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10-26-2009

The Science Behind Climate Change: A Journey to Reedy Glacier

Brenda L. Hall

Principal Investigator; University of Maine, Orono, brendah@maine.edu

Molly Schaufler

Co-Principal Investigator; University of Maine, Orono, mschauff@maine.edu

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Final Report for Period: 03/2009 - 08/2009

Submitted on: 10/26/2009

Principal Investigator: Hall, Brenda L.

Award ID: 0628867

Organization: University of Maine

Submitted By:

Schauffler, Molly - Co-Principal Investigator

Title:

The Science Behind Climate Change: A Journey to Reedy Glacier,

Project Participants

Senior Personnel

Name: Hall, Brenda

Worked for more than 160 Hours: Yes

Contribution to Project:

Name: Schauffler, Molly

Worked for more than 160 Hours: Yes

Contribution to Project:

Post-doc

Graduate Student

Undergraduate Student

Technician, Programmer

Other Participant

Research Experience for Undergraduates

Organizational Partners

National Park Service - Acadia

Acadia NP will host one of the kiosk exhibits we create

Maine Discovery Museum

We will place one of the kiosk exhibits we create at the Maine Discovery Museum

Other Collaborators or Contacts

December 2008: We have installed the electronic exhibit kiosk at Cadillac Mountain Sports' Patagonia store (retailer for outdoor clothing and recreational goods) in Bar Harbor Maine. The exhibit will stay there through the Christmas shopping season, at which time we will evaluate whether to keep it there, or move to a different store until March.

September 2009: In January, 2009 we moved the exhibit at the Patagonia Store to the Maine Discovery Museum (January - March) for a trial period, and then returned it to Acadia National Park, where it has been re-deployed for a second season by the Park with

an added interactive Carbon Footprint survey (created by NPS staff).

The second kiosk exhibit is still in development at the Maine Discovery Museum. Drawing from the pilot period last winter, the Museum is incorporating the kiosk into a larger display about glaciers and climate change, which will be ready later this fall.

Activities and Findings

Research and Education Activities: (See PDF version submitted by PI at the end of the report)

Creation of the electronic kiosk exhibit 'The Science of Climate Change: A journey to Reedy Glacier, Antarctica' (#ESI 0628867) was completed in the summer of 2008 and installed at Acadia National Park, the Patagonia store in Bar Harbor, and at the Maine Discovery Museum in 2009 (during our one-year, no-cost extension). We also exhibited the display at the University of Maine's two-day public Climate Change conference in October 23rd and 24th, 2008.

(Please see the attached file summarizing activities for the entire project).

Findings: (See PDF version submitted by PI at the end of the report)

In October, 2008, we observed how the kiosk was used for one morning at Acadia National Park, and interviewed several of the viewers there. These observations were posted in our mid-term report and informed our findings posted here as part of the final report.

(See attached Findings file)

Training and Development:

September 2009: Acadia National Park held a one-day training session on June 20, 2009. Reedy Researcher Gordon Bromley gave a 40-minute presentation to approximately 50 Park Interpretive staff about the work at Reedy Glacier, its relevance to Acadia National Park, and about Climate science research and climate change. The presentation was followed by discussion and the exhibit was available for staff to view. We also provided the Park with copies of the Exhibit Discussion Guide. Discussion included conversation about how to communicate the sometimes controversial topic of climate change with the public, and how to relate global-scale research to Acadia.

Outreach Activities:

(This entire project is outreach).

Journal Publications

Books or Other One-time Publications

Web/Internet Site

URL(s):

<http://climatechange.umaine.edu/reedyjourney>

Description:

This University of Maine Climate Change Institute web site URL will allow visitors to view the twelve modules contained in the exhibit as of the end of September.

Other Specific Products

Product Type:

Teaching aids

Product Description:

We created a tri-fold discussion guide that teachers, families, Park interpreters, or other informal groups can use to explore some of the scientific and climate research topics related to the work at Reedy Glacier. A copy of the Discussion Guide is attached.

