



HANDS-ON SCIENCE ACTIVITIES



Activity 1

A Century of Change Display

For use with participants
ages 8 to adult



LUNAR AND
PLANETARY
INSTITUTE



ALA American
Library Association



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Discover Earth Themes and Overview of Activities

The *Discover Earth* activities focus on Earth science topics close to home – such as local weather and the plants, animals, crops, and environmental features particular to your region – as well as a global view of our changing planet. Through hands-on investigations and discussions, young audiences discover that Earth's global environment changes – and is changed by – the local environment. The activities explore three key messages relating to this overall theme: A. We belong to Earth; B. Each region is unique; and C. Your home is changing. These messages all relate to the overall theme: Earth's global environment changes – and is changed by – the local environment. The activities were developed with guidelines set forth by the National Science Education Standards and American Association for the Advancement of Science (AAAS) benchmarks, and they were designed for audiences in the following four age ranges: 5 to 7, 8 to 9, 10 to 13, and teens.

Overall Theme

Earth's global environment changes — and is changed by — the local environment.

A. We Belong to Earth

We belong to a complex system of interacting water, ice, air, and life.

Community Activities

The community contributes to two exhibits: In *Century of Change Display*, the community gathers and compares photos and/or illustrations of the local areas taken a century and more ago with more contemporary photos of the same areas. In *Weather Wall*, children track the local weather over a period of two months or more, plotting weather data on a kid-friendly sticker chart.

Icebreaker Activities

Children ages 5 and up are introduced to Earth's major characteristics (or parts or systems) — water, ice, air, and life — through the brief icebreaker activities *Catch!...the World's Ocean*, *Ice-y Experience*, *Share the Air*, and *Web of Life*.

Discover Earth through Reading

I Belong to Earth can serve either as part of a kick-off celebration or as an outreach program to area schools. Children and teens discover Earth science questions and answers using the library's resources and participate in reading games — customized for ages 5 to 9, 10 to 13, and teens — that combine book lists and reading logs into take-home adventures! After this activity, the reading



games continue to connect patrons with the *Discover Earth* activities and resources. Participants advance by reading, engaging in suggested at-home activities, attending *Discover Earth* library programs, or investigating Earth and the environment through a variety of citizen science programs. Completed game boards may be submitted to the library for display, and if desired, entry into promotional drawings. Participants earn a decal upon completion.

B. Each Region Is Unique

Changes to distant oceans, air moving freely around our globe, and all living things have an influence on our regional environment, now and in the past and future.

Weather Explorations

Children ages 5 to 7 explore various aspects of weather through a series of stations featuring games, crafts, and weather observations in *Weather: The Many Faces of Mother Nature*. Children ages 8 to 9 and 10 to 13 undertake more advanced investigations of rain, wind, clouds, and weather instruments and consider how locally collected weather data relate to the broader Earth systems of water, ice, air, and life in *Weather Stations*.

Regional Explorations

In *Climate Tour*, children ages 10 to 13 celebrate their region of the United States by creating a regionally-inspired postcard and recipe. Finally, they use a set of *What if...* cards about their region to reconsider their postcards and recipes in light of future climate change. In *Polar Bears or Penguins?*, children ages 10 to 13 use a fast-action matching game to demonstrate how each of Earth's polar regions is distinct and special.

C. Your Home Is Changing

Earth's water, ice, air, and life will continue to interact over long-term scales, shaping the particular features of that place we each call home.

Environmental Stewardship

In teams, children ages 11 to 13 build an understanding of how human actions impact global change by playing a board game, *Polar Bears Go with the Floes*, in which chance and choice determine the fate of a lone polar bear on an ice floe. Teens, ages 14 to 18, engage their communities in science through art in *Earth: Artistically Balanced*. The teens first interact with a climate scientist to unravel, on a very basic level, the complexities of Earth's climate system, and then they create a three-dimensional artistic representation of Earth's climate. The art may be created on a large scale and displayed at the library or made on a smaller scale to take home.



How to Use These Activities in Your Programs

You may design your own program of one or more of these flexible activities, or you may choose to build the story of Earth and its changing environment through the complete series of activities! Background information and facilitator resources are provided to help you prepare to lead the activities. Encourage further exploration with the books, websites, and videos listed in the *Facilitator's Resources* packet. Programming ideas for all ages, infant to adult, are also provided.

