Name_____ Number_____

Core Sample Processing

1. Take a piece of the core sample and put it in a plastic bag. After making sure that the bag is completely sealed use a hammer to break up the piece so most of the grains are separated.

2. Carefully transfer the core material into a beaker that is halfway filled up with water.
3. Stir the material and let it settle down for a while. After waiting for several minutes, observe if the sediments make any layering and anything else that may be happening in the beaker.

What is the grain size variation you can see within your sample? Use common objects to describe the grain sizes, for example, are they about the size of a poppy seed or smaller/larger? Be creative in finding a way to communicate their sizes to us using familiar objects.

_____

_____

_____

_____

Look closely at the beaker and see if the sediments formed any layering. If you do, think about the following questions: what does it mean? What material makes up each layer? Why and how do you think the layers form?

_____

_____

_____

_____

ICE CORE LAB-Peter Cady Grade 6 Science

Teacher notes:

Introductory slides from

http://ec.europa.eu/research/environment/pdf/descriptions/raynaud_ipy_bxl07.pdf

and connection between CO2 levels and global warming.

"You are climatologists returning from Antarctica with ice cores. You will be observing and analyzing your cores for carbon dioxide levels using our CO2 meter (LIcor meter and software from Univ. of New Hampshire)."

Pass out simulated ice cores to small groups. Each is made from freezing layers of tap water and seltzer in a paper cup. (Orange juice concentrate cans would be better shape.) A layer of sediment/ash between ice layers adds realism.

Student directions on marker board:

1. Sketch ice cores, first without magnification, then using hand lenses or Proscopes. Draw your sketches large! Label the oldest and youngest layers.

2. Make a prediction--Which layer has more CO2?

3. Place each layer in a different sample jar. As they melt under the heat lamp, take measurements of CO2 (ppmv) with the Licor meter every 5 minutes and record them in your notebook:

Time	CO2 layer 1	CO2 layer 2

4. Answer all of these questions in your notebook:
   - Which layer has more CO2?
   - Which layer indicates a warmer climate?
   - How does CO2 get inside an ice core?
   - What are you doing to reduce our emissions of CO2?

5. Use the data from the 1987 Vostok ice cores (at this website)

http://cdiac.ornl.gov/ftp/trends/co2/vostok.icecore.co2

to complete the following graphing assignment:

Name_____ Number_____ Date_____

ICE CORE DATA-Line Graphs

Here's some real data collected from Arctic ice cores in 1987. Let's use it to check out how ice thickness changes with age and to see how CO2 levels have changed over time.

That means two graphs, so pick some graph paper. Your first graph will be ice depth versus age.

1. Labels: X axis: Age (years) Y axis: Depth (meters)

2. You need to choose a scale for each axis. Fill in this chart:

	Maximum number (*Round the number if it helps you.)*	Number of lines on axis (*Give yourself room for a border.)*	Divide first number by second number. This is your interval. *(Adjust this to make the interval easy to use.)*
Years ago			
Depth			

3. Choose at least 10 data points to plot on your graph. It's your choice.

4. Connect your points with a straightedge.

5. Create a title and add it to the top of your graph. Add the axes labels.

Now for your second graph--CO2 Levels versus Age

Repeat the above steps.

X axis: Age (years) Y axis: CO2 Level (ppmv)

	Maximum number (*Round the number if it helps you.)*	Number of lines on axis (*Give yourself room for a border.)*	Divide first number by second number. This is your interval. *(Adjust this to make the interval easy to use.)*
Years ago			
CO2 level			

Barnola et al,Nature, 329, 408-414 (1987)
Barnola et al. 1987
File contains depth, Age, and CO2 concentration to 160,000 Years BP. Published Reference: Barnola et al, Nature, 329, 408-414 (1987)

