NEW YORK CITY INTERNATIONAL POLAR WEEKEND

TOPIC: EXPLORING OCEAN WATERS BENEATH AN ICE SHELF

PROJECT PERSONNEL:
David Holland, Denise Holland
Courant Institute of Mathematical Science, New York University

GENERAL BACKGROUND INFORMATION ON THE SUBJECT:
There are two major ice sheets on Earth, one over Greenland and a much larger one over Antarctica. The ice from these sheets is forced by gravity to flow off the land and into the ocean, forming vast floating extensions known as ice shelves. In the cavity beneath the floating ice ocean waters circulate. If the ocean waters in the cavity change from cold to warm (for whatever the reason), the ice shelf would rapidly melt away. In this exhibit we provide an idealized, clear-plastic scale-model of an ice shelf and its ocean cavity. Methods to explore the cavity are demonstrated.

TERMS YOU SHOULD KNOW (VOCABULARY):
Ice Sheet: An ice sheet is a mass of glacier ice that covers surrounding terrain and is greater than 50,000 km² (19,305 mile²).
Ice Shelf: An ice shelf is a thick, floating platform of ice that forms where a glacier or ice sheet flows down to a coastline and onto the ocean surface.
Sub Ice Shelf Cavity: The space below the ice shelf base and above the ocean floor, where ocean waters circulate.
Grounding Line: The location where the ice sheet begins to float.

WHY ARE WE STUDYING THIS IN THE POLAR REGIONS?
Ice shelves are thought to be the "bottlenecks" that prevent the ice sheets from sliding off the land and into the ocean, and thus raising global sea level. Of special interest is West Antarctica where the ice shelves are holding back land ice which rests on land *already below* sea level, possibly making this region particularly sensitive to climate change.

HOW DOES THIS AFFECT US HERE IN THE UNITED STATES?
Increased melting of ice shelves could lead to an accelerated increase of land ice going into the ocean and thus the raising of global sea level. If the ice of West Antarctica were to be melted into the ocean, then global sea would be raised by 5 m (~ 15 feet). This would be a major problem for cities like New Orleans, Miami, and New York.

TO LEARN MORE ABOUT THIS TOPIC:
Go to: http://efdl.cims.nyu.edu/project_oisi/realistic/jakobshavn/

ACTIVITY YOU CAN TRY:
Pilot a radio-controlled miniature submersible into a clear-plastic, scale-model ice-shelf cavity, and of course, pilot it back out!

TOPIC:
Sami: The indigenous people of northern Norway, Sweden, Finland and Russia.

PROJECT PERSONNEL:
Johan Anders Bær, Terje Tretnes, Per Tor Turi and Halvdan Nedrejord.

GENERAL BACKGROUND INFORMATION ON THE SUBJECT:
The Sami (Lapps) are the indigenous people of northern Scandinavia. Their language and culture is unique to the region. In Norway, the Sami number about 45,000. There are two main types of Sami – the nomadic people and the sea people.
The nomadic Sami have traditionally moved throughout the region with their reindeer herds. They follow the reindeer across wide expanses of land in northern Norway, Sweden, Finland and Russia. The reindeer has been essential to the survival of the Sami, who have lived in northern Scandinavia for thousands of years. Their culture is one of hardship, driven by the extreme survival skills needed to get through the long grueling winters on the arctic plains, where the temperature can dip below –50 degrees Fahrenheit. The reindeer has been absolutely essential to their existence, providing the Sami with food, clothing, shelter and tools. Today, only 1,500 Sami are still herding reindeer. Many have moved to different parts of the country, or lead "ordinary" modern lives. As they abandon their traditional way of life, the Sami culture is also rapidly disappearing.

TERMS YOU SHOULD KNOW (VOCABULARY)…
Joik: ("y-oik") Traditional Sami singing/chanting. Traditionally sung a cappella, sometimes accompanied by a drum. It usually has short lyrics or no lyrics at all. This type of song can be deeply personal or spiritual in nature.
Nomads: Nomadic people, also known as nomads, are communities of people that move from one place to another, rather than settling down in one location. Sami nomads raise reindeer herds, and move with them so as not to deplete pasture beyond recovery in any one area.
Lavvu: A traditional Sami tent, comparable to a Native American teepee. The traditional lavvu consists of wooden poles interlocked together so that they form a tripod. Upon the assembly of the forked poles, the straight poles are then laid up against the tripod in a circular fashion, finally covered by a large piece of canvas. In the middle, one can put a fireplace, for light and warmth. The Lavvu is very stable in the strong winds in northern Scandinavia.

WHY ARE WE STUDYING THIS IN THE POLAR REGIONS?
The Sami people, along with Inuit tribes in Canada, Greenland and the Arctic regions of Alaska and other indigenous groups in the Arctic, are severely threatened by the effects of global warming. As such, it is important to be aware of the challenges of these groups.

HOW DOES THIS AFFECT US HERE IN THE UNITED STATES?
The fate of the Sami people in the north of Scandinavia has parallels with the fate of other indigenous peoples, such as Native Americans and Inuit populations here in the U.S. As members of these groups move to cities and abandon their traditional way of life, it is more important than ever to preserve and further develop the culture and traditions of these indigenous groups.

TO LEARN MORE ABOUT THIS TOPIC:
For more information, please visit the Norwegian University of Tromsø's online exhibit "Sapmi – Becoming a Nation" at http://sapmi.uit.no/

TOPIC: NORTHERN LIGHTS

PROJECT PERSONNEL: DR. PÅL BREKKE

GENERAL BACKGROUND INFORMATION ON THE SUBJECT:

THE NORTHERN LIGHTS IS CAUSED BY LARGE ERUPTIONS ON THE SUN THAT SHAKES UP THE EARTHS MAGNETIF FIELD. THIS CAUSES PARTICLES TO BE CHANNELED DOWN INTO THE EARTHS ATMOSPHERE WHERE THEY COLLIDES WITH ATOMS AND MAKE THEM GLOW.