Reading games, geared toward different age levels, support this module and connect the activities and resources. The games combine the traditional reading log and book list into a board game, where participants advance by reading, engaging in suggested at-home activities, attending library programs, or investigating Earth and the environment through a variety of citizen science programs. These games are introduced in Activity 4: *I Belong to Earth*. The game boards may be customized with your institutions' address, and if desired, an additional step in the instructions for winning prizes. Matching decals may be printed and awarded as prizes. *Read Me* bookmarks are available as a way for children to read, review, and recommend titles to others. These materials (shown below), including the supporting book lists, are available free for educational use at www.lpi.usra.edu/explore/discoverEarth.

Weather Watcher
Reading List for Ages 5 to 9

Thoughtful Steward of the Earth
Reading List for Teens and Adults

Read Me!
I _____
recommended this book because _____

Discover Earth's Special Places in the Continental U.S.
Reading List for Ages 10 to 18



Correlations to National Standards

National Science Education Standards

Grades K-4

Earth and Space Science - Content Standard D

Changes in Environments

- Changes in environments can be natural or influenced by humans. Some changes are good, some are bad, and some are neither good nor bad. Pollution is a change in the environment that can influence the health, survival, or activities of organisms, including humans.
- Some environmental changes occur slowly, and others occur rapidly. Students should understand the different consequences of changing environments in small increments over long periods as compared with changing environments in large increments over short periods.

Grades 5-8

Science in Personal and Social Perspectives - Content Standard F

Populations, Resources, and Environments

- When an area becomes overpopulated, the environment will become degraded due to the increased use of resources.
- Causes of environmental degradation and resource depletion vary from region to region and from country to country.

Grades 9-12

Life Science - Content Standard C

The Interdependence of Organisms

- Human beings live within the world's ecosystems. Increasingly, humans modify ecosystems as a result of population growth, technology, and consumption. Human destruction of habitats through direct harvesting, pollution, atmospheric changes, and other factors is threatening current global stability, and if not addressed, ecosystems will be irreversibly affected.

Earth and Space Science - Content

The Origin and Evolution of the Earth System

- Interactions among the solid earth, the oceans, the atmosphere, and organisms have resulted in the ongoing evolution of the earth system. We can observe some changes such as earthquakes and volcanic eruptions on a human time



scale, but many processes such as mountain building and plate movements take place over hundreds of millions of years.

National Geography Standards

Grades K-12

NSS-G.K-12.5 ENVIRONMENT AND SOCIETY

- Understand how human actions modify the physical environment.
- Understand how physical systems affect human systems.
- Understand the changes that occur in the meaning, use, distribution, and importance of resources.



Activity Procedure

Overview

Library patrons contribute photos and/or illustrations of the community, including those taken a century and more ago and more contemporary photos of the same areas, which are displayed at the library. The community engages in a dialog to note environmental changes and to discuss how the environment impacts them and how people impact the environment. Ages 8 to adult contribute to the materials. The exhibit may be broadened to further capture local stories of change by including weather journal entries, diaries, letters, and recorded personal recollections (audio or video). The activity may be presented as a contest, with library patrons voting to select the best submission. This community engagement activity can be offered before, during, or after offering *Discover Earth* programs at your site, and may span two or more months.

What's the Point?

- Earth's systems interact over long-term scales to determine a community's environment.
- The community's historical treasures record local changes.
- The community engages in a dialog about what has changed in the local environment over the last century and what has not.
- The library is a forum where community members can engage in a dialog about what has changed in the local environment over the last century and what has not.
- The library is engaged in the process of developing a science-themed exhibit that will be a community resource.
- If the materials are archived, they serve as a legacy of the community's contributions and dialog.

