

Key Idea

**World of science and the world of STEM education
are interrelated but not the same**

**Problem of impedance matching between science
and learners - Need a transformer**

**Informal Science Education Institutions can be a
system of change - Pedagogy, design and
distribution**

**Distributed Learning Environment for STEM -
science producers, science museums, schools
and out of school locations, homes - Internet 2**

Field Background

**Science centers are more than individual exhibits
and kids**

**Audience is mixed - At Exploratorium 2/3 over age
21, 50% of visit units have no-one under 18**

**25% of elementary teacher in-service is done by
museums**

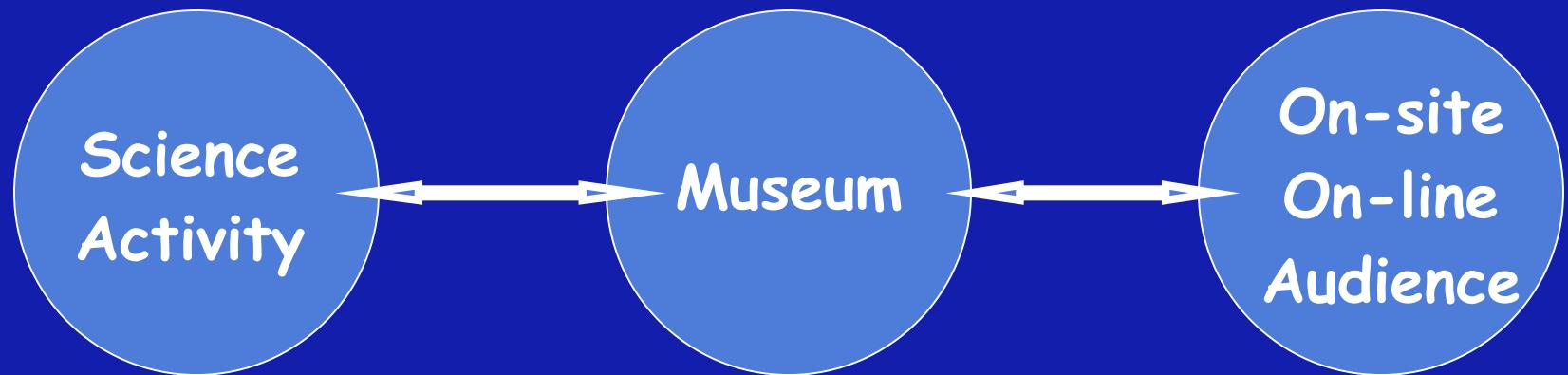
**Media extends museum work - 17 Million Web
visitors to Exploratorium Website**

**Field is diverse with institutions of different
capacities and missions - PBS-like**

**Resurgence of interest in discussing current
science research**

International dimension - EU, Asia

Museum as Mediator



CERN
Hubble
LIGO

Exhibition
Activities
Materials
Pedagogy
Design

Teachers
Students
Out of School
Public

Exploratorium



**Palace of Fine Arts
San Francisco**

Museum of science, art and human perception

- Collection of interactive exhibits - 25%
- National science education resource - professional development and materials 50%
- Networked approach with partnerships - 25%

Applied research program

- Center for Informal Learning and Schools

Access to process of scientific discovery

Public and students do not know what doing science is

Difficult for the public and students to visit locations to see scientists at work or see real scientific activity

Difficult to create exhibits which provide authentic science experience

Use the science center skills and facilities to mediate an on-line and on-site public experience with science

Use new media technology to provide on-site and on-line visitors with remote fieldtrip opportunity