TERMS YOU SHOULD KNOW (VOCABULARY):

AURORA BOREALIS - NORTHER LIGHTS
CORONAL MASS EJECTIONS - GAS ERUPTION ON THE SUN
SOLAR WIND - STREAM OF PARTICLES FROM THE SUN
MAGNETOSPHERE - AN INVISIBLE MAGNETIC SHIELD AROUND THE EARTH PROTECTING US FROM THE SOLAR WIND AND SOLAR STORMS

WHY ARE WE STUDYING THIS IN THE POLAR REGIONS?

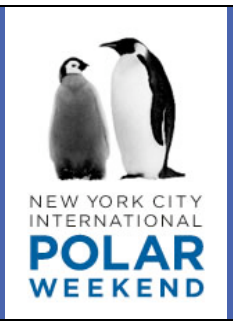
THE AURORA IS MOSTLY SEEN IN THE POLAR REGIONS. ONLY DURING VERY STRONG SOLAR STORMS ARE THEY "PUSHED" FURTHER SOUTH AND CAN BE SEEN IN NEW YORK

HOW DOES THIS AFFECT US HERE IN THE UNITED STATES?

THE NORTHERN LIGHTS NEVER HURT ANYBODY HERE AT EARTH. HOWEVER SOLAR STORMS MAY DISRUPT THE ELECTRIC POWER GRIDS, DISABLE SATELLITES WE DEPEND ON, DISRUPT RADIO COMMUNICATIONS AND NAVIGATIONS SYSTEM. SOLAR STORMS CAN ALSO BE DANGEROUS FOR HUMANS IN SPACE.

TO LEARN MORE ABOUT THIS TOPIC:

WWW.NORTHERN-LIGHTS.NO/



TOPIC: IMAGING THE POLES

PROJECT PERSONNEL:
Andrew Goodwillie, Suzanne Carbotte, Julie Bonczkowski

GENERAL BACKGROUND INFORMATION ON THE SUBJECT:
Scientists have collected many types of data that can be used to learn information about what an area is like, but most of these (sonar, radar, magnetic, seismic etc.) give one piece of information which doesn't give a really complete idea of what an area is like. Geomapapp has been developed to use many types of scientific data, allowing them to be visualized in a geographical map-based context, which greatly aids their interpretation.
It is a free computer program that offers cool visualisation and exploration of geoscience data from around the globe, including the polar regions.

TERMS YOU SHOULD KNOW (VOCABULARY):
scientific data – Facts, numbers, measurements collected by scientists
data visualization – Techniques interpret data (numbers and measures) into images
research cruise – Trips organized to collect science information/data
ocean bathymetry – Measurement of the depth of the ocean floor
ice scours – Erosion or digging out caused by ice moving over an area
geophysics - The study of the physics of the Earth, especially its electrical, gravitational and magnetic fields, and the seismic waves within it
plate tectonics – The theory that the earth's surface is divided into a few large, thick plates that are continually moving.

WHY ARE WE STUDYING THIS IN THE POLAR REGIONS?
The polar regions offer exciting opportunities to study marine geology and geophysics. They are also key to understanding global oceanic and atmospheric processes. Many research cruises and field expeditions visit the polar regions each year to help us better understand the earth.

HOW DOES THIS AFFECT US HERE IN THE UNITED STATES?
Scientists across the U.S. study data collected in the polar regions. a major concern for humanity is Global warming. The effects will be felt here in the UNITED STATES and around the globe.

TO LEARN MORE ABOUT THIS TOPIC:
visit www.geomapapp.org to download the free software.

NEW YORK CITY INTERNATIONAL POLAR WEEKEND

TOPIC:
Implications and causes of shrinking arctic ice extent

PROJECT PERSONNEL:
Stephanie Pfirman, Barnard College
Krista Hoff, Barnard College

GENERAL BACKGROUND INFORMATION ON THE SUBJECT:
Arctic sea ice melts and freezes with the seasons. Arctic ice extent has been decreasing since monitoring began in 1979. The summer of 2007 saw a dramatic decline in ice extent, which models did not predict.

TERMS YOU SHOULD KNOW (VOCABULARY):
arctic - (from Greek arktikos which means northern) northern polar region of the earth which includes almost the whole area of the Arctic Ocean and adjacent areas of Eurasian and North American continents.
albedo - a measure of how well a surface reflects solar energy
drift ice/pack ice – sea ice that moves from winds, currents, or other forces.
first-year ice - floating sea ice of no more than one year's growth
multiyear ice - ice that has survived at least one melt season; it is typically 2 to 4 meters (6.6 to 13.1 feet) thick and thickens as more ice grows on its underside.
sea ice - any form of ice found at sea which has originated from the freezing of sea water.

WHY ARE WE STUDYING THIS IN THE POLAR REGIONS?
Sea ice is an important component of regulating global climate. Bright white ice reflects a lot of incoming solar radiation, while dark waters absorb this heat. Melting and freezing of ice also affects the way water moves throughout the oceans. As sea water freezes, the salt excluded from the crystals makes the ocean water dense. Cold dense water moves southward while warmer water moves northward. Changes in sea ice can alter this global ocean "conveyor belt". Also, many animals rely on Arctic sea ice for feeding, breeding and raising young and many people who live in Arctic depend on these animals for their livelihood.

HOW DOES THIS AFFECT US HERE IN THE UNITED STATES?
Arctic warming will disrupt Earth's natural air conditioner, leading to warming around the rest of the globe.