Materials

Facility Needs

- | | | |
|---|----|--|
| <input type="checkbox"/> Blank wall provided with the <i>Discover Earth</i> travelling exhibit | OR | <input type="checkbox"/> A blank wall space on which to hang photographs |
| <input type="checkbox"/> A location, near the photographs, stocked with materials for feedback: | | |
| <input type="checkbox"/> Note cards | | |
| <input type="checkbox"/> Comment box (with a lock and slit at the top, if used for voting) | | |



- Pencils or pens
- A location, perhaps at the reference desk, where patrons submit materials to the library
- Books about the Earth and environment; possible selections are listed in the *Facilitator's Resources* packet and include:

WHAT'S SO SPECIAL ABOUT PLANET EARTH?

Robert E. Wells, Albert Whitman & Company, 2009, ISBN: 0807588156

By examining the other planets in our solar system, Wells sets the stage for enumerating Earth's unique features, including its atmosphere, water, and life. The book concludes with family-friendly tips for taking care of our home planet. Readers age 4-8 may enjoy the cartoon illustrations and conversational text.

NATURE IN THE NEIGHBORHOOD

Gordon Morrison, Houghton Mifflin Books for Children, 2004, ISBN: 0618352155

Morrison reveals the diversity and abundance of life that can be found in your very own backyard. Readers, ages 6-10, explore landscapes, seasons, plants and animals through unique facts, engaging text, and beautiful illustrations.

PLANET EARTH

Kathryn Senior, Franklin Watts, 2000, ISBN: 0531164454

This introduction to Earth explores land, oceans, the atmosphere, and animals that inhabit the different climate regions around the globe. Special split pages and colorful illustrations will engage children ages 9-12.

THE KIDS' NATURE Book

Susan Milord, Gareth Stevens Publishing, 1997, ISBN: 0836819675

This guidebook of activities and experiences give children ages 9-12 something new to learn about weather, seasons, plants and animals every day of the year.

STORIES FROM WHERE WE LIVE

Essays and poetry bring the regions of the United States to life. Each anthology features an appendix, which includes information about the region's habitats, animals and plants, and parks and preserves.



THE GREAT LAKES

Sara St. Antoine and Trudy Nicholson (Editor), 2003, Milkweed Editions, ISBN: 1571316396
Appropriate for ages 9-13.

THE GREAT NORTH AMERICAN PRAIRIE

Sara St. Antoine (Editor), 2001, Milkweed Editions, ISBN: 1571316302
Appropriate for ages 9-13.

THE SOUTH ATLANTIC COAST AND PIEDMONT

Sara St. Antoine and Trudy Nicholson, 2006, Milkweed Editions, ISBN: 1571316647
Appropriate for ages 9-13.

THE CALIFORNIA COAST

Sara St. Antoine, 2005, Milkweed Editions, ISBN: 1571316531
Appropriate for ages 9-13.

THE NORTH ATLANTIC COAST

Sara St. Antoine, 2004, Milkweed Editions, ISBN: 1571316434
Appropriate for ages 9-11.

THE GULF COAST

Trudy Nicholson, Paul Mirocha, Katrinka Moore, and Sara St. Antoine (Editor), 2002, Milkweed Editions, ISBN: 1571316361
Appropriate for ages 12-18.

THE WORST HARD TIME: THE UNTOLD STORY OF THOSE WHO SURVIVED THE GREAT AMERICAN DUST BOWL

Timothy Egan, Mariner Books, 2006, ISBN: 0618773479
Personal stories bring the tragedies of the Dust Bowl to life in this gripping account. Appropriate for adults.

WORLD CHANGING: A USER'S GUIDE FOR THE 21ST CENTURY

Alex Steffern and Al Gore, Harry N. Abrams, Inc., 2006, ISBN: B0019AFFAO

This book is an encyclopedia of environmentally friendly ideas. This excellent resource guide offers new concepts and an array of resources about green issues and future possibilities. Appropriate for adults.



- Optional: prizes to offer for best submissions (e.g. oldest or voted most interesting)
- Optional: access to a high-resolution scanner for archiving materials
- Optional: digital archive for viewing contributions online
- Optional: website or email address where patrons can submit their own digital photos
- Optional: a means for capturing personal stories of environmental change, including:
 - Access to video or audio equipment
 - A quiet area for patrons to record
 - If possible, staff to operate the equipment or a means of offering the equipment for checkout
- Optional: 1 copy of a resource guide such as:

EXHIBITS IN LIBRARIES: A PRACTICAL GUIDE

*Mary E. Brown and Rebecca Power, McFarland & Company, Inc., 2006,
ISBN: 78642328*

This guide covers the development, set-up, and programming of exhibits in libraries.

