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Glaciers

Exploring the Impact of Climate Change Aboard the Noorderlicht

In September of 2007, twelve 14 to 17 year old students from Canada, Germany and the United Kingdom sailed to the Arctic aboard a 120-foot, two-masted schooner called the Noorderlicht (in English, Northern Lights). Their voyage was part of a Cape Farewell project. Cape Farewell is a unique organization that brings together artists, scientists and teachers to address and raise awareness about climate change. So far, Cape Farewell has led five expeditions into the wild, beautiful and icy Arctic. The British Council is planning another Cape Farewell voyage for 2008.

Why the Arctic?

In many ways, the Arctic is a perfect laboratory for studying the effects of our energy habits. With such extremely cold weather, the species that live there have adapted in ways that make them very sensitive to temperature changes. Even a change of a few degrees can threaten the survival of some species. In addition, many species need ice for hunting or migration. If climate change causes the temperature to rise and the ice to melt, whole patterns of life for species like the polar bear will change. Likewise, rising temperatures can result in the presence of new species such as bugs, and they can also allow for diseases that colder temperature would prevent. The Inuit and other peoples of the Arctic are reporting species of plant and animals in the region that they never saw before.



Click to see larger map

When studying in the Arctic, scientists look at various plant and animal species, at temperature changes, and at the size of glaciers.

Antarctica, Greenland and the Canadian arctic glaciers represent the three largest ice deposits in the world, although all three are changing at an alarming rate. Changing climates are causing thawing of ice glaciers and rising sea levels as a result. A 2013 study suggested that the Canadian arctic glaciers could thaw as much as 20% by the end of the 21st century, which would cause an increase of 3.5cm in sea level¹.

Life aboard the Noorderlicht



Photo courtesy of Benoit Mesnard, Cape Farewell

Up at the 78th parallel, the students worked with scientists to explore many different aspects of our changing climate — from the effects of climate change on plankton to the extent of temperature changes in the region to the rate at which glaciers are melting. Besides taking part in real research experiments, each of the students expressed their experiences through group art projects such as making a giant ice sculpture and learning creative dance. Students also used the inspiration of the Arctic to express themselves through individual art projects. Many used photography and film to capture the beauty and stillness of their surroundings, while others wrote music that ranged

from songs for the guitar to a throat-singing piece.

Amy, a student from England, is writing a children's story for her art project called *One Lonely Polar Bear*. While on the voyage, she helped make a human graph of weather changes and took part in the group ice sculpture project. You can see the results of both group projects in her video.



Amy hauling the sails aboard the Noorderlicht

Watch Amy's video diary

After the trip, Amy wrote an article about the voyage for her school paper. There, she writes:

Out of the 30 in our class I was the one who was picked to go to the Arctic! Seeing the sun set every day, feeling the breeze, waking up in the mornings to the sound of nothingness, the whole thing was just incredible! The ten days that I spent in the Arctic along with some amazing people — 6 from England, 3 from Canada and 2 from Germany — was packed with lots of things for us to do.

When in Ny Alesund, a small town in Svalbard, Norway, we visited a beach and tried to make some kind of sculpture from the blocks of broken ice. While building, a part of one of the other glaciers fell. The sound of it breaking roared over in our direction. It was as if it was sending a message to us, and it made me realize just how badly we are damaging our planet.

Even though the project was about looking at the science and the arts of the expedition, we all had a little fun along the way. We couldn't go all that way and not have a swim. You could call it crazy, but we called it curiosity. 2.5 degrees Celsius! — "Don't try this at home." We all made a deal, if we went in we had to get our whole body under the water, including our heads. It was freezing!



Sailing aboard the Noorderlicht at night

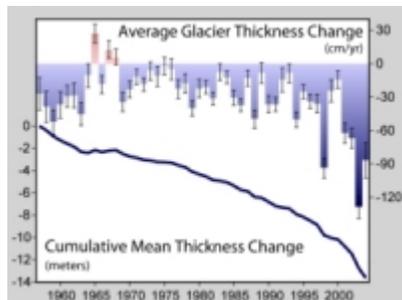
Studying Glaciers

As large, slow-moving rivers of ice, most glaciers exist in the Arctic or very high mountain ranges elsewhere.



Sailing toward the blue glacial ice

Scientists measure the Arctic glaciers every spring and fall to keep track of their changes. Each year, a glacier gains mass (gets a little bigger) with snowfall accumulation in the winter and then loses mass (gets a little smaller) with melting in the summer. Under natural conditions, this glacier mass balance (GMB) – the difference between what it gains in size and what it loses — stabilizes over time. In other words, although it is natural for glaciers to change and move with the seasons, they eventually balance out at about the same size.