TO LEARN MORE ABOUT THIS TOPIC:
http://nsidc.org/seaice/
http://www.nrdc.org/globalWarming/qthinice.asp

TOPIC: NORWAY-US IPY SCIENTIFIC TRAVERSE OF EAST ANTARCTICA

PROJECT PERSONNEL: Tom Neumann, University of Vermont, and Zoe Courville, Cold Regions Research and Engineering Laboratory

GENERAL BACKGROUND INFORMATION ON THE SUBJECT:

The US-Norwegian traverse is crossing the high polar plateau, an area that few have visited and little data has been collected. The team will collect snow samples from the surface and ice cores down to 90 meters (about 300 feet) along the way. The ice at 90 meters is about 1000 years old, and examining them will help us determine what the climate was like that long ago. The team is using radar to track the layers of snow all along the traverse to tell them how much snow has fallen in different years (the thickness of layers corresponds to snow fall). They are also using an unmanned aerial vehicle (uav), which is like a remote controlled plane, to take pictures and radar images of the snow along the way, and setting up automatic weather stations which beam temperature, wind speed & direction, and pressure data to researchers in the US via satellite link.

TERMS YOU SHOULD KNOW (VOCABULARY): Firn, which is a term for old snow, snow older than one year found in polar regions where it rarely melts.

WHY ARE WE STUDYING THIS IN THE POLAR REGIONS? Snow, and firn, in polar regions builds up and builds up over thousands of years because temperatures are very rarely above freezing. These built-up layers of snow preserve evidence of past climates, from gases contained in bubbles in the ice, to chemicals (dust, pollutants, radiation, sea salts) found in the snow, to variations in light and heavy isotopes which allow scientists to determine temperature changes in the past. The traverse is going through East Antarctica because very few of these measurements have been made here in the past.

HOW DOES THIS AFFECT US HERE IN THE UNITED STATES?

The climate record contained in the snow and ice in Antarctica reflects things that we in the US have done. For instance, there is a very distinct radioactive layer in the firn that was caused by atmomic bomb testing in the 1960's. The absence of lead in Antarctic firn marks the switch to unleaded gasoline in the 1970's. Deep cores from East Antarctica provide the longest records of past atmospheric gas concentrations, and show that current and projected future carbon dioxide levels are the higher than any time in the last 800,000 years, and that carbon dioxide and temperature trends are closely tied to one another.

TO LEARN MORE ABOUT THIS TOPIC:

Website: traverse.npolar.no
Book: Two mile time machine, by Richard Alley

ACTIVITY YOU CAN TRY: dig a snow pit in your backyard (No snow? try digging a pit in the dirt). It doesn't need to be deep, maybe a foot or less. Choose a wall of the pit, and make that wall as smooth and as flat as you can. Look for different layers in the snow (or dirt)…maybe there are ice layers caused by rain, or very large crystals if the bottom of your pit is near the ground (these large crystals are called hoar, and are formed by heat from the ground and the air making the crystals grow larger). How thick are some of the layers? What could the thickness of the layers mean?

TOPIC: GREENLAND IN NEW YORK? HOW CAN THAT BE?

PROJECT PERSONNEL: YURI GOROKHOVICH, LEHMAN COLLEGE, CUNY

GENERAL BACKGROUND INFORMATION ON THE SUBJECT:
Glacial environment in New York State since the last glacial maximum (approx. 20,000 years ago) was very similar to the modern glacial environment in Greenland. While glacial processes in Greenland are still active, New York State contains only geological evidences of these processes expressed in landforms and structures of sedimentary deposits. To visualize the origin of these deposits and their environment we filmed variety of modern glacial environments in Greenland and made a parallel between them and ancient glacial deposits in New York State. This parallel between active and ancient features helps students during their field trips to understand better geological evidence of the former glacial environments in New York State.

TERMS YOU SHOULD KNOW (VOCABULARY):
Arctic desert; Braided streams; Calving; Catabatic winds; Crevasses; Cross-bedding; Dunes; Erratics; Fluvial deposits; Glacial landforms; Graded bedding; Ice sheet; Icebergs; Moraines; Striations; Till; Wind erosion;

WHY ARE WE STUDYING THIS IN THE POLAR REGIONS?
We study glacial environments in polar regions because this is the only way to see them in action and learn from their behavior how to interpret buried ancient environments left to us by similar processes that took place thousands years ago. For example, ice melting and retreat in Greenland provides a unique opportunity to see geological features formed by these processes and identify them in now buried deposits of New York State.

HOW DOES THIS AFFECT US HERE IN THE UNITED STATES?
In USA we have quite large number of glacial landforms such as remnants of moraines and glacial till; there are also deposits left by ancient glacial lakes and rivers. These deposits play important role as aquifers, building foundations or construction materials. Water yield from aquifers, stability of buildings or qualities of sand and gravel mixes have direct connection to the texture and structure of glacial deposits and their ancient environmental conditions. Therefore geologists need to know these conditions to provide viable economical solutions and advices to the industry or governmental agencies.

TO LEARN MORE ABOUT THIS TOPIC:
1. Story of Glaciers and the Ice Age. W. H. Matthews. New York: Harvey House, 1974.
2. After The Ice Age: The Return of Life to Glaciated North America. E.C. Pielou. University of Chicago Press, 1992.

ACTIVITY YOU CAN TRY:
Go to the web site:
http://www.uwsp.edu/geo/faculty/lemke/alpine_glacial_glossary/exercise/exercise.html

Look at the GLOSSARY first, identify photos with topographic maps. Go thoroughly through images and all terms. Answer questions.

TOPIC: DEMONSTRATION OF ICE CORING

PROJECT PERSONNEL:
Charlie Bentley

GENERAL BACKGROUND INFORMATION ON THE SUBJECT:
Drills for collecting ice cores come in a wide range of sizes, from easily held in one hand, like the one here, to as big as a 4-story building and weighing many tons. They all do essentially the same thing -- cut and remove a cylindrical sample of ice from a glacier or ice sheet (or, in the case of this demo, from a block of ice).

