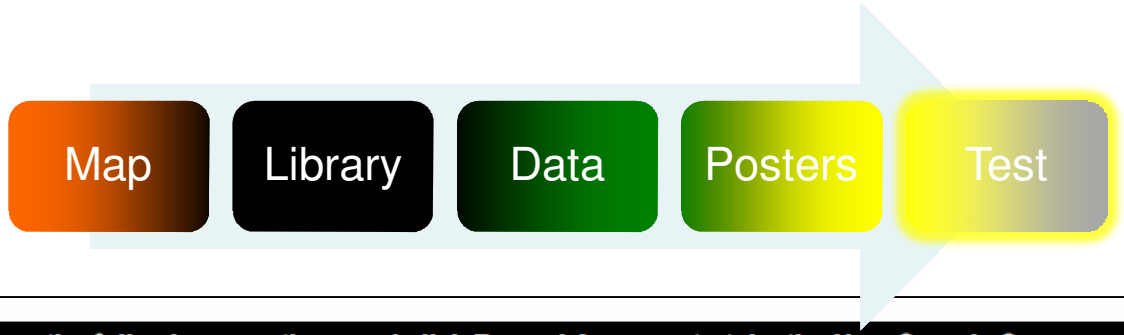
Figure 1. Liberty High School Flux Data

Discussion and Conclusions

The period was determined to be 24 +/- 3hrs. The uncertainty is due to the lack of more detailed axes. A smaller interval for time and a greater range for data would have decreased the uncertainties

Bibliography

Not entered



Answer the following questions and click Record Answers to take the New Cosmic Survey.

Don't guess!! "Do not know" is a perfectly good answer. You will learn the answers to questions like these in your investigation.

1. **Students in Ms. Marchant's third hour class did an experiment with 151 United States pennies. They were asked to write down the "observables" on the pennies and organize the results. Each group decided to inspect each penny and record their own set of observables Three groups asked their teacher for an electronic balance in order to measure the mass of each penny.**

   Groups brainstormed which observable to record and argued about whether or not some could be measured accurately. Their final list included:

   the penny's shininess

   the year that the penny was made

   the mass of the penny

   the worn-ness of the penny

   the mint the stamped the penny

   Which of these can be accurately and reliably determined? You may choose more than one.

   a. ◯ All

   b. ◯ Shininess, year and mass

   c. ◯ Year, mass and worn-ness

   d. ◯ Year, mass and the mint location

   e. ◯ Mass, worn-ness and mint location

2. **Which of these characteristics requires measurement by a scientific instrument?**