Sharing Information:

The Journey to Reedy Glacier Discussion Guide has been provided to Acadia National Park for dissemination to Nature Center visitors and those viewing the exhibit, and the the Maine Discovery Museum for visitors. We will also disseminate the Discussion Guide with copies of the Exhibit on DVD to teachers requesting a copy in response to posting on the Maine Science Teacher's ListServ and as promoted at the Maine Science Teachers Association Annual Meeting.

Product Type:

Software (or netware)

Product Description:

We have created a DVD version of the twelve Exhibit modules.

Sharing Information:

The DVD is available for downloading from the Journey to Reedy Glacier web URL.

Product Type:

Audio or video products

Product Description:

We have created twelve two to three-minute video modules depicting the research at Reedy Glacier, Antarctica, and its bearing on Acadia National Park and Maine. We have also created two stand-alone kiosks with touch-screen monitors, hard drive, and keyboards to allow viewers to view the modules interactively.

Sharing Information:

One kiosk is deployed for its second season at the Sieur de Mont Nature Center in Acadia National Park; the other (after being piloted for three months last winter) will be part of a larger exhibit about Glaciers at the Maine Discovery Museum in Bangor, Maine. The video modules will also be available through the Climate Change Institute web site and for downloading in DVD format.

Contributions

Contributions within Discipline:

The twelve video modules we have created are in open-source formats that are available to anyone wishing to create a similar exhibit about climate -- or any other kind -- of scientific research.

Contributions to Other Disciplines:

Same: We have created and are implementing and evaluating a template for communicating research publicly that could be made available to apply any other research project.

Contributions to Human Resource Development:

Our intention is that the exhibit communicates to the public how scientific (in particular,

climate) research is conducted, what its like to be a scientist and to live and work on a glacier, and how scientists piece together understanding about climate change and its influence on glaciers in Antarctica. We hope the exhibit inspires interest in climate research.

We received the following comments from the National Park Service in August 2009:

'...these additions to the kiosk will allow visitors to ground the information of the Reedy Glacier research with specific connections back to the park and actions they can take to reduce their own impact. And this is only the beginning! We can add onto this topic in the future. Thanks again for the opportunity to expand out ability to interpret this topic to new audiences in creative ways.' -- Sonya Berger, Acadia National Park, Supervisory Ranger, Interpretation, August 2009.

(See attached Findings file)

Contributions to Resources for Research and Education:

The exhibit consists of 12 short (ca. 2-minute) video modules depicting the research conducted by Brenda Hall's research team at Reedy Glacier, Antarctica. (A glossary of glacier terms, leads to further information, and credits and acknowledgments are also included). The exhibit is displayed on an interactive touch-screen and viewers can visit any module in any sequence. The research story is framed as a sequence of scientific steps to give viewers a sense of how scientists approach their work.

This provides a framework, or template, for similar exhibits about other climate (or any other) research projects.

Contributions Beyond Science and Engineering:

The exhibit has provided Acadia National Park with a launch pad for exhibiting additional information about climate change and its relevance to the Park and its visitors. (See comments in attached Findings file)

Conference Proceedings

Categories for which nothing is reported:

Any Journal

Any Book

Any Conference

Final Report for Period: 03/2009 - 08/2009

Submitted on: 09/25/2009

Principal Investigator: Hall, Brenda L.

Award ID: 0628867

Organization: University of Maine

Submitted By:

Schauffler, Molly - Co-Principal Investigator

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Conference Proceedings

Categories for which nothing is reported:

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Any Book

Any Conference



DISCUSSION 1: LIVING ON THE ICE

What personal, physical, and scientific *challenges* and *dangers* do researchers face while they are working at Reedy Glacier? (*Modules 2, 4, 7*)

What personal and scientific *advantages* and *rewards* do they face working “on the ice”?

What limitations to the extent of their work might they experience?

FURTHER INVESTIGATIONS:

Visit Antarctica using Google Earth. Can you find the Transantarctic Mts, the South Pole, the West Antarctic Ice Sheet? Reedy Glacier? (*Module 2*)

The base station for U.S. researchers in Antarctica is McMurdo Station. Visit the McMurdo Station web cam to see what it looks like today!

