Teacher's Guide for ODYSSEY

Nov./Dec. 2010: On Ice

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INTRODUCTION: Guide students with these questions: What can you do if you live where there is ice?, What can ice do? Record their answers on three separate chart papers labeled…What I think I know about **ice**, What I want to know about **ice**, and What I learned about **ice**.

What I Think I Know about ICE.	What I Want to Learn about ICE	What I Learned about ICE

Post the charts in the room. Provide post-it notes for them to write down something knew that they learned and then put it on the What I Learned about ICE paper. Before posting their note, students should read what is posted. If what they learned is on the poster, then stick their post-it on top of the one(s) already there.

WHOLE CLASS: Have students create an ICE FACT JOURNAL for the ON ICE magazine. Then assign the following articles to be read:

Shrimp Surprise! p.2

Planes Make It Snow p.3

Asteriod Special Delivery p.4

BOOM…CREEEAAAAAAAAK…It's An Earthquake! P.4-5

Moons Born from Speeding ICE p.5

When is a Solid Water not ICE p.9

The Ice Storm That Stole Christmas p.26 & 28

Ice Power-It Can Break Steel p.27 & 29

This Is Your Brain On Ice p.37-39

Hare on ICE p.49

The Time Has Come p. the back cover of magazine

As students read have them create a page in their ICE FACT JOURNAL for each article and write down facts for the article. They can illustrate each page too.

GROUP WORK: Divide students into groups. Have them read assigned article and add facts to their journal. After reading and discussing what they learned, have students create a visual on the article to share when they do their presentation on the article.

Assign these articles to groups:

The Truth About ice-nine p. 6-9

Seeing Snow p.10-13 &16

Attack of the Real Snow Monster p.17-19

Travel Journal: On an Icebreaker in the Arctic Ocean p.20-22

Ice Fishing For Ghosts in the World's Clearest Ice p.30-33

Ice Blankets p.34-36

Questions that can stimulate discussion after articles have been read.

THE TRUTH ABOUT ice-nine (p.6-9)

1. What is ice-nine?
2. Who is Dr. Felix Hoenikker?
3. Describe ice-nine.
4. What does ice-nine do in Cat's Cradle?
5. What does apocalyptic mean?
6. What is Ice Ih?
7. Where can the other ices be coaxed into existence?
8. Where did ice XV come from?
9. Where might you find naturally occurring Ice II?
10. Why does Ice Ih float?
11. If Ice Ih sank to the deep, dark bottoms of ponds, lakes, and seas every winter, what would happen?
12. Explain Ice Ih's all important-ability to float.
13. What does covalently bonded mean?
14. What is the reason why there are several different kinds of ice?
15. How could Dr. Hoenikker make Ice IX in his laboratory?
16. Why would a crystal of Ice IX not survive outside the laboratory?
17. What is the difference between Ice IX and Ice-nine?

SEEING SNOW (p.10-13 &16)

1. Who is Dr. Kenneth Libbrecht?
2. Where has he studied snowflakes?
3. When did his research begin?
4. Why did he choose snowflake crystals to study?
5. What was the first thing he did when he started his research?
6. How many forms are there?
7. What are "stellar dendrites"?
8. What are "capped columns"?
9. What two dimensions may many snowflakes have?
10. What is the third dimension many snowflakes may have?
11. What is the common characteristic all snowflakes have?
12. What is the difference between snow and hail, sleet, and freezing rain?
13. As crystals, what do snowflakes echo?
14. What do scientist thinks of typical ice crystals?
15. Why are they in neat orderly stacking?
16. What do snowflakes stacking revolve around?
17. Where do snowflakes start?
18. How does Professor Libbrecht describe the creating of a snowflake?
19. What's the key?
20. What's the guide to start the process going?

21. Who created first system to classify snowflakes?
22. Why do some windows have frost and others don't?
23. How does Professor Libbrecht create, photograph snowflakes in his lab?
24. What is Professor Libbrecht still trying to figure out?