Public Events



**Pioneer 10 Flyby of Jupiter
December 3, 1973**

**Mission controlled at Ames
research Center -
Mountain View, CA**

**Live video feed of real-time
images to public event at
Exploratorium**

**5,000 people showed up for
the 6 hour event**

**Demonstrated public interest
in scientific discovery**

Remote Fieldtrips

**Live connection between a
class at the Exploratorium
and their teacher and
Exploratorium staff on the
KAO**

**First Internet
videoconference with an
airplane using ACTS
satellite**

**Compare in-class and
airborne experiments**



**Kuiper Airborne Observatory
Spring 1995**

Webcasting



**Daily Webcasts during 10 day
HST servicing mission**
**Live connection to Space
Telescope Science
Institute**
**On-site event at
Exploratorium**
**On-line event on
Exploratorium Website**
**Interviews with scientists and
astronauts**

**Hubble Space Telescope
Servicing Mission - Spring 1997**

Live @ Exploratorium



Field trip opportunities to worldwide scientific locations

Webcast studio serves as production hub and exhibit

Remote studio connections to scientific locations

Live and archive viewing by an on-line public

Museum audience acts as surrogate for on-line user

Exploratorium Webcast Studio

Faultline Project



**San Andreas Fault
October 1989**

**Weeklong road trip up the
San Andreas Fault**
**Daily Webcasts from
research labs along the
way**
**INMARSAT video
transmission**
**Participation by research
scientists at research sites
and at the Exploratorium**
Sponsored by NSF-GEO

Eclipse Webcasts

Collaboration with NASA OSS Sun-Earth Connection

Use eclipse interest to discuss sun-earth science

Aruba 98, Turkey 99, Zambia 01

70 Museum network

Public Website with archive

Supported by NASA

www.exploratorium.edu/eclipse



Eclipse: Zambia 2001



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Back Forward Stop Refresh Home AutoFill Print Mail Sherlock

Address: © http://www.exploratorium.edu/eclipse/index.html



go

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SOLAR ECLIPSE

Stories from the Path of Totality

[Français / Italiano / English]

WEBCASTS

live!

Zambia: June 21, 2001

Turkey: August 11, 1999

Aruba: February 26, 1998

FEATURES

The Sun-Eating Dragon

The Sun-Earth Connection

Eclipse Expeditions

RESOURCES

What to See During an Eclipse

How to View an Eclipse

Why Eclipses Happen

Share Your Stories

Eclipse Links

SPONSORS



NASA



The Sun-Earth
Connection
Education Forum

PARTNERS



AboveNet
Communications
Inc.

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Link: http://www.abovenet.com/

Live @ the Exploratorium: Origins



LEP Accelerator
CERN

Electronic field trips to six observatories/laboratories

Origins of matter, the universe, the earth and life on earth

Provide a window on the process of doing current science

Show science as a human enterprise

Choose major laboratories with significant activity

Extensive Website and Webcasts

www.exploratorium.edu/origins

Sponsored by NSF-ISE

THE HEART OF THE MATTER

Inside CERN, the world's largest particle accelerator



PLACE

Just outside Geneva, CERN's geography and scientists form a unique international community.

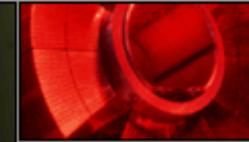


PEOPLE

What inspires a physicist? Meet some of CERN's scientists and hear what fuels their search for the secrets of matter.

TOOLS

CERN's giant machines reveal the universe's tiniest particles. Follow a proton through the accelerators.



IDEAS

Antimatter, the Big Bang, and a particle that gives others mass: The big ideas behind CERN's big experiments.



Live at CERN

Meet with scientists, machine operators, control-room jockies and others who make CERN a vibrant exciting location for doing science.

[Get the rundown on all our November webcasts aired](#)

Live Webcasts From CERN:

Missed our live webcasts? You can still watch them from our Live@CERN page.

Some highlights:

Sunday, Nov. 12

[Exotic Atoms and Antihydrogen:](#)

[Three Cool Experiments in the AD, part I](#)

Scientists at CERN in Switzerland explain to the Exploratorium's San Francisco audience why preparing for antimatter experiments is like arranging a marriage.

Saturday, Nov. 18

Particles in the News

CERN's largest machine closes to make way for a new accelerator.