LINKS:

McMurdo Station & webcam:
www.nsf.gov/od/opp/support/mcmurdo.isp

1. Why is everyone talking about climate?



2. Welcome to Reedy Glacier, Antarctica



3. Why do scientists go to Antarctica?



4. Daily life at Reedy Glacier



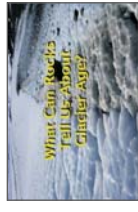
5. What is the researcher's question?



6. What might the answer be:?



7. What evidence helps answer the question?



8. What can rocks tell us about glacier age?



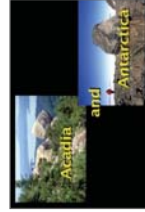
9. What did the researchers find?



10. What does the evidence mean to the researchers?



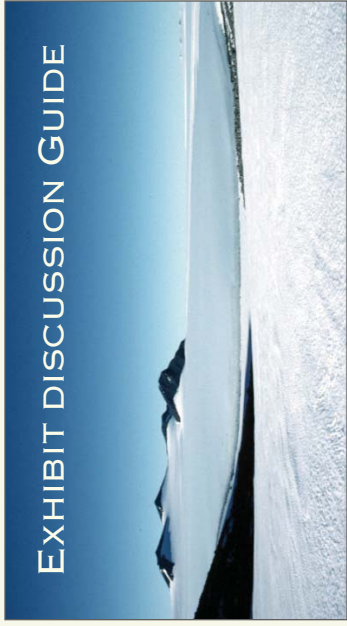
11. What do we know, and what do we still need to learn?



12. Acadia and Antarctica

THE SCIENCE OF CLIMATE CHANGE: A JOURNEY TO REEDY GLACIER, ANTARCTICA

EXHIBIT DISCUSSION GUIDE



Climate affects everyone.

That is why, as Earth's climate warms measurably, climate change and its effects are a powerful impetus for involving citizens in public policy discussions, and in the search for ways to adapt to and mitigate rapid change. The need for citizens to understand the science behind climate change has never been greater.

The interactive electronic exhibit “The Science of Climate Change: A Journey to Reedy Glacier, Antarctica” communicates information to public audiences about the general process of investigating climate change through the particular case of current research at Reedy Glacier in Antarctica. It also reflects upon the relevance of the research to Maine.

This Discussion Guide provides teachers, discussion groups, and others a jumping-off point for continued discussion and exploration about the research, the process of science, climate change and the implications of all of these together for society.

The Journey to Reedy Glacier, Antarctica exhibit and this Discussion Guide are created with support from the University of Maine Climate Change Institute, Acadia National Park, and the Maine Discovery Museum through a grant from the National Science Foundation: .ESI Communicating Research to Public Audiences



Grant #0628867

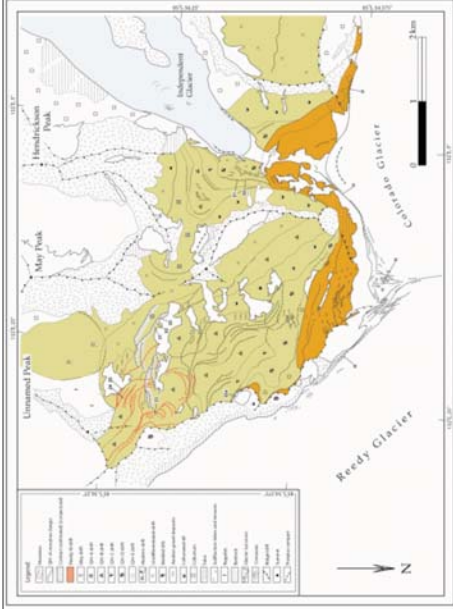


Fig. 1.10 Depth, elevations, mountains, and surficial geomorphology of the Quartz Hills, beside Reedy Glacier. Numbers refer to excavation locations.

DISCUSSION 2: SCIENCE PROCESS AND UNCERTAINTY

How do the Reedy Glacier scientists talk about uncertainty? What are they still uncertain about? How do they balance what they know and what they don't know? (Modules 5,6,10,11)

What evidence do the Reedy scientists use, and what uncertainties might be built into their interpretations of the evidence? (Modules 7, 8, 9, 10)

Did the Reedy scientists answer their question? (Modules 5, 6, 10, 11)

How can a society best use scientific information to make good policy decisions in light of scientific uncertainty?