TERMS YOU SHOULD KNOW (VOCABULARY):
Ice core: a cylindrical sample of ice cut from a glacier, ice sheet, or other body of ice
WAIS: West Antarctic Ice Sheet
WAIS Divide: site of deep ice coring in the WAIS

WHY ARE WE STUDYING THIS IN THE POLAR REGIONS?
Ice cores contain a great store of valuable information about the past climate of the Earth, information that will help scientists predict the climate of the future. Just two weeks ago (January 2008) U.S. drillers finished a first (southern) summer of coring at WAIS Divide in Antarctica using one of the really big drills. After two or three more summers of drilling, we hope have cores taken from all depths in the ice sheet, right down to the bottom of the ice, more than 2 miles below the surface.

HOW DOES THIS AFFECT US HERE IN THE UNITED STATES?
Climate affects everybody everywhere, including the U.S. The deep ice core from WAIS Divide will reveal how climate changed over the last 100,000 years; comparison with a similar record already obtained from Greenland in the Arctic will be particularly important for learning how the polar regions interact with each other and the rest of the world in between.

TO LEARN MORE ABOUT THIS TOPIC:
Visit the exhibit by Tom Neumann and Zoe Courville, " Norway-USA IPY Traverse of East Antarctica," in table #12 GG
Go to: http://www.waisdivide.unh.edu/

ACTIVITY YOU CAN TRY:
Handle a real ice core after watching it being cut from a block of ice.

TOPIC: MELTING ICE SHEETS IN GREENLAND AND ANTARCTICA AND GLOBAL SEA LEVEL RISE
PROJECT PERSONNEL: Mary-Elena Carr, Brandon Whitney, Rita Ricobelli

GENERAL BACKGROUND INFORMATION ON THE SUBJECT: Increased atmospheric concentrations of greenhouse gases will lead to warming. A warmer world will be conducive to melting the ice sheets at the poles. That will lead in turn to increased sea level. Ice sheets are thought to melt/form on thousand year time scales. However melting takes place faster than growth. The future rate of melting of the ice sheets on Greenland and West Antarctica is poorly understood because the process is complex, occurs at small spatial scale, and is potentially non-linear. It is possible that the ice sheets will destabilize and melt over time scales of a century, with noticeable changes in sea level over a decade.

TERMS YOU SHOULD KNOW (VOCABULARY):
Greenhouse gas (GHG): Greenhouse gases, like carbon dioxide and methane, trap heat at the earth surface. they are produced by burning fossil fuels, such as coal or oil.
Scenario: A scenario is a set of projected future events that follows certain pre-defined physical or social conditions, such as global warming or business-as-usual.
Ice Sheet: ice sheets are large masses of ice formed by accumulating and compacting snow on land. ice sheets spread outward towards the edge of the continent due to their weight. the flow is very complex and can happen through deformation or basal sliding.
Basal Sliding: flow of ice sheets over the land base. It is much faster when there is melt water or partially liquid sediments.
Ice shelf: ice shelves are platforms of ice resting on the ocean where ice sheets have flowed offshore. at the SEAWARD EDGE icebergs can break off.
Positive Feedback or Vicious Circle: A disturbance causes a positive feedback when it pushes a system further in the same direction.

WHY ARE WE STUDYING THIS IN THE POLAR REGIONS? Most of the frozen water on that is on land (and can thus affect sea level) can be found in the polar ice sheets.

HOW DOES THIS AFFECT US HERE IN THE UNITED STATES? A large part of United States population lives near the coast. Many coastal regions are within a few feet of sea level, for example Florida, Cape Cod, and New York are areas that with even small changes in sea level will see more flooding with storms, and that will lose land for changes of a three feet or more.
ACTIVITY YOU CAN TRY:
1. Look at the poster and choose a greenhouse gas (GHG) concentration level. These are related to how national and global economies use energy. This also includes people like you.
2. There are four jars of tokens, representing the outcomes of warming and sea level change for that ghg concentration. pull a token out of your chosen jar. (You can repeat this step to understand the range of possible values and which ones are more probable.)
3. Read the warming and sea level change and decide what area you would like to see. we suggest New York City, Florida, the Netherlands, Bangladesh.

4. go to the corresponding laptop and input the sea level change, watch how the coastline is affected by the rising sea level.

TOPIC: ANTARCTIC GAMBURTSEV PROVINCE – A MYSTERIOUS MOUNTAIN RANGE HIDDEN BENEATH THE ICE SHEET
PROJECT PERSONNEL:
Robin Bell, Michael Studinger, Nick Frearson

GENERAL BACKGROUND INFORMATION ON THE SUBJECT:
Some problems are to hard to solve alone, and some places are to hard to go to. The Gamburtsev Mountains are deep in Antarctica lying beneath Dome A (the highest and perhaps the coldest place in East Antarctic Ice Sheet), and just west of the Pole of Inaccessibility. This location is so remote that it is difficult and expensive for any single country to try and get to. The International Polar Year **(IPY)** provides opportunities for International Collaboration, with countries working together to plan projects and share their resources, science programs and results. This study will involve scientists from US, Germany, Britain, China and Australia and is only possible because of the international collaboration of IPY.
Fun Fact: There is a statue of Vladimir Lenin (former Soviet leader) left here in 1958!

TERMS YOU SHOULD KNOW (VOCABULARY):
Precambriam – old geologic time ~500 my
Craton – old piece of continent – a stable part of continental crust
Ice core – sample of an ice sheet collected by drilling a hole through
IPY – 125 year old concept when scientists work together to solve a really hard problem
Dome A – Highest point on the East Antarctic Ice Sheet
Pole of Inaccessibility – way in the interior of the continent & the point furthest away from any Antarctic station.

WHY ARE WE STUDYING THIS IN THE POLAR REGIONS?
These are Mysterious Mountain Ranges – Mountains are normally formed by either (1) continents colliding into one another; OR (2) hot spots creating volcanoes as they push up OR (3) continents tearing apart. None of these have happened recently in East Antarctic. It is a precambrian craton - old and stable - . There is no good reason for a mountain range to be there, but this is a big mountain range! About the size of the European Alps!!

