NASA Goddard Space Flight Center
History of Winter (HOW)

HOW 2004 TEACHER-AS-SCIENTIST (TAS) PROFESSIONAL DEVELOPMENT
for the NASA Explorer Schools

February 15th – 21st
Northwood School-Lake Placid, New York

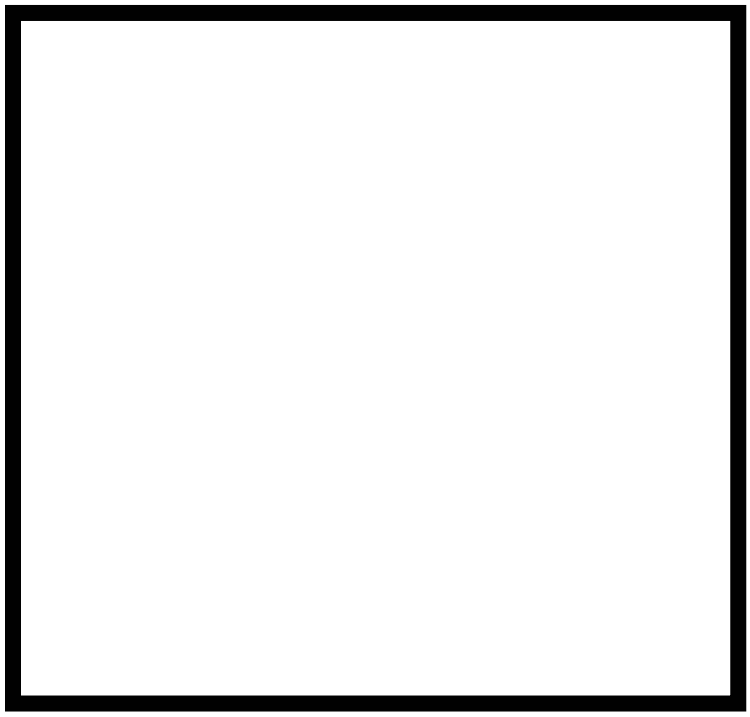
Winter happens during the annual transit of the tilted earth in its orbit around the sun. During this special time ice comes to Lake Placid the host city for the 1932 and 1980 Winter Olympics. Ice, the frozen form of water, is one of the most widespread, intriguing, and familiar compounds in the solar system. It falls as snow, forms lacy deposits on winter windows, skating surfaces on lakes, graceful draperies on rock cliffs, thick packs on the polar oceans, and the even thicker ice caps covering Greenland and Antarctica. Beyond the Earth, ice is present in the frozen oceans of Jupiter's moon Europa, the particles in Saturn's rings, and the spectacular tails of passing comets. Ice on Earth, in the Solar System and beyond is of interest to the NASA Earth and Space Science Enterprises. By participation in HOW the teachers in the NASA Explorer school program (NES) will gain an understanding about how " As only NASA can" relates to Ice on Earth and beyond.

We will study the record in the snow and ice in order to understand the annual history of winter and to generalize an understanding of the Pole to Pole context of winter. Additionally you will learn the scientific technique for the study of ice which will lead to enabling classroom immersion of your experience. You will leave HOW with the intellectual and physical tools to make it happen in your schools. The impact of winter on the ecosystem and man will be considered. Our responsibility is to enhance your abilities as a science teacher and to provide the support resources (including a web site) to enable classroom extension of your experience

www.blueiceonline.org (*which will continue to be the HOW site*) contains results of prior HOW events and will contain the record of continuing HOW events and deliver science content relating to HOW**.**

. One benefit of your association with NASA scientists and educators that are now part of the NASA team is the access to resources. This saves time and provides you with information and content that you otherwise might find difficult to acquire. Consider the snow cover map for December 25, 2003 below.

http://www.ssd.noaa.gov/PS/SNOW/ARCHIVE/USA/
Snow in North America on December 25, 2003



This NOAA map site puts up a daily snowcover map identical to the one above allowing a tracking of snowcover during the year.

NASA web sites
http://modis-snow-ice.gsfc.nasa.gov/modis.html
http://cse.ssl.berkeley.edu/SegwayEd/lessons/search_ice_snow/ski.2b3Look.html
http://visibleearth.nasa.gov/Cryosphere/Snow_Ice/Snow_Cover.html
http://ku-prism.org/resources/polar/iceimages.html
http://www.giss.nasa.gov/research/intro/sohl_01/
http://ku-prism.org/resources/polar/iceinfo.html
http://nasadaacs.eos.nasa.gov/eosposters/icedetail.html
http://icesat.gsfc.nasa.gov/intro.html
http://www.gsfc.nasa.gov/topstory/2003/1209icesat.html
http://snowcover.gsfc.nasa.gov/about.html
http://www.nasa.gov/home/hqnews/2003/feb/HP_news_03058.html
http://visibleearth.nasa.gov/Cryosphere/Snow_Ice/

PARTICIPANT OUTCOMES:

Teacher teams will be created from the attendees and each team will be expected to write a report before concluding the event. Each day will conclude with time spent summarizing the days events and learning ensuring that Friday will be sufficient time to complete requirements.