FURTHER INVESTIGATION:

Find out what role science is playing as climate change policies are being developed in your state.

How do International Panel of Climate Change (IPCC) scientists discuss uncertainty in their reports?

LINKS:

International Panel of Climate Change:
www.ipcc.ch



DISCUSSION 3: CONNECTING CLIMATE RESEARCH TO MY LIFE

Which of the possibilities that the Reedy Glacier scientists talk about could affect my life, and how? (Modules 1, 11)

How might the work at Reedy Glacier relate to the greenhouse effect or other aspects of climate change that I hear about in the news?

What are some implications of Earth's changing climate for my life?

FURTHER INVESTIGATIONS:

Search the web for a carbon footprint calculator to determine how you use energy and ways to reduce your contribution to atmospheric CO₂.

Use the NetLogo climate model to discover why the concentration of carbon dioxide in the atmosphere contributes to a rise in Earth's temperature.

www.ccl.northwestern.edu/netlogo/models/ClimateChange

Consider a career in science!

RESOURCES:

Maine's Climate Future: an initial assessment. A report to the Governor and the people of Maine.
www.climatechange.umaine.edu/mainesclimatefuture/index.html

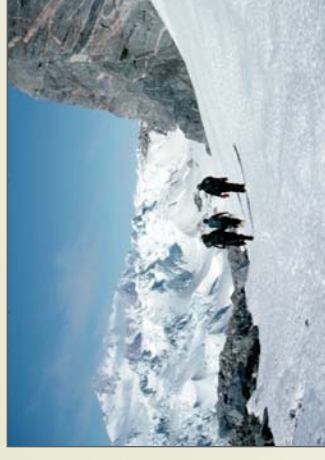
Maine's Ice Age Trail Map:
www.iceagetrail.umaine.edu/

THINKING BEYOND THE EXHIBIT

How does the work at Reedy Glacier and in Antarctica fit into the larger context of climate research? (Modules 5, 11)

LINKS:

www.climatechange.umaine.edu
www.ncdc.noaa.gov/



Scientists at Reedy Glacier used cosmogenic dating as a measure (or proxy) how long ago the rocks at the edge of the glacier were uncovered by the melting ice. What other measurements or proxies are used to reconstruct Earth's climate history? (Modules 7, 8)

LINKS:

www.ncdc.noaa.gov/paleo/

Besides Antarctic glaciers shrinking and growing, what other features on Earth change as climate changes? How are scientists monitoring those changes?

LINKS:

www.nws.noaa.gov/ weather
www.usgs.gov/ land/freshwater
www.gomooos.org oceans
www.geo.unizh.ch/wgms/ glaciers

The Science of Climate Change: A journey to Reedy Glacier, Antarctica Interactive Electronic Exhibit

NSF Final Report
ACTIVITIES 2009
18 Sept 2009

During the first 11 months of the funding period (September 2007-July 2008) we created twelve video modules, each 2-3 minutes long, depicting our research conducted at Reedy Glacier, Antarctica (NSF grant #OPP-0229034). Although we originally proposed to tell the story in seven modules, we determined in the course of interviewing scientists and gathering videos and photographs that the story would be more clearly told in twelve modules.



In July 2008, working with Acadia National Park staff, we installed the exhibit at Sieur de Mont Nature Center, where it was displayed from August 15 until the Nature Center closed for the season on October 13 (2008). At the end of October, the exhibit and an accompanying poster were displayed for two days at the University of Maine's public Climate Change conference in Orono (October 23 and 24, PDF of the poster is submitted with this report). On November 12, the exhibit was moved to the Cadillac Mountain Sports' Patagonia store in Bar Harbor for the holiday shopping season, and remained there until after the New Year.



We constructed the second kiosk exhibit and installed it at the Maine Discovery Museum in a temporary location in early spring, 2009. During this "pilot" period, Discovery Museum staff determined that they would like to make the video exhibit part of a larger, themed display, as indicated in the attached letter from the Maine Discovery Museum Director, Andrea Stark. This installation is scheduled for completion in December 2009.



During the spring 2009 we created a one-page trifold Discussion Guide and links to resources, for teachers, families, Park staff, and other informal groups to use with the Exhibit. A copy of the Discussion Guide is submitted with this report.