Read all about it, and about this and other recent physics developments in our [News section](#).

Origin Locations



Antarctica

- Elementary particles - CERN (Geneva),**
- Astrophysics - Hubble Space Telescope (Baltimore),**
- Life in Extreme Environments**
 - McMurdo Station and South Pole Station (Antarctica)**
- Biodiversity - Las Cuevas Research Station, (Belize) and The Natural History Museum, (London)**
- Genetics - Cold Spring Harbor Laboratory (New York)**

Access to Real Science Data

Scientific research occurs on the Web

Difficult for the public to interpret raw on-line science material

Create a mediated portal to authentic on-line science activity

[SOLAR MAX](#)[AURORAS](#)

ソーラー マックス SOLAR MAX

Your Guide to the Year of the Active Sun

exploratorium

[Main Guide](#)

The Exploratorium - Japan Science Foundation -SECEF - SLN- HESSI Mission

Solar Maximum in the News

Friday, April 4th, 2003

NASA: Space Science News -[Space Radiation Storm](#) (7/14/00)**E**-[SOHO Observatory](#)[-Movies of the latest Earth-directed CME](#) (7/14/00)**W**-[CNN.com -Another Strong Solar Flare Heads Toward Earth](#) (7/14/00)**S**-[Space.Com -Biggest Solar Storm in 6 Years Strikes Earth](#) (7/14/00)**NASA & NOAA: Daily Reports** - [Current Solar Forecast](#), [Report of Solar & Geophysical Activity](#), [Current Geomagnetic Conditions](#)[\(more news\)](#)

Solar Max FAQ

- [What is Solar Max? \(Full Guide\)](#)

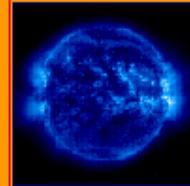
- [What is Solar Max? \(RealVideo\)](#)

- [Should we be concerned about Solar Max? \(RealVideo\)](#)

[\(more\)](#)

Upcoming Sun-Earth Missions

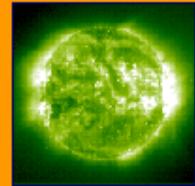
Current Solar Images

[Extreme Ultraviolet Images](#)

Extreme Ultraviolet Imaging Telescope from the SOHO satellite. (EIT) full-field Fe IX, Xn 171Å. More current solar images available at [SDAC site](#).

[White Light](#)

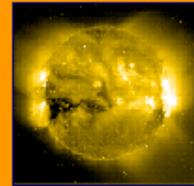
White Light image from Big Bear Solar Observatory. More current solar images available at [Big Bear Solar Observatory](#).



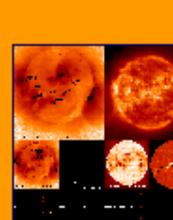
Extreme Ultraviolet Imaging Telescope from the SOHO satellite. (EIT) full-field Fe XII, 195Å. More current solar images available at [SDAC site](#).

[Soft X-Ray Images](#)

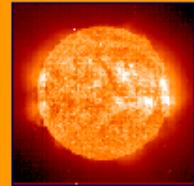
Soft X-Ray Telescope from the Yohkoh satellite. More recent images from the [YPOP site](#).



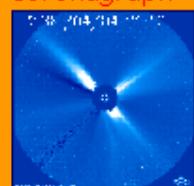
Extreme Ultraviolet Imaging Telescope from the SOHO satellite. (EIT) full-field Fe XV 284Å. More current solar images available at [SDAC site](#).



First Light - Yohkoh SXT and Ground Based Data Summary. More at [Yohkoh SXT site](#).



Extreme Ultraviolet Imaging Telescope from the SOHO satellite. (EIT) full-field He II 304Å. More current solar images available at [SDAC site](#).

[Coronagraph](#)

LASCO (Large Angle and Spectrometric CORonagraph) from the SOHO satellite. More recent images from the [LASCO site](#).