Decline in global glacier mass. Click for larger image. Source: Wikipedia

Glaciers can be important barometers of global warming. If a glacier retreats and loses more and more mass year after year and decade after decade, as we know many glaciers around the world are doing, scientists worry that the change is not natural. The on-going melting and loss of glacier mass leads to higher sea levels and can lead to flash floods, landslides and decreased melt-water for some of the world's key river systems. This graph of the last 50 years shows the steady decrease in glacier mass around the world. There are some glaciers in the Rockies that have been photographed since 1850 which show a steady negative mass balance. They have been shrinking and retreating for more than 150 years!

The students on the Cape Farewell voyage who were especially interested in learning about glaciers worked with American glaciologist, Dr. Jack Kohler. The Glacier Group took precise measurements of one glacier to see how much it had melted so that they could assess the glacier mass balance (GMB). They graphed the data alongside the GMB measurements that scientists have taken in the Arctic for the last 40 years.

See the Glacier Group at work in this video from the expedition

Shona and Jethro were two of the students in the Glacier Group:

Shona was one of three Canadian students on the voyage. She lives in St. Hubert, Quebec where she attends Heritage Regional High School. Shona took more than 700 photos while in the Arctic, and she used these to create a photography exhibit at her school.



Shona

Watch Shona's video diary

Jethro is a highschool student in Somerset, England. As you can see in his video footage, Jethro plays guitar and is composing pieces of music inspired by his experiences in the Arctic. He plans to combine his music with images of the voyage in an effort "to help spread the word on climate change."



Jethro

Watch Jethro's video diary and listen to his song

In her blog, Shona described the Glacier Group's first day of research:

Today I was able to do my science project! We were able to meet up with an American glaciologist [Dr. Jack Kohler], and he took us up to see the stakes that he had put in last spring. The stakes are used to measure glacier mass balance (a measurement of how much has accumulated and melted on the glacier over a year). Since the summer has just ended, we were looking at how much had melted since he was last on the glacier.

The experience was incredible. The sun was shining and the air was so fresh. Jack is a very kind man, and he let us measure the stakes for ourselves and help him take the GPS [Global Positioning System] readings. I learned a huge amount about glaciers and was overwhelmed by the size of the glacier and the amount that had melted. It wasn't as dramatic as seeing the ice fall into the water (on the last glacier), but when I stood there and realized how much the glacier had moved over the past century and how fast it was receding, it made me think hard about what we have done to this planet and what we have to do. It was also very empowering to know that the measurements that I was taking were going to be documented in real scientific journals and that [they] would be consulted by scientists all over the world and I did it with my own hands and eyes (at only 16!).

Jethro summed up what they learned from the experience:

We learnt that the amount of ice on the glacier is going down and that the glacier is retreating. The scientist also told us that melting glaciers are strongly contributing to rising sea levels. This relates to the bigger picture of climate change because the glaciers could be melting at such a quick rate due to human activity and carbon/methane emissions.

All of the students aboard the *Noorderlicht* kept blogs and video diaries during the trip and then wrote reports about their experiences. Talk to your teacher if you would like to learn more.

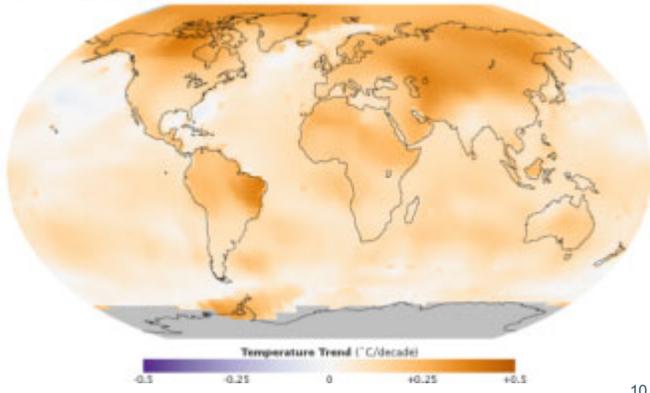


The Cape Farewell team, September 2007

Arctic Glacier Facts

- In the past few decades, temperatures in the Arctic have risen at nearly twice the rate as in the rest of the world²
- Glaciers store about 75% of the world's freshwater, and if all land ice melted the seas would rise about 70 m³
- Presently, 10% of Earth's land area is covered with glaciers. During the last Ice Age, glaciers cover 32% of the total land area!⁴
- North America's longest glacier is the Bering Glacier in Alaska, measuring 204 km in length⁵
- Glacial ice can be very old--in some Canadian Arctic ice caps, ice at the base is over 100,000 years old⁶
- Canada's Arctic region is covered by approximately 150,000 km² of land ice⁷
- In the next 100 years, melting glaciers and ice caps, a significant portion of which are in Canada, are expected to raise global sea levels by 20 to 40 centimeters⁸
- Scientists predict that up to a quarter of global mountain glaciers could disappear by 2050 and up to half could be lost by 2100⁹

1950-2013 Temperature Trend



Nine of the ten warmest years on record have occurred since 2000¹⁰