Co-PI Molly Schaufler and Reedy Glacier researcher and graduate student Gordon Bromley attended Acadia National Park's Interpretive staff training session in June 2009, where Gordon gave a one-hour presentation and discussion about climate science, the research at Reedy Glacier, and its connection to Acadia National Park and Maine. Park interpretive staff had the

opportunity to ask questions and view the exhibit. We also provided the Park with electronic copy of the Journey to Reedy Glacier Discussion Guide.

During the spring, Park staff added to the electronic exhibit information about carbon footprints and other climate change information related to the Park, and with this new material the Journey to Reedy Glacier exhibit is on display for a second season at the Nature Center. (Please see the attached note from Sonya Berger, ANP Supervisory Ranger for Interpretive Staff.

Finally, the videos have been reformatted for web display and are available for viewing at <http://www.climatechange.umaine.edu/reedyjourney> . A version formatted for DVD is also available for download from the web site.



Top: Presentation to Acadia national Park interpretive staff, June 2009.



Bottom: Reedy Glacier exhibit at the University of Maine Climate Change Conference, Oct 23 & 24, 2008

Next page: A Journey to Reedy Glacier Discussion guide



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What limitations to the extent of their work might they experience?

FURTHER INVESTIGATIONS:

Visit Antarctica using Google Earth. Can you find the Transantarctic Mts, the South Pole, the West Antarctic Ice Sheet? Reedy Glacier? (Module 2)

The base station for U.S. researchers in Antarctica is McMurdo Station. Visit the McMurdo Station web cam to see what it looks like today!

LINKS:
McMurdo Station & webcam:
www.nsf.gov/od/opp/support/mcmurdo.jsp

1. Why is everyone talking about climate? 
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12. Acadia and Antarctica 

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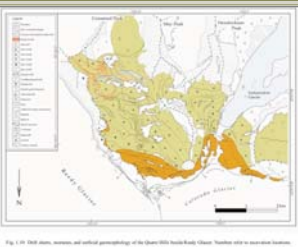


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The Science of Climate Change: A journey to Reedy Glacier, Antarctica Interactive Electronic Exhibit

NSF Final Report

FINDINGS

22 Sept 2009

We feel the videos provide a good reflection of the research process, the setting, and the findings stemming from our work at Reedy Glacier. Based on our observations and our discussions with our collaborators at Acadia National Park and the Maine Discovery Museum, we believe that the Journey to Reedy Glacier exhibit communicates effectively to audiences about how climate research is conducted and what relevance of the work at Reedy Glacier has for Acadia National Park, Mainers, and other Park and Museum visitors. Particular aspects of this project that contributed to its success include:

1. Involving the researchers in the telling of the research story through video interviews;
2. Using graphics and illustrations to make it simpler for lay people to understand a research project involving complex ideas;
3. Making each module self-contained and centered around a question, so that even those watching one or two modules learned something;
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fax: 207/947-6281
mainediscoverymuseum.org

September 23, 2009

Molly Schauffler

Asst. Professor, Dept. of Earth Sciences
University of Maine Climate Change Institute
316 Bryand Global Science Bldg.
University of Maine,
Orono, ME 04469

Dear Professor Schauffler,

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As you know, the kiosk and software have been on the floor of the museum since early spring, where all visitors have had access to the program and information about the research. Our intention was always to surround the kiosk with a themed environment that would draw people to the exhibit and provide related activities and interest for young children.

To that end, our Director of Education and I have been working with an artist and with your team from the University to conceptualize and design the environment, which will include photos of some of the researchers and of the glacier, a painted mural depicting the research site, a tent similar to those used at Reedy, and possibly a snowmobile (!), if we can find one of suitable size.

The opposite wall will have photos, signage, and a bas-relief of an erratic, to make the geological connection between Antarctica and Acadia National Park in Maine.

We appreciate your understanding and cooperation, as we work towards completion of this project, which we think will be a unique addition to Maine Discovery Museum.

Sincerely,

A handwritten signature in cursive script that reads 'Andrea Stark'.