Depth m	ice Age years	Gaz age years	CO2 ppmv	mimimum value	maximum value
124.6	4050	1700	274.5	279.5	269.5
173.1	5970	3530	270	278	257
250.3	9320	6800	252	262.5	239
266	10040	7500	257	262	252
302.6	11870	9140	259	266	252
375.6	16350	12930	245	250	235
426.4	20330	16250	193	198	183
474.2	24280	20090	194.5	201.5	187.5
525.1	28530	24390	200	205	195
576	32680	28720	198	215	194
602.3	34770	30910	223	232	214
625.6	36600	32800	207	211	203
651.6	38600	34870	210	215	199
700.3	42320	38660	207	211	203
748.3	45970	42310	178.5	196.5	173.5
775.2	48000	44350	200	205	190
800	49850	46220	207.7	214.3	199.3
852.5	53770	50150	201	220	195
874.3	55450	51770	201	213	189
902.2	57660	53860	219.5	229.5	214.5
926.8	59670	55780	214.5	233.5	208.5
951.9	61790	57800	206.5	224.5	201.5
975.7	63880	59770	201	209	193
1002.5	66230	62080	192	195	189
1023.5	68040	63960	193	200	186
1052.4	70470	66540	205.5	225.5	193.5
1074.8	72330	68490	226.5	245.5	215.5
1101.4	74500	70770	243	254	227
1124.19	76330	72690	235	257	226
1148.69	78270	74720	230.5	237.5	223.5
1175	80320	76860	219.5	228.5	210.5
1225.69	84220	80900	222.5	242.5	210.5
1251.5	86220	82820	234	241	222
1274.19	87980	84700	218.8	224.3	213.3
1299.3	89940	86680	210	217	203
1322.5	91760	88520	221.5	238.5	217.5
1349	93860	90630	226	231	216
1374.8	95910	92700	234	238	230
1402.5	98130	94940	226.5	244.5	221.5
1425.5	100000	96810	236	241	231
1451.5	102210	98950	225	231	219
1476.09	104410	101040	229	234	219
1499.59	106610	103130	238.5	249.5	222.5
1526.3	109240	105620	234.5	243.5	225.5
1547	111250	107650	244	256	232
1575.19	113850	110510	233.5	238.5	228.5
1598	115850	112700	240	247	230
1626.5	118220	115290	276	282	270
1651	120170	117410	271.5	278.5	264.5
1676.4	122100	119500	280	290	270
1700.9	123900	121430	271.5	278.5	264.5
1726.8	125730	123380	265.3	270.3	257.3
1774.09	129020	126770	275	282	268

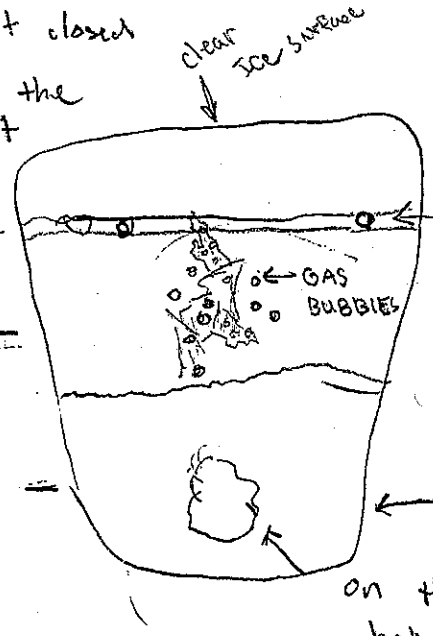
1802.4	131030	128780	266.5	276.5	254.5
1825.69	132700	130460	275	285	265
1850.5	134510	132280	266	285	260
1875.9	136450	134170	296.5	304.5	283.5
1902	138660	136170	266	270	262
1928	141170	138410	246.5	264.5	236.5
1948.69	143440	140430	231	251	224
1975.3	146860	143370	217	221	213
1998	150330	146340	191	209	187
2025.69	154980	150700	200.5	208.5	192.5
2050.3	159100	154970	191.3	198.8	183.8
2077.5	163670	159690	195.5	201.5	189.5

Ryan W. 5/15/08

Layer 1 - evaluation- Layer one is a patch of clear thick ice with a small hole that revealed the inside of the ice core.

layer 2 evaluation. This is where thousands upon thousand (gas) babbles were. - And from what I believe this was A drink and as the drink froze it closed in on the air grabbing co2 gases that the air had. And as it melt I thought it might of multiplide co2-so could drinks give off co2? Layer 1 -

5 holes that I have seen but on the crackling surface theirs probe millions.