ATTACK OF THE REAL SNOW MONSTER (p.17-19)

1. What happened in August 2010?
2. This iceberg is the _____ .
3. What makes a glacier more awe-inspiring than any Hollywood snow monster?
4. What is the… glacier's head, glacier's snout, accumulation zone, firn, glacial ice, continental glaciers, alpine glaciers, tidewater glaciers, geothermal energy, basil sliding, stresses, strains, crecasse, gracture zone, and glacial isostasy?
5. What are glaciers born from?
6. How old is some glacial ice?
7. What do these ice cores from deep in Antarctic glaciers help reveal?
8. Besides the frozen North where else can glaciers be found?
9. Glaciers cover about _____ of Earth's surface and hold about _____ on the planet.
10. Unlike most substances on, _____.
11. What can happen deep down in a glacier because of this?
12. What does the melting create?
13. What drives the movement of a glacier downhill?
14. What is different about Greenland's Jakobshavn Isbrae Glacier?
15. What can cause the glacier to surge or speed faster?
16. Explain the movement of flat continental glacier.
17. Explain the third way glaciers can move.
18. What does all this twisting cause?
19. What do glaciers really move like?
20. Describe the movement of a glacier across a landscape.
21. What has the glacial retreat indicated?
22. Explain what happens once the glacial melting begins.

TRAVEL JOURNAL: ON AN ICEBREAKER IN THE ARCTIC OCEAN (p.20-22)

1. What is NASA ICESCAPE?
2. What does ICESCAPE stand for?
3. What is happening in the project?
4. Where and when did the first cruise start?
5. When will the second cruise be?
6. What is the name of the research ship?
7. Why is the Chief engineer one of the most important people onboard?
8. What are Gumby suits?
9. Why do they test sea water for chlorophyll?
10. What does the Inherent Optical Properties (IOP) package do?
11. What does the 66^{th} parallel mark?
12. What color are the ice floes?
13. What are the different parts of the IOP package and what do they do?
14. What happens when a person crosses the 66^{th} parallel?
15. What was the measurement of the Arctic ice in 1980?
16. What happened when measured in 2007?
17. What does the Imaging Flow Cytobot do?
18. Before the crew can go out on the ice, what has to be determined first?

ICE FISHING FOR GHOSTS IN THE WORLD'S CLEAREST ICE (p.30-33)

1. What is Landsman's "fish"?
2. What is a neutrino?
3. Explain Landsman's "net"?
4. What is the name of the "net"?
5. What is Landsman's ocean?
6. Describe the ice.
7. What is IceCube?
8. Explain the 4 types of telescopes and what they do.
9. What is the problem with neutrinos?
10. What do neutrinos do?
11. What is the "catch"?
12. Describe how neutrinos travel and what happens if it doesn't reenter space.
13. How big is ICeCube?
14. Create a flow chart of a neutrino that doesn't reenter space.
15. Where do the scientists at IceCube look?
16. What is beta decay?
17. What does neutrino mean?
18. When neutrinos slam into atoms, what do they create?
19. How did they finally see the flashes of lights and why?
20. The neutrinos properties make them ideal for studying what?
21. What blocks ordinary light for seeing nearby stars and planets?
22. Where do most of the neutrinos come from?
23. What is IceCube want?
24. Why are there "holes" in IceCube's net?
25. What is the "tale of violence" the powerful neutrinos tell us?
26. What do Landsman and other scientists at IceCube hope to understand?

ICE BLANKETS (p.34-36)

1. Why do Wisconsin growers use blankets of ice?
2. What is " latent heat of fusion"?
3. Why do cranberry growers depend on this?
4. What is a "perennial" crop?
5. Describe the characteristics of a cranberry and what it causes the cranberry to do?
6. Where do cranberries grow?
7. What is the cranberry grower's biggest job?
8. What does the Frost Forecast predict?
9. Why are 2 frost detection systems needed?
10. What is the first system?
11. Why do cranberry growers use sprinkler irrigation systems?
12. What happens when the water turns to ice on the vines?
13. How effective is the sprinkler system?
14. What happens when temperatures drop below 20 degrees F?
15. When do cranberry growers flood their bogs?
16. What two things are ice blankets good for?

After reading the articles, have the students plan a presentation with a visual. Have students discuss each article after the presentation and then write some facts on a page in their journal.

WRITING: Have students write about how important ICE is to them and the rest of the earth using facts from their ICE FACT JOURNAL

EXPERIMENT: Make an Iceberg…Save a Glacier (p.24-25)

Have the students do the experiments and report on them.

CREATIVITY: Show Your Best Paper Snowflake (p.14-15)

Have your students create paper snowflakes and have a contest to pick the "BEST".

PROBLEM SOLVING: The Mystery Triangles (p.23)

Have your students try to solve the puzzle.

READ, RELAX, ENJOY: FROG-SLEEP (p.41-43)

Why the Winter Solstice Was a Time of Fear (p.45)

Have your students read the short story and the fact sheet.