Andrea Stark
Executive Director

From: [Sonya Berger@nps.gov](mailto:Sonya_Berger@nps.gov)
Subject: **Fw:Carbon Dioxide Calculator**
Date: August 4, 2009 7:19:32 PM EDT
To: Molly Schauffler<mschauff@maine.edu>

Hello Molly!

Is the summer going by as quickly for you as it is for me? It is hard to believe that it is already August.

As you can see from the message below, Todd has put the first addition onto both the Climate Change kiosk at the nature center, and on our web site. One more calculator is under development (to determine how the average carbon footprint adds up for an individual) and we are filming/editing a short ranger talk on the evidence of sea level change (looking at both glaciers in the past and global climate change in the future as agents of this change) to add to both the kiosk and the website as well.

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Thanks again for the opportunity to expand out ability to interpret this topic to new audiences in creative ways.

I hope your summer is going well!

Sonya Berger
Supervisory Park Ranger - Interpretation Gorham Mountain District
Acadia National Park

mail: P.O. Box 177, Bar Harbor, ME 04609
phone: 207-288-8803
fax: 207-288-8813

**Preliminary observations: Acadia National Park Nature Center
Mid-term report to NSF, December 2008.**

*The Science of Climate Change: A journey to Reedy Glacier, Antarctica: **Voluntary exhibit evaluation***

Date: 2 Oct. 2008

Observation time: 3 hrs (10:00 am - 1:00 pm)

Total visitors during this time: 166

who paused and looked at exhibit (but didn't use it): 24

parties who view at least one (or part of one) module: 14

Interviewed: 8

1. Which modules did you visit?

1. Introduction __3__

2. Welcome to Reedy Glacier __2__

3. Why Scientists go to Antarctica __3__

4. Daily Life __2__

5. Question __1__

6. Hypothesis_5_

7. Evidence ____

8. Rocks and glacier age _2__

9. What did we find? ____

10. What does it mean? ____

11. Need to Learn ____

12. Acadia __1__

13. Glossary

14. Addit'l info

15. Credits

2. How long did you spend viewing the modules, in total? _4.0, 2.5, 3.0, 0.5, 6.0, 4.0, 15.0, 1.5 _____

3. Did you have any technical problems using the exhibit? (If so, please describe).

Buttons didn't always activate (3 parties)

Black square at the end doesn't return to Main Menu (2)

Didn't recognize earphones at first (2)

No problems at all (4)

4. Please rank the following statements

1 = strongly agree

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What did you learn?

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"I learned what they do all day, how the sun stays up at night"

"My house in Boston is at 27'. I guess I would own shore front property".

5. What questions about climate change or climate science did this exhibit raise for you?

"Where is Reedy Glacier?" (She didn't view intro modules)

"It's information I'm already familiar with."

6. Comments about the exhibit or suggestions for improvement:

"I love these kinds of exhibits. I wish we had time to view all of the units"

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7. Your age group: (I estimated)

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46-60 4

Over 60 8

8. Where are you from? (I didn't ask everyone this question)

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Yosemite

Boston

France

Bavaria

May we contact you at a later time for a short phone or email interview about your reflections on this exhibit? If yes, your best contact phone or email: _____

(None)

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Interpreter comments:

More families come in July & August. Kids are drawn to the technology, but it doesn't hold their interest. Would be great to have a kid's version. (The kids do seem to love those frog phones -- Molly)

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The Science of Climate Change: A journey to Reedy Glacier, Antarctica Interactive Electronic Exhibit

NSF Final Report

FINDINGS

22 Sept 2009

We feel the videos provide a good reflection of the research process, the setting, and the findings stemming from our work at Reedy Glacier. Based on our observations and our discussions with our collaborators at Acadia National Park and the Maine Discovery Museum, we believe that the Journey to Reedy Glacier exhibit communicates effectively to audiences about how climate research is conducted and what relevance of the work at Reedy Glacier has for Acadia National Park, Mainers, and other Park and Museum visitors. Particular aspects of this project that contributed to its success include:

1. Involving the researchers in the telling of the research story through video interviews;
2. Using graphics and illustrations to make it simpler for lay people to understand a research project involving complex ideas;
3. Making each module self-contained and centered around a question, so that even those watching one or two modules learned something;
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The Science of Climate Change: A journey to Reedy Glacier, Antarctica Interactive Electronic Exhibit

NSF Final Report
ACTIVITIES 2009
18 Sept 2009

During the first 11 months of the funding period (September 2007-July 2008) we created twelve video modules, each 2-3 minutes long, depicting our research conducted at Reedy Glacier, Antarctica (NSF grant #OPP-0229034). Although we originally proposed to tell the story in seven modules, we determined in the course of interviewing scientists and gathering videos and photographs that the story would be more clearly told in twelve modules.