This is Changing Ice - Ice sheets are changing today. They can change by melting the ice floating in the ocean that is holding them back. The ice in the ocean acts like someone holding the front edge of a snowboard on a hill. Once they let go the snowboard slides down the hill. The other way an ice sheet can go faster is by greasing the bottom. Water is like grease for an ice sheet. Water in an ice sheet can come from the top or from the bottom (from subglacial lakes!)

HOW DOES THIS AFFECT US HERE IN THE UNITED STATES?
This is OLD ICE - Ice contains samples of air and water so old ice tells us about old climate. To understand changing climate today we want to find the oldest possible ice, and this is probably close to the Gamburtsev Mountains. Scientists are looking for the oldest ice to study!

TO LEARN MORE ABOUT THIS TOPIC:
http://www.ldeo.columbia.edu/gambit

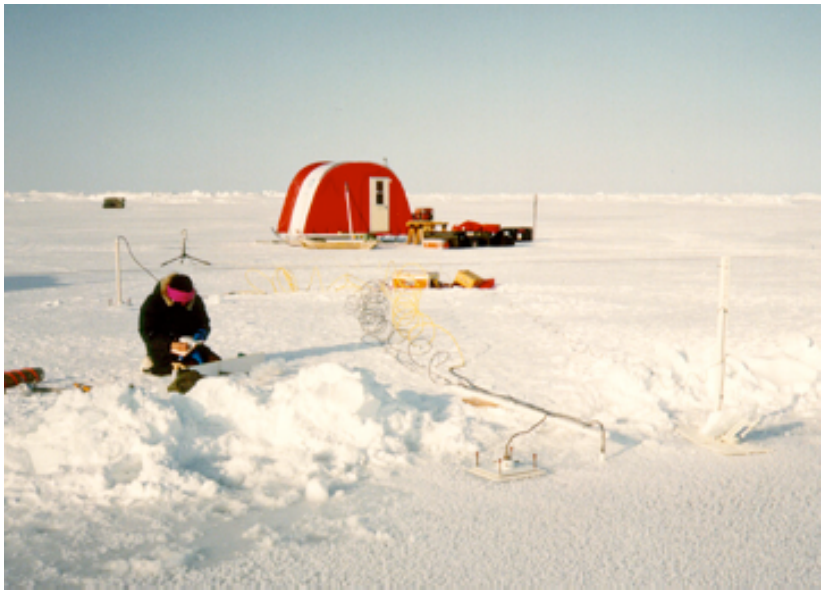
NEW YORK CITY INTERNATIONAL POLAR WEEKEND

TOPIC: HELO HUT – USED IN POLAR FIELD WORK – NAMED 'HELO' SINCE IT CAN BE SUSPENDED FROM A HELICOPTER.

PROJECT PERSONNEL: Cold Region Research & Engineering Laboratory

GENERAL BACKGROUND INFORMATION ON THE SUBJECT:
Like any tent, this one can be used for shelter or storage or as an outdoor laboratory. What makes the helo hut special is its light weight (relatively speaking) and its runners that make it highly mobile. With the runners it can be dragged behind a snow machine from place to place. With its light weight it can even be slung from a helicopter (photo)

The wind and ocean currents, and other stresses in the ice, can cause both first year and multi-year floes to break apart, forming areas of open water through the middle of the ice floe. These areas of open water are called leads (photo). The tent was first used on an experiment called LEADEX, a study of springtime 'leads'.We were like a bunch of hermit crabs - one helo hut, two scientists, a stove, bunk beds, and all our science gear.



NEW YORK CITY INTERNATIONAL POLAR WEEKEND

TOPIC: HOW TO BUILD AN IGLOO AND OTHER SNOW SHELTERS

PROJECT PERSONNEL: Bert Yankielun

GENERAL BACKGROUND INFORMATION ON THE SUBJECT:
The "Inuit" are the native people of Alaska, and northern most America and over to Greenland. Inuit means "the people". This people learned to survive in what we would feel are very harsh climates. Building temporary winter hunting shelters was important to their way of life. An igloo, also spelled 'iglu', is a temporary winter shelter built by Inuit to be used mainly in winter hunting camps.

The igloo probably evolved over hundreds of years mainly by Canadian and Greenland Inuit. Historically the igloos were constructed using a long sharp blade knife to cut the snow into blocks.

The igloo is a carefully balanced construction, requiring precise shaping and placement of snow blocks so that when it is completed it forms a stable and strong dome-shaped structure that is so strong that a person could even stand on the roof! Using snow as the construction material keeps the igloo warm, as snow is a good insulator due to its low density.

See the attached sheet for designs of different snow dwellings that can be constructed in the winter based on the conditions, type of snow available, and other materials found in the wild.

TOPIC: EXPLORATORY TRAVERSES IN ANTARCTICA DURING THE IGY, 1957-58

PROJECT PERSONNEL:
Charlie Bentley

GENERAL BACKGROUND INFORMATION ON THE SUBJECT:
Fifty years ago, in 1957 and 1958, a previous International Polar Year was observed as part of the International Geophysical Year (IGY). Expeditions from half a dozen nations conducted treks in tracked vehicles across the previously unexplored interior of Antarctica, measuring surface height, ice thickness, and snowfall rates, and making geographical discoveries. These traverses provided the information needed to draw the first contour maps of these quantities across much of Antarctica. The IGY also marked the beginning of the modern era of continuous scientific study of the southern continent, which continues today.

TERMS YOU SHOULD KNOW (VOCABULARY):
IGY: International Geophysical Year
IPY: International Polar Year
Oversnow Traverse: A trip across the ice sheet in tracked vehicles pulling cargo sleds

WHY ARE WE STUDYING THIS IN THE POLAR REGIONS?
The oversnow traverse program of the IGY provided the first information needed to understand how the Antarctic ice sheet affects climate and sea level around the entire world.

HOW DOES THIS AFFECT US HERE IN THE UNITED STATES?
Rising sea level will have drastic effects on the coasts of the US and on the people living there.