Global Climate Change

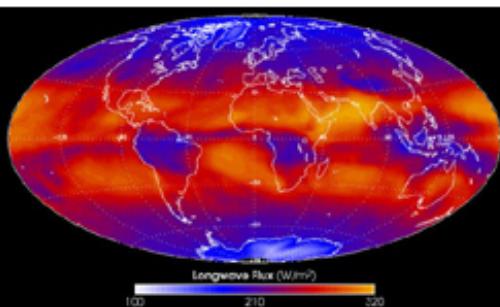
research_explorer

[home](#)[atmosphere](#)[hydrosphere](#)[cryosphere](#)[biosphere](#)[global effects](#)

Friday, April 4th, 2003

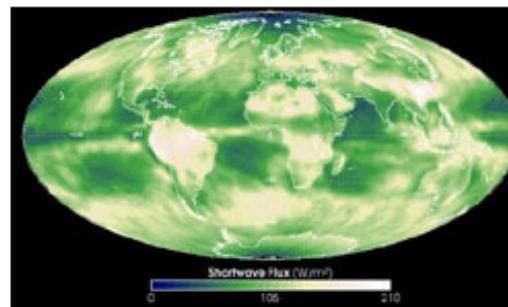
The greenhouse effect is actually essential to our existence: The sun warms the earth, and certain gases (including carbon dioxide and water vapor) act like the glass of a greenhouse, trapping heat and keeping the planet's surface warm enough to support life. However, measuring humanity's effect on the concentration of greenhouse gases is a key issue in understanding global climate change. Industry and other human activity add carbon dioxide to the atmosphere. This strengthens the greenhouse effect and may cause a significant warming trend.

Understanding how the atmosphere works is fundamental to understanding climate change. The atmosphere is composed of layers of air, each with its own temperature patterns. Researchers must determine whether changes in temperature or air circulation are part of complex, longer-term cycles. And the interconnections between air, sea, and land mean that any change could have multiple causes—and multiple effects.



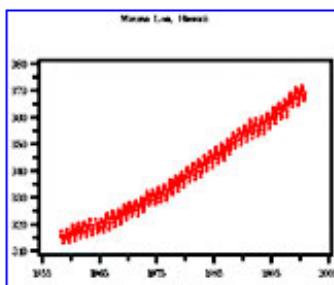
Global Outgoing Longwave Heat Radiation - CERES instrument team

short - term data



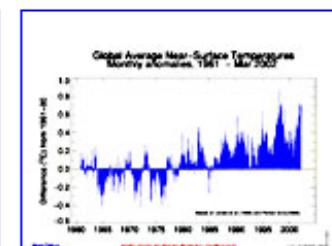
Global Reflected Shortwave Solar Radiation - CERES instrument team

short - term data



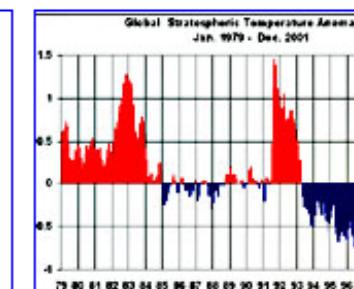
Atmospheric Carbon Dioxide Records from Mauna Loa, Hawaii (1958–2000) - Carbon Dioxide Information Analysis Center

short - term data



Global Average Near-Surface Temperatures – Monthly Anomalies (1961–2002) - The Hadley Centre for Climate Prediction and Research

short - term data



Global Stratospheric and Tropospheric Temperature Anomalies (1979–2001) - Global Hydrology and Climate Center

short - term data

questions about this section

Does the atmosphere get colder and thinner as you go higher, until it simply turns into the vacuum of outer space?

Email your own questions about this section.

glossary terms

Click for definitions of words used on this page:

Conclusions

What will it take to do this?

Collaboration and partnership

Understanding the value proposition for everyone

Acknowledgement of knowledge of each player in the system

Get the right people in the right places

Network infrastructure

ISE field organization

Research

CLT - Center for Informal Learning and Schools