In July 2008, working with Acadia National Park staff, we installed the exhibit at Sieur de Mont Nature Center, where it was displayed from August 15 until the Nature Center closed for the season on October 13 (2008). At the end of October, the exhibit and an accompanying poster were displayed for two days at the University of Maine's public Climate Change conference in Orono (October 23 and 24, PDF of the poster is submitted with this report). On November 12, the exhibit was moved to the Cadillac Mountain Sports' Patagonia store in Bar Harbor for the holiday shopping season, and remained there until after the New Year.



We constructed the second kiosk exhibit and installed it at the Maine Discovery Museum in a temporary location in early spring, 2009. During this "pilot" period, Discovery Museum staff determined that they would like to make the video exhibit part of a larger, themed display, as indicated in the attached letter from the Maine Discovery Museum Director, Andrea Stark. This installation is scheduled for completion in December 2009.



During the spring 2009 we created a one-page trifold Discussion Guide and links to resources, for teachers, families, Park staff, and other informal groups to use with the Exhibit. A copy of the Discussion Guide is submitted with this report.

Co-PI Molly Schaufler and Reedy Glacier researcher and graduate student Gordon Bromley attended Acadia National Park's Interpretive staff training session in June 2009, where Gordon gave a one-hour presentation and discussion about climate science, the research at Reedy Glacier, and its connection to Acadia National Park and Maine. Park interpretive staff had the

opportunity to ask questions and view the exhibit. We also provided the Park with electronic copy of the Journey to Reedy Glacier Discussion Guide.

During the spring, Park staff added to the electronic exhibit information about carbon footprints and other climate change information related to the Park, and with this new material the Journey to Reedy Glacier exhibit is on display for a second season at the Nature Center. (Please see the attached note from Sonya Berger, ANP Supervisory Ranger for Interpretive Staff.

Finally, the videos have been reformatted for web display and are available for viewing at <http://www.climatechange.umaine.edu/reedyjourney> . A version formatted for DVD is also available for download from the web site.



Top: Presentation to Acadia national Park interpretive staff, June 2009.



Bottom: Reedy Glacier exhibit at the University of Maine Climate Change Conference, Oct 23 & 24, 2008

Next page: A Journey to Reedy Glacier Discussion guide



DISCUSSION 1: LIVING ON THE ICE

What personal, physical, and scientific *challenges* and *dangers* do researchers face while they are working at Reedy Glacier? (Modules 2, 4, 7)

What personal and scientific *advantages* and *rewards* do they face working "on the ice"?













What limitations to the extent of their work might they experience?

FURTHER INVESTIGATIONS:

Visit Antarctica using Google Earth. Can you find the Transantarctic Mts, the South Pole, the West Antarctic Ice Sheet? Reedy Glacier? (Module 2)

The base station for U.S. researchers in Antarctica is McMurdo Station. Visit the McMurdo Station web cam to see what it looks like today!

LINKS:
McMurdo Station & webcam:
www.nsf.gov/od/opp/support/mcmurdo.jsp

1. Why is everyone talking about climate? 
2. Welcome to Reedy Glacier, Antarctica 
3. Why do scientists go to Antarctica? 
4. Daily life at Reedy Glacier 
5. What is the researcher's question? 
6. What might the answer be? 
7. What evidence helps answer the question? 
8. What can rocks tell us about glacier age? 
9. What did the researchers find? 
10. What does the evidence mean to the researchers? 
11. What do we know, and what do we still need to learn? 
12. Acadia and Antarctica 

THE SCIENCE OF CLIMATE CHANGE:
A JOURNEY TO REEDY GLACIER, ANTARCTICA



Climate affects everyone.
That is why, as Earth's climate warms measurably, climate change and its effects are a powerful impetus for involving citizens in public policy discussions, and in the search for ways to adapt to and mitigate rapid change. The need for citizens to understand the science behind climate change has never been greater.