TO LEARN MORE ABOUT THIS TOPIC:
Read the book "Defrosting Antarctic Secrets," by Henry S. Francis, Jr. and Philip M. Smith

NEW YORK CITY INTERNATIONAL POLAR WEEKEND

TOPIC: AN UNKNOWN SUBGLACIAL WORLD
PROJECT PERSONNEL: Michael Studinger, Robin Bell

GENERAL BACKGROUND INFORMATION ON THE SUBJECT:
Subglacial Lakes are unique environments isolated from the sun for millions of years, yet they may be playing an important role is changing ice sheets today. It is interesting to think that ice floats – Even when it is 2 miles thick. How does water form or stay liquid under ice? Geothermal heat, the heat coming out of the center of the earth, occurs throughout the world. This heat keeps deep mines, down towards the core of the earth, actually hot! It can cause warming and melting at the bottom of a glacier. Additionally, pressure from the several miles of glacial ice thickness can cause melting at the base.

TERMS YOU SHOULD KNOW (VOCABULARY):
Ice sheet – thick piece of ice often over 2 miles thick that can cover an entire continent
Glacier - slow moving mass of ice often found high in the mountains and in polar regions
Subglacial – beneath a glacier or ice sheet/ **Subglacial Lake** – Lake beneath an ice sheet
Subglacial Environments – The environments beneath an ice sheet can include lakes, rivers, streams, swamps
Vostok – Russian word for East/ **Vostok Station** – Russian Station in East Antarctica
Lake Vostok – Biggest subglacial lake found under 2 miles of ice under Vostok station
Microbe – microorganisms that probably live in subglacial lakes
Ice Streams – Rivers made of ice that act like a conveyor belt moving ice in an ice sheet towards the ocean where it becomes icebergs

WHY ARE WE STUDYING THIS IN THE POLAR REGIONS?
There is a lot of water under the Antarctica ice sheets - it collects in lakes, flows between different lakes, in rivers and even drains out in huge flood events. These are unique environments that we did not know existed 10 years ago. ***SO what have we learned:***
•Ice sheets Insulate – the top of an ice sheet is cold (-50C) but the bottom is warm. The ice sheet traps the geothermal heat just like a blanket traps your body heat at night
•Ice Melts – The bottom of an ice sheet can get so warm that it melts!!!
•Ice Melts – If you add friction to the bottom of an ice sheet it will also melt!!
•Ice Sheets are old – The ice at the bottom of the Antarctic ice sheet is almost 1 million yrs . old!!

HOW DOES THIS AFFECT US HERE IN THE UNITED STATES?
Water, in subglacial lakes or streams, can make the bottom of the ice sheet slippery like a banana on a sidewalk. Water draining out of a lake may make the ice sheet flow faster, carrying it towards the ocean where pieces can break off. This can have a wide reaching effect including sea level rise, reduced marine environments, climate change from reduced reflectivity.
TO LEARN MORE ABOUT THIS TOPIC:
http://www.ldeo.columbia.edu/res/pi/gambit/SubglacialLakes.htm
http://www.ldeo.columbia.edu/~mstuding/vostok.html

TOPIC: GLACIER MOVEMENT
PROJECT PERSONNEL: DAVID BRAATEN

GENERAL BACKGROUND INFORMATION ON THE SUBJECT:

Glaciers are slow-moving masses of ice that exist where more snow falls than melts. They occupy about 10% of the Earth's land, mostly in Greenland and Antarctica. Here, glaciers can be as much as 2 miles thick and weigh millions of tons. As they move, glaciers can widen and deepen valleys, flatten forests and grind boulders into pebbles.

Gravity drives glaciers in 2 ways: by sliding over the bedrock with melt water and by ice building up in the middle, forcing the edges to expand. In the Polar Regions, glaciers are frozen to the bedrock and move very slowly, or slide on a film of liquid water and move much more rapidly. A slowly moving glacier flows from about 30 feet to a half mile each year. A sliding glacier can move several miles each year.

TERMS YOU SHOULD KNOW (VOCABULARY):

Glacier- *large masses of ice that move due to gravity, friction and melting*
Regelation- *the melting of the ice due to pressure and its refreezing*
Ice sheet- *ice that covers land that is more than 50,000 kilometers (12 million acres) and is very thick*

WHY ARE WE STUDYING THIS IN THE POLAR REGIONS?

Glacier movement is accelerating in the polar regions and this is contributing to the increase in global sea level.

HOW DOES THIS AFFECT US HERE IN THE UNITED STATES?

Directions:

1. Remove the glacier goo from the bag and place it on the PVC pipe at the higher end. You can use a plastic shoe box or a cookie sheet with something under one end to make a slant instead of the PVC pipe.
2. Observe the movement of your glacier.
3. Design your own experiment. Try it!

Discussion:

1. When the goo initially flowed, what shape did the front take?
2. What part of the goo flows the fastest? Why?
3. How did you design your experiment to show this?
4. How can you make this glacier flow faster?
5. What happens to the flow of a glacier when it hits obstructions in the valley? Does the surface of the glacier change?
6. What did you use for a dam and how effective was it?
7. In Antarctica, what would dam up a glacier flow?
8. What did you learn about glacier flow?

Glacier Goo Recipe:

Mix#1:
One 20 oz cup
1 stirring stick
3/4 cup warm water
1 cup Elmers white glue

Mix#2:
one 8 oz cup
1/2 cup warm water
one stirring stick (for the 8 oz cup)
2 tsp. Borax powder
1 qt plastic zip lock bag

****

Mix # 1:
In the large cup, add 3/4 cup warm water and 1 cup glue. Stir until well mixed.
Mix # 2:
In the smaller cup, measure 1/2 cup warm water. Add 2 tsp. of Borax powder.
Stir until the powder is dissolved.
Pour Mix 2 (the powder mix) into the glue mix. Stir until a glob forms and most of the water is mixed in. This happens quickly! Knead and work the mix for 2 – 3 minutes. Most, if not all, of the water will be incorporated into the mixture.
Place the glacier goo in the zip lock bag.
The mixture will store for a few months.