Preparation

Advertising

- Develop an advertising plan using the library's website, calendar, flyers, and personal interactions with patrons; if desired, distribute information through local newspapers, newsletters, and listservs. Distribute an invitation to the community describing the activity and timeframe (preferably of two months or more). Require submitters to note the dates and locations of their photographs and sign an image release form. On the image release form, offer the option to provide or omit personal identifiers in the public display. For those submissions that will be returned to their owners, require names and contact information. State that participants grant the library the right to use the submissions in the display without compensation. Libraries may want to make it clear that patrons should submit copies of materials, not originals because there may be some risk of loss or damage. An exception may be made for a journal or other artifact, in which case the library should refer to its own policies for accepting, displaying, and protecting such materials.



Partnerships

- If possible, develop community partnerships (such as with a local historical society) to support this effort.
- If possible, involve schools as described in the “Community Involvement Plan” section below.

Community Involvement Plan

- Encourage participants to look through old photographs and submit those that capture the same local area at two or more points in time. Encourage participants to return to that location and take a contemporary photograph and submit it.
- If desired, take special effort to involve children in this community effort.
 - Encourage families to explore old photographs together, and — like in a scavenger hunt — search for that same location, where the child can take a contemporary picture. Encourage children to use their families’ cell phones, film cameras, or more sophisticated equipment for the contemporary photograph. Families can discuss how the photographs compare and record what, if any, changes they observe.

Facilitator’s Note: The Institute for Global Environmental Strategies holds an annual Earth Day Photo & Essay Contest for children in grades 5 to 8. Past contests have focused on the theme of change in the environment, and future contests may continue to closely align with the goals of this activity. (View recent winning entries at http://www.strategies.org/education/index.aspx?sub=education&sub2=earthday&sub3=Winners_2011.) If the timing is appropriate, consider advertising this contest as an extension of this activity.

- Engage local students in the process of collecting materials. Work with the school district or teachers to arrange for school credit for participating. Social studies classes may be interested in recorded stories of family history — perhaps obtained through a taped interview with a grandparent or other adult — or discussions of land use changes over time. Science classes may be interested in the students’ documented observations of change in the local environment. Art classes may be interested in exploring the medium of photography and creating art with a comment on changing times.
- If desired, promote the activity as a contest. Provide a mechanism for capturing patrons’ votes, such as a locked box with a slot in the top provided alongside index cards and pencils. Alternatively, reward the oldest submission (i.e. photograph(s), weather or journal entry). Arrange for prizes, possibly donated from local organizations with a vested interest in environmental awareness or



conservation, such as nonprofit education groups, rotary clubs, or electric companies.

Library Facilities

- Provide community wall space or a public website for posting the submissions. Set out the note cards, comment or voting box, and pencils or pens nearby and invite feedback. Monitor the wall or website and group the submissions by location so that viewers can compare current and past descriptions of each location.
 - For online exhibitions, consider using a website like Historypin.com. Historypin features photographic images, videos, audio clips, and text contributed by libraries, archives, museums, and individuals. Users can access the site through a Google account login, then upload photographic images and “pin” them to a map along with a title, location and approximate date. Users can compare historical images with contemporary views of the same scene. Content can be collected as a new “tour” on the site, and users can search by location or date — through the website or an app — to view others’ contributions.
- If possible, create a digital archive of contributions. Obtain access to a high-resolution scanner to digitize old photographs. If desired, provide a website where patrons can submit their own digital photos. Include requirements for a minimum resolution of 300 dpi.
- If possible, invite contributions of not just photographs, but weather and journal entries, diaries, letters, and recorded personal recollections (audio or video). Arrange to have these artifacts displayed, on loan to the library, near the display of photographs.
- If desired, provide access to video or audio recording equipment and a location and/or checkout process for facilitating its use.
- Provide access to a variety of books about the Earth and environment, such as those listed in the *Facilitator’s Resources* packet. Highlight any unique resources in the library’s collection that relate to the locations and time periods depicted in the community’s submissions. Use a display of the books to advertise the activity and promote interest in the topic.