The interactive electronic exhibit "The Science of Climate Change: A Journey to Reedy Glacier, Antarctica" communicates information to public audiences about the general process of investigating climate change through the particular case of current research at Reedy Glacier in Antarctica. It also reflects upon the relevance of the research to Maine.

This Discussion Guide provides teachers, discussion groups, and others a jumping-off point for continued discussion and exploration about the research, the process of science, climate change and the implications of all of these together for society.

The Journey to Reedy Glacier, Antarctica exhibit and this Discussion Guide are created with support from the University of Maine Climate Change Institute, Acadia National Park, and the Maine Discovery Museum through a grant from the National Science Foundation: ESI Communicating Research to Public Audiences Grant #0628867

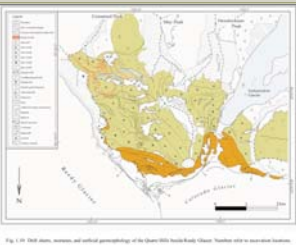
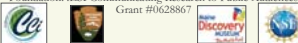


Fig. 1.1. 1980 area, extent, and total percentage of the United States with Reedy Glacier. (Source: USGS, 1980)

DISCUSSION 2: SCIENCE PROCESS AND UNCERTAINTY

How do the Reedy Glacier scientists talk about uncertainty? What are they still uncertain about? How do they balance what they know and what they don't know? (Modules 5, 6, 10, 11)

What evidence do the Reedy scientists use, and what uncertainties might be built into their interpretations of the evidence? (Modules 7, 8, 9, 10)

Did the Reedy scientists answer their question? (Modules 5, 6, 10, 11)

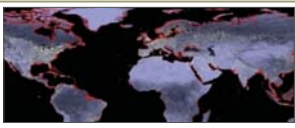
How can a society best use scientific information to make good policy decisions in light of scientific uncertainty?

FURTHER INVESTIGATION:

Find out what role science is playing as climate change policies are being developed in your state.

How do International Panel of Climate Change (IPCC) scientists discuss uncertainty in their reports?

LINKS:
International Panel of Climate Change:
www.ipcc.ch



DISCUSSION 3: CONNECTING CLIMATE RESEARCH TO MY LIFE

Which of the possibilities that the Reedy Glacier scientists talk about could affect my life, and how? (Modules 1, 11)

How might the work at Reedy Glacier relate to the greenhouse effect or other aspects of climate change that I hear about in the news?

What are some implications of Earth's changing climate for my life?

FURTHER INVESTIGATIONS:

Search the web for a carbon footprint calculator to determine how you use energy and ways to reduce your contribution to atmospheric CO₂.

Use the NetLogo climate model to discover why the concentration of carbon dioxide in the atmosphere contributes to a rise in Earth's temperature.
www.cd.northwestern.edu/netlogo/models/ClimateChange

Consider a career in science!

RESOURCES:
Maine's Climate Future: an initial assessment. A report to the Governor and the people of Maine.
www.climatechange.umaine.edu/mainesclimatefuture/index.html
Maine's Ice Age Trail Map:
www.iceagetrail.umaine.edu/

THINKING BEYOND THE EXHIBIT

How does the work at Reedy Glacier and in Antarctica fit into the larger context of climate research? (Modules 5, 11)

LINKS:
www.climatechange.umaine.edu
www.ncdc.noaa.gov/



Scientists at Reedy Glacier used cosmogenic dating as a measure (or proxy) how long ago the rocks at the edge of the glacier were uncovered by the melting ice. What other measurements or proxies are used to reconstruct Earth's climate history? (Modules 7, 8)

LINKS:
www.ncdc.noaa.gov/paleo/

Besides Antarctic glaciers shrinking and growing, what other features on Earth change as climate changes? How are scientists monitoring those changes?

LINKS:
www.nws.noaa.gov/ weather
www.usps.gov/ land/freshwater
www.gomoos.org oceans
www.geo.unizh.ch/wgms/ glaciers