TO LEARN MORE ABOUT THIS TOPIC: VISIT WWW.CRESIS.KU.EDU
FOR MORE POLAR FAIR ACTIVITIES:
WWW.LDEO.COLUMBIA.EDU/EVENTS/POLARWEEKEND

TOPIC: Siberian Student Art Exhibition

PROJECT PERSONNEL:
Max Holmes, Scientist, Woods Hole Research Center
Liz Braun, Director of Communication, Woods Hole Research Center

GENERAL BACKGROUND INFORMATION ON THE SUBJECT:
The paintings in this exhibition were given to Max Holmes by students from Zhigansk, Siberia. Dr. Holmes has worked with these students for several years as part of the Student Partners Project (www.studentpartnersproject.org). They have been involved in collecting and analyzing water samples from the Lena River to help scientists better understand how global warming is impacting the Arctic.

TERMS YOU SHOULD KNOW (VOCABULARY):
Siberia – the vast region of Russia east of the Ural mountains

Lena River – a huge river in Siberia, comparable in size to the Mississippi River. The students who drew these paintings live beside the Lena River, north of the Arctic Circle.

WHY ARE WE STUDYING THIS IN THE POLAR REGIONS?

The Student Partners Project is working to understand how global warming is impacting the Arctic, particularly the large rivers that flow into the Arctic Ocean (such as the Lena River). Specifically, we are analyzing the chemical composition of the river water, including nutrients and organic matter, which are expected to change as the Arctic warms. We are also interested in how climate change is continuing to impact the discharge of these great rivers, which has been increasing over the past several decades.

HOW DOES THIS AFFECT US HERE IN THE UNITED STATES?

Global warming will impact everyone on earth, but changes are now greatest in the Arctic. By studying the Arctic we can therefore get clues about changes that may impact the rest of us in future years.

TO LEARN MORE ABOUT THIS TOPIC: www.studentpartnersproject.org

TOPIC: MEASURING THE SURFACE TEMPERATURE OF POLAR ICE SHEETS

PROJECT PERSONNEL:
SCIENTIST: DR. MALCOLM A. LECOMPTE
STUDENT RESEARCHERS:
Derrick Pitts
Ebony Addison
Diaminatou Goudiaby
Brian Campbell

GENERAL BACKGROUND INFORMATION ON THE SUBJECT:
How are the surface temperatures of large polar ice sheets, like those in Greenland and the Antarctic, measured?
Satellites can make observations over very large areas determing temperatures by measuring the amount of infrared or microwave radiation being emitted by the ice.

TERMS YOU SHOULD KNOW (VOCABULARY):
electromagnetic energy
infrared and microwave radiation

WHY ARE WE STUDYING THIS IN THE POLAR REGIONS?
long term temperature trends at the Earth's poles is an indicator of global climate change. Polar warming can result in sea level rise, making large populated areas uninhabitable.

HOW DOES THIS AFFECT US HERE IN THE UNITED STATES?
Most of the nations major cities and a significant fraction of the population lie on the coast that will be inundated.

TO LEARN MORE ABOUT THIS TOPIC:
HTTP://EN.WIKIPEDIA.ORG/WIKI/SEA_LEVEL_RISE
HTTP://FLOOD.FIRETREE.NET/
HTTP://WWW.SCIENCEDAILY.COM/RELEASES/2006/03/060308211836.HTM
HTTPS://WWW.CRESIS.KU.EDU/RESEARCH/SATELLITEMEASUREMENTS.HTML
HTTP://NSIDC.ORG/DATA/DOCS/DAAC/NSIDC0002_SSMI_SEAICE.GD.HTML

NEW YORK CITY INTERNATIONAL POLAR WEEKEND

TOPIC: NEW YORK AT THE CLOSE OF THE LAST ICE AGE – HOW FAST DID PLANTS COLONIZE? WHAT DID THE ENVIRONMENT LOOK LIKE?

PROJECT PERSONNEL: DOROTHY PETEET, MIRIAM JONES, SANPISA SRITRAIRAT

GENERAL BACKGROUND INFORMATION ON THE SUBJECT:

NEW YORK WAS ICE COVERED ABOUT 18,000 YEARS AGO, BUT NEW EVIDENCE SHOWSTHE ICE BEGAN MELTING AROUND 16,000 YEARS AGO, AND TUNDRA PLANTS AND ANIMALS COLONIZED THE NEW GROUND. MODERN ENVIRONMENTS LIKE THIS ARE ON GREENLAND AND ICELAND TODAY…AND NORTHERN PARTS OF ALASKA. RAPIDITY OF COLONIZATION OF OPEN GROUND AND LAKE SEDIMENTATION OF INTEREST AS CLIMATE WARMED…POPULATIONS OF PLANTS AND ANIMALS CHANGED

TERMS YOU SHOULD KNOW (VOCABULARY): DEGLACIATION, ICE AGE, TUNDRA, ORGANIC MATTER, DWARF BIRCH, DWARF WILLOW, DIPTERA, GYTTJA, TILL

WHY ARE WE STUDYING THIS IN THE POLAR REGIONS?

AS MODERN ANALOGS FOR ENVIRONMENT IN NEW YORK AT TIME OF THE CLOSE OF THE LAST ICE AGE

HOW DOES THIS AFFECT US HERE IN THE UNITED STATES?

HOW FAST DID WARMING HAPPEN IN THE PAST? WHAT WERE ENVIRONMENTAL CHANGES LIKE? WILL WE SEE RAPID SHIFTS IN PLANTS AND ANIMALS IN THE FUTURE AS CLIMATE WARMS?