Layer 2 -

Hole - As you look in you find a hollow surface - where the air or co2,

Layer 3 -

yellow

on the ice core why was their 1 thick ball of ice in the middle and a no where else? -

- When the ice core was emerged under the heavy light bulb - Many more little holes started to produce. - Were those holes giving of co2 or any thing else?

ICE CORES TEACHER GUIDE

Overview:

In this activity, students will learn how and why scientists drill ice cores in Greenland. They will use this knowledge to create an ice core that demonstrates how natural and human factors affect climate. Designed as an Environmental Science lesson for students in grades 6-8.

Required Materials:

- Frozen orange juice containers, 3 for each group of students
- Access to freezer or freezing outside temperatures .
- Snow or shaved ice
- Paper
- Colored pencils
- Camera (optional)
- Materials to add to the snow to create the various layers. Students will determine what these items will be in their groups. They should be easily acquired items that can be brought in from home.

Activity:

1. Divide the class into small groups and send them on an information hunt to learn about ice cores. Tell students to go to the Ice Core section of WBUR's Greenland site, as well as Daniel Grossman's The Drilling Site and Striking Bottom dispatches. After the groups have finished gathering information, have them share what they learned with the rest of the class.

2. Tell groups to choose one of the following topics and create a poster based on the information they gathered.
   - Ice and ice ages
   - Drilling for ice cores
   - Ice Laboratories
   - What scientists learn from ice cores

3. Send students to the National Geophysical Data Web site Climate History: Exploring Climate Events and Human Development Beyond 100,000 Years. Tell students to search the time periods for examples of natural and human activities that have affected the climate.

4. Create a class list of natural and human activities that affect the climate. This information may come from web sites, newspapers, students' knowledge or other sources. The list should include items such as volcanic activity, droughts, air pollution sea storms, radioactive fallout from Chernobyl, or anything else that students find.

5. Divide the class into small groups for this activity. Tell groups to create a climate timeline that includes both natural and human created events that have an impact on the climate. The timeline should include 7-10 events. Explain to students that the timeline doesn't have to be historically accurate and should instead be a timeline of their own creation.

6. Tell groups that they are going to create an ice core that will simulate the climate changes they have outlined in their climate timeline.

7. Help students layer snow in orange juice containers to create an ice core that reflects their timelines. Ask groups to brainstorm ideas of how they will create each ice layer. For example, if they placed the existence of sea storms on their timeline, they might add some salt to the snow for that particular layer of ice, a very thin layer might signify a drought, ashes might be added to the layer for volcanic activity, and so on.

Tell students that the items they add to the snow should be everyday materials that can be brought in from home like pepper, ashes, food coloring, or any appropriate item that the students can imagine.

8. After students have collected the materials they need for the project, begin constructing the ice cores. Groups may use multiple cans to recreate how actual ice cores are broken into sections. Remind students to add the layers in the reverse order as they appear on the timeline. Tell students to make sure that they pack each layer of snow tightly into the orange juice can. If the snow begins to melt between layers, it may be necessary to place the containers in the freezer until frozen. The construction of the ice cores can take place over several days.

9. After the final layer has been added, freeze the cans overnight. Tell students to remove their ice cores from the cans. Ask students to make a drawing on their ice core, take a measurement of each layer of the core, and write a description of each layer. If you have a camera for the classroom, take pictures of the ice core layers.

10. After all of the groups have completed recording their information, ask them to write down the climate events that were included in their ice cores on separate pieces of paper. Ask them to mix up the order of the papers and place them all face up next to the ice core. Have groups take turns looking at the other groups' ice cores and guessing which events go with which ice layer. Ask each student to write an explanation of how natural events and human activities can affect the climate, what information scientists learn from studying ice cores and why this information is valuable.

Standards: www.mcrel.org

• Standard 6, Understands relationships among organisms and their physical environment, Level III Grade: 6-8

Contact Us

We'd appreciate hearing from you, please send us an email at webmaster@wbur.bu.edu to tell us about your experience using the WBUR Greenland Teacher Guides in you classroom. WBUR's Greenland Teacher Guides were prepared by Bay Breeze Educational Resources.