   a. ◯ Shiny-ness

   b. ◯ Year

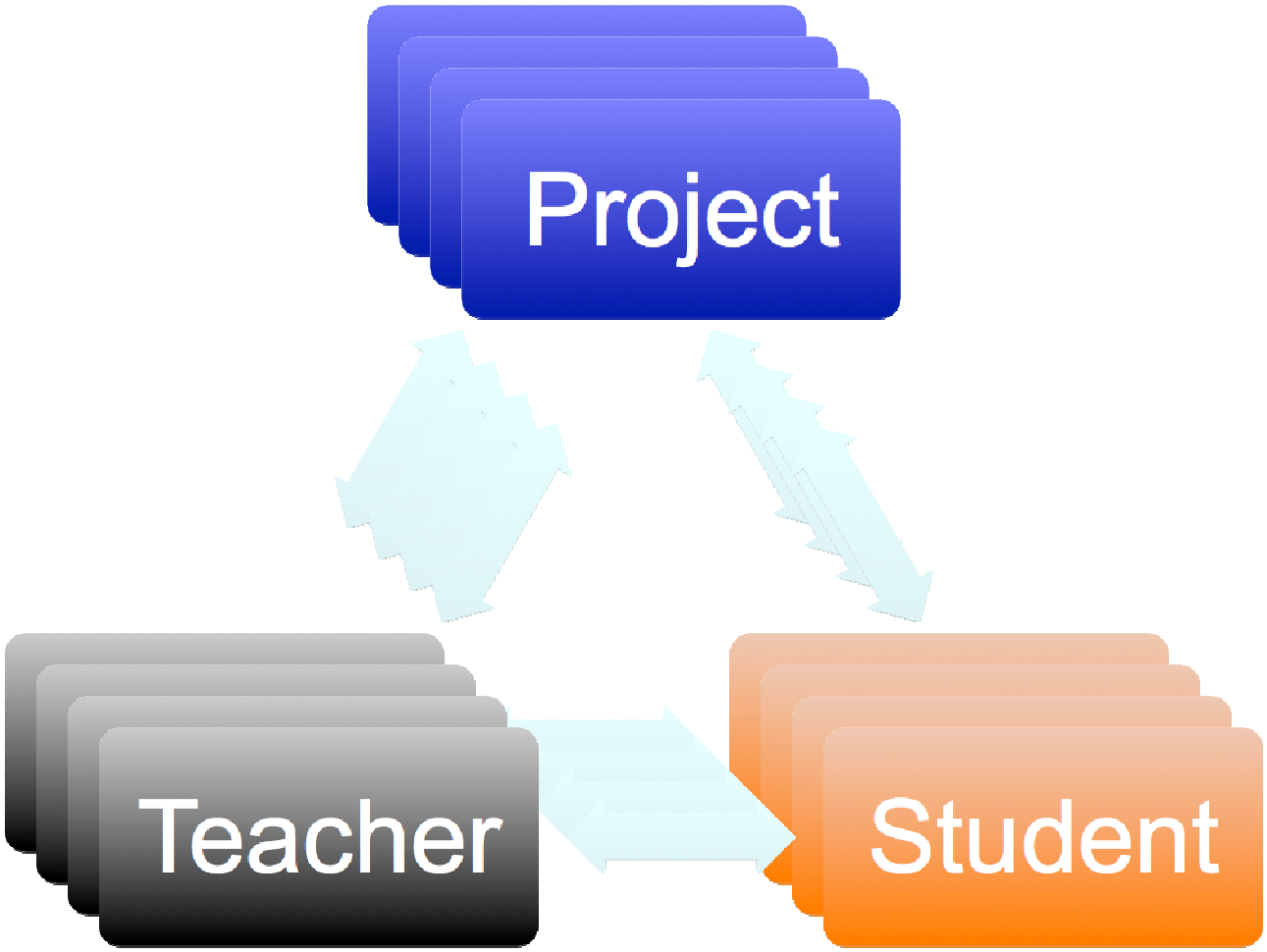
   c. ◯ Mass

Cosmic Is a Success!

April 2010 Report

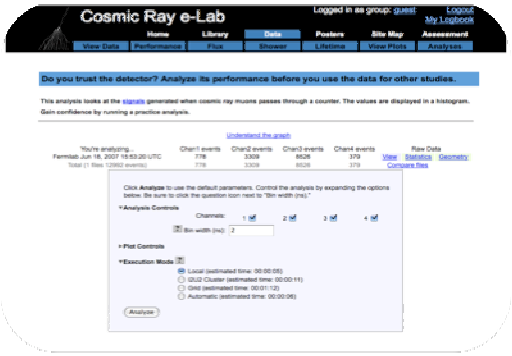
- 761 teacher accounts
- 1,509 student research group accounts
- 517 DAQs in the field
- 16,240 data files from 306 QuarkNet schools in 46 states
- 454 posters, 21 in March alone
- Server stats for March: 5,962 visits from 1,566 unique sites

What Next?

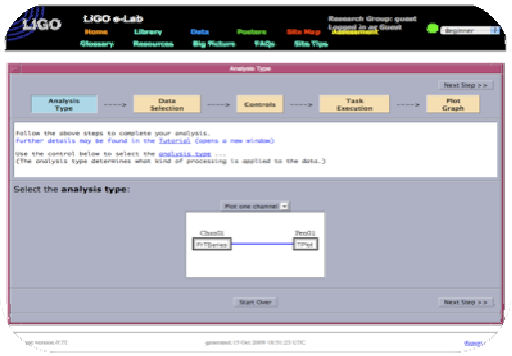


A Research Question:

Can other experiments make use of the virtual data workstation?



Cosmic



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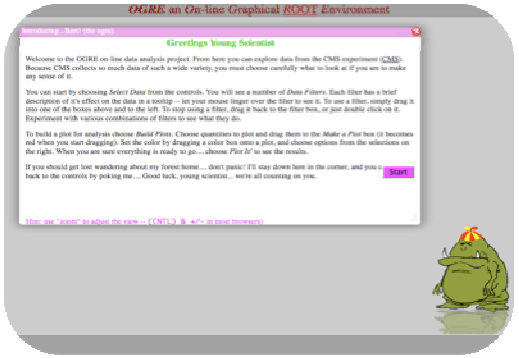

CMS

Using The Virtual Data Grid For Discovery in Science Education

A partnership of GriPhyN, iVDGL, and QuarkNet

Presented by Mike Wilde

Argonne National Laboratory

Grid Physics Network – GriPhyN
International Virtual Data Grid Laboratory – iVDGL

Lepton Photon 2003 – Fermilab – 14 August 2003

Everybody Wins

- Education — A new style of collaborative learning:
  - Investigating highly motivating science content
  - Modeling scientific research
    - Analyzing data
    - Publishing and defending results
    - Reviewing results of others
    - Synthesizing findings
  - Using Grid tools and techniques
    - Computing resources
    - Data on the Grid
    - Systematized data analysis (metadata)
    - Collaboration tools

Everybody Wins

- Science & Grid Computing
  - Test Bed
  - Research collaborators
  - Potential students
  - Future research scientists and computer scientists
  - Goodwill ambassadors
  - Public support
  - . . .