TO LEARN MORE ABOUT THIS TOPIC:

LOOK UP ARTICLES ON TUNDRA, ICE AGE, GREENLAND AND ICELAND PLANTS AND ANIMALS

ACTIVITY YOU CAN TRY:

SCOOP A CUP OF SEDIMENT FROM THE BOTTOM OF A LAKE OR POND. SCREEN IT WITH WATER IN A SINK AND THEN DUMP WHAT THE SCREEN CAUGHT IN A PETRI DISH AND LOOK AT IT UNDER THE MICROSOCPE. TRY TO IDENTIFY WHAT YOU HAVE…PARTS OF PLANTS AND ANIMALS…

The International Polar Year ANDRILL Offshore New Harbor Project

The Offshore New Harbor Project: Investigating the Tipping Point from the Greenhouse to Icehouse World of the Past in Antarctica

Introduction

Today, the climate is changing faster than any time of the last 65 million years, with rising temperatures occurring at an alarming rate. Warmer ocean sea surface temperatures are feeding ever more powerful hurricanes, while heat waves and droughts are occurring in record numbers. Moreover, thawing glaciers and melting of the sea ice are shrinking at rates that are far quicker than what even the most pessimistic climate models have predicted.

There is a growing body of knowledge indicating these changes are due to increased concentrations of greenhouse gases such as CO_2 in our atmosphere. Predictions of future atmospheric CO_2 levels expected to occur by the end of this century range from 500 to 900 ppm. The last time that atmospheric CO_2 levels were this high occurred between 25 and 34 million years ago. During this time, the Antarctic ice sheet was far more dynamic, retreating hundreds of miles inland during warm periods, which resulted in sea level to rise over a hundred feet, while during colder periods, the ice sheet expanded across the Antarctic shelf and grew, in some case, larger than today. Additionally, it was also during this period (~34 million years ago) that one of the most dramatic and permanent climatic changes of the last 100 million years occurred: the abrupt change from greenhouse world conditions in which ice sheets were either absent of ephemeral in nature to an icehouse world in which large continental sized ice sheets expanded across Antarctica. Scientists are still struggling to understand what were the causal mechanisms that resulted in this tipping point that switched the climate in Antarctica so dramatically. As this time interval is the last time that atmospheric CO_2 was as high as what is predicted for this century and was considerably warmer than today, studying this period may be able to provide us with a glimpse of our future.

Although a wealth of data from deep sea and terrestrial records provide a detailed story of climate changes at low and mid latitudes, first-order questions remain about how climate and the ice sheet changed in Antarctica. This is due in part to the difficulty in conducting an expedition in this cold harsh region. In fact, many scientists now agree that the key to the climate puzzle lies literally at the bottom of the Earth: Antarctica. However, so far no one has recovered a continuous record during this time interval on the Antarctic continent or on its shelf.

From K. Miller, Rutgers University

If all of the world's ice sheets melted, sea level would rise by approximately 230 feet. This is a representation of how New York Harbor would look in an ice-free world.

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The Offshore New Harbor Project: Exploring Undiscovered Country

Starting last fall and continuing until the spring of 2009, the International Polar Year (IPY) will mark a global effort to understand how patterns of present and past climate change at high latitudes can help scientists better

understand and forecast future climate conditions. This fall, an IPY expedition led by Queens College Professor, Dr. Pekar, will travel to Antarctica to collect seismic and gravity data that will image and constrain the geometry of the sediments below the sea floor in the offshore New Harbor (ONH) area of the Ross Sea. These sediments were deposited during the Greenhouse World (45-34 million years ago) as well as across the transition from the Greenhouse to Icehouse World (34-25 million years ago). The goal of the project will to evaluate the geometry of these Greenhouse World sediments to provide a better understanding of the depositional history in the western Ross Sea and then to develop a drilling project to recover these sediments. This expedition is part of the ANDRILL Program (ANtarctic DRILLing, www.andrill.org), which "is a multinational initiative with the objective to recover stratigraphic core records for the use of interpreting Antarctic's climatic, glacial, and tectonic history for the past 50 Ma".

In early October, the ONH team will fly from Christchurch, New Zealand to McMurdo Station, the largest base in Antarctica. This is the early spring in Antarctica and temperatures typically are in the minus 20's Fahrenheit (plus wind chill). After they are given training on how to survive on the sea ice, they will traverse by vehicles across the sea ice of McMurdo Sound to offshore of New Harbor. There they will conduct the seismic and gravity survey, while living on the sea ice and sleep in unheated tents. It is planned that we will be on the sea ice for about 35 to 40 days. The team will include Dr. Pekar (lead PI), a professor at Queens College (CUNY), Marvin Speece (Co-PI from Montana Tech), Ms. Brown, a teacher at the Promise Academy, which is part of the Harlem Children's Zone, as well as three students from Queens College.

As the storm ebbs….
This is a scene from the 2005 ANDRILL expedition in which Dr. Pekar was a participant. In the background are the Trans-Antarctic Mountains, which soar over 12,000 feet above McMurdo Sound. It is anticipated that we will also experience similar conditions during our upcoming expedition.

Results of the Expedition: Developing a Strategy to Drill One of Antarctic's "Holy Grails"

After the expedition, the seismic and gravity data will be processed, analyzed, and then interpreted to reconstruct the geometry of these greenhouse world sediments. This will provide clues about the depositional history of the area and most importantly will permit us to develop a proposal to drill these sediments in the near future. Such a drilling project would represent a first time that cores from this time interval and region would be recovered. These sedimentary archives have the potential to allow us to unlock many of the secrets of Antarctica's climatic and cryospheric evolution during times when the Earth was a Greenhouse World. In fact, for many Antarctic scientists, these sediments are considered to be one of "Antarctic's Holy Grails".

For more information contact:
Dr. Stephen Pekar (Principal Investigator)
School of Earth and Environmental Sciences
Queens College
65-30 Kissena Blvd.
Flushing, NY 11367
http://qcpages.qc.edu/EES/pep/pekar.html
Email: stephen.pekar@qc.cuny.edu