Closing Program

- Plan and advertise an “opening night” celebration, where the public is invited to come see their wall! If desired, ask a scientist or historian (such as a local professor, museum curator, or park staff member) to give a talk about what the photo wall reveals about changes to the local environment. Ideally, the speaker would be good at facilitating a discussion among the audience about what they



see in the photos. Request that the speaker add his or her professional insight into the meaning behind the changes captured by the photo wall or website.

Activity

1. **Invite the community to email or submit their photographs (and artifacts, if desired) to the library's email address or drop-off location.**
2. **Collect submissions and organize them in a public display. Include the locations and dates.** Arrange photographs by location and date so that the community can make their own observations of change over time.
3. **Collect feedback about the experience through comment cards and informal conversations with patrons.** Refer to the display during your *Discover Earth* programs. If desired, formalize the community's input in a voting process. Have patrons submit their votes for the "best" contribution (e.g. most interesting or detailed, or pair/series of materials that documents the greatest change over time).
4. **Optional: Gather and record stories (video or audio) and incorporate them into the display.**
5. **Optional: Archive all submissions and add them to the library's collection. If possible, offer the submissions in an online, searchable database.**
6. **Hold an opening night!** If possible, encourage discussion and further exploration with a presentation by a guest presenter.

Conclusion

Celebrate your dynamic community by launching or continuing the *Discover Earth* activities and, if desired, additional programming ideas. If the activity was presented as a contest, tally the votes and announce a winner. Highlight the winning entry in your display.



Contact Information

Your questions and comments about the *Discover Earth: Hands-on Science Activities* are welcome!

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STAR_Net Project Overview

The *STAR Library Education Network* project (*STAR_Net* for short) is part of a national initiative to support libraries that are already providing informal STEM learning, or want to provide it. The *STAR_Net* project has a number of components, including:

- Two traveling exhibits for libraries: *Discover Earth: A Century of Change*, and *Discover Tech: Engineers Make a World of Difference*.
- An Education Program, which includes developing exemplary hands-on activities for libraries, as well as conducting training (both online and in-person) for library staff.
- An Outreach Program that helps libraries to develop STEM programming and find local partners for collaborations on programming.
- An online Community of Practice (CoP) (<http://community.discoverexhibits.org>) for librarians (both hosts and non-hosts of the exhibits) and STEM professionals who want to support STEM programming in public libraries.

The National Science Foundation (NSF) provided funding the *STAR_Net* project. *STAR_Net* is led by the National Center for Interactive Learning (NCIL) at the Space Science Institute. Dr. Paul Dusenberry is the project director. STAR stands for “Science-Technology Activities and Resources.” In addition to NCIL staff, the project team includes:

- The American Library Association (ALA), which is managing the exhibit tours and helping to raise awareness among librarians of the many opportunities for providing STEM programming



- The Lunar and Planetary Institute (LPI), which is leading the Education Program component. For some years, LPI has led the *Explore* program for libraries, which has been at the forefront of developing STEM programming and training for librarians.
- The National Girls Collaborative Project (NGCP), which is leading the project's Outreach Program. As a project partner, this NSF-funded project is helping libraries across the country partner with a variety of organizations to provide STEM programming.
- NCIL's Kate Haley Goldman and staff from Evaluation and Research Associates are conducting evaluations of the project's components. The project also includes a research component that explores how public libraries can serve as STEM learning centers in rural, under-served communities. The evaluation and research results will be shared with the informal science education community.

The activity described in this packet was developed for libraries to use in support of the *Discover Earth* traveling exhibit, though it may be implemented independently.

Online Community

Librarians, scientists, engineers, educators, museum staff, and others are invited to join the *STAR_Net* online community! The website fosters collaboration among professionals who want to provide or support Science, Technology, Engineering, and Mathematics (STEM) learning experiences in libraries. The *STAR_Net* project team hopes you find the following activity useful. Please join the online community (<http://community.discoverexhibits.org>) and share your experiences implementing it with your colleagues.

For more information about the *STAR_Net* project, please contact:

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Field Tests

Appreciation is extended to the librarians who field tested the materials in their children's, youth, and teen programs.

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