- These teacher teams will describe how their experience satisfied the National professional development standards

- These teacher teams will describe how the content presented to them fits the National Education standards

- Teachers will individually describe how they will use what they learn here in their classroom and how they will enhance the environment at their schools with their new skills

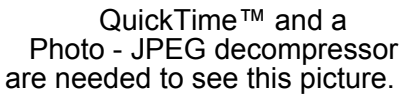
- Teachers at HOW 2004 will come from 11 states. meetings. At Lake Placid three regional teams will be created:

    Team 1 Oregon, Arizona, Montana, New Mexico
    Team 2 Michigan, Minnesota, North Dakota
    Team 3 Florida, North Carolina, New York, Massachusetts

Each team will be encouraged to put together a presentation for the 2005 NSTA meetings. The long lead time between abstract submission and the meetings will prevent the participation in the 2004 NSTA meetings

Each State has its own science teachers meeting and each of the teachers should strive to present at the respective State meetings.

In the preparation of the presentations Peter Wasilewski (the director of HOW) and the HOW science team working with Kathy Bender will assist your preparation and review your abstarcts and presentation materials.


QuickTime™ and a
Photo - JPEG decompressor
are needed to see this picture.

HTTP://WWW.ADIRONDACKS.COM/MAP1_3.HTM

http://www.northwoodschool.com/

Cascade Lake can be located at the same site

http://adirondacks.com/map2_3.htm

You can obtain the latitude and longitude information from the teacher reports from previous HOW events. These are located at http://www.blueiceonline.org

Agenda

Any questions about the HOW Agenda should be addressed to Peter Wasilewski at peterw@blueiceonline.com **.**

WELCOME

SUNDAY, FEBRUARY 15	**NORTHWOOD SCHOOL**	
7:00pm – 7:10pm	**Welcome to Northwood School**	***Perry Babcock,*** Northwood Assistant Headmaster
7:10PM – 7:20pm	**The week at Northwood School**	***Jeff Martin*** On site administration and support
7:20pm – 7:30pm	**Teacher supervision and expectations**	***Rosemary Millham*** Supervisor of attendees
7:30pm – 7:40pm	**Introduction to HOW 2004**	***Peter Wasilewski,*** Director of HOW

SKILLS AND TECHNIQUE DAY WITH SCIENTIFIC METHODOLOGY

Monday, February 16	**Northwood School Cafeteria**	
7:30am – 8:15am	**BREAKFAST in Cafeteria**	
8:15am – 9:15am	**Solar system Ice and the content of HOW**	***Peter Wasilewski***

A broad survey of FROZEN WATER in the Solar System from the first piece of ice ever to the snow and ice at Lake Placid (Ice, the frozen form of water, is one of the most widespread, intriguing, and familiar compounds in the solar system. It falls as snow, forms lacy deposits on winter windows, skating surfaces on lakes, graceful draperies on rock cliffs, thick packs on the polar oceans, and the even thicker ice caps covering Greenland and Antarctica. Beyond the Earth, ice is present in the frozen oceans of Jupiter's moon Europa, the particles in Saturn's rings, and the spectacular tails of passing comets.)

9:15am – 12:00 am **TOOLS WE WILL USE IN OUR STUDIES**

Calibration of thermometers and demonstration of the use of Vernier tools, data logger, and PALM PC/Laptop. How to obtain and use climate data. Basic equations and graphics with climate, snow pit, and ice/snow data. iBUTTON data logger tool (the THERMOCHRON) will be calibrated and its use during the HOW event and throughout the year in your school will be described. The use of polarizer sheets which

will enable the details of ice grain size and texture in the transparent ice to become colorful and visible will be demonstrated

Tony Gow
Peter Wasilewski
Allen Lunsford

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Noon - 1:00 pm **LUNCH in Cafeteria**

1:00pm – 2:00 pm Continuation of Tools also with **Web site resources** ***Peter Wasilewski,***
Allen Lunsford
Tony Gow

To provide participants with the access to content background and related protocols for gathering data, and acquiring samples from snow study locations and ice study locations (Using http://www.blueiceonline.org and other sites)

2:15 –4:45 pm **Set-up Cold Weather Camp Site**

Participants will set-up their sleeping accommodations (sleeping in the camp site is optional), develop teamwork, and be instructed in the principles of living in cold conditions.

Jeff Martin

Snow pit will be dug and the techniques for snowpit analysis will be described. The iBUTTON thermochron s will be embedded in the profile and the diurnal thermal wave will be logged during the week.

Tony Gow
Allen Lunsford
Peter Wasilewski

4:45 pm – 5:00 pm **Travel Back To Northwood**

MONDAY, FEBRUARY 16 NORTHWOOD SCHOOL CAFETERIA

5:00 pm – 7:00 pm DINNER/FREE TIME in Cafeteria. Rosemary the teacher coordinator and Kathy Bender who is responsible for follow-on with distance learning and associated technology will discuss their roles at HOW and provide a framework for communication about topics of interest to the participants.

7:00pm – 9:00 pm Communication with scientists about what lies ahead. Tony will talk about his global ice experience , particularly about his studies with ice on New England Lakes and Peter will talk about collecting meteorites on the Antarctic ice cap.

APPLICATION OF METHODOLOGY TO SNOW PIT AND LAKE ICE SAMPLING SITES

TUESDAY, FEBRUARY 17 NORTHWOOD SCHOOL CAFETERIA

7:30am – 8:15am BREAKFAST in Cafeteria

Tuesday, February 17 **Ice Sampling Field Work at Mirror Lake and Lake Placid**

The Mirror Lake and Lake Placid sites will be reached by short walks. The techniques for ice core and chain saw sampling of the ice will be demonstrated. Vernier tools and the THERMOCHRON will be used to determine the temperature profile of Lake Placid. The ice samples will be returned to Northwood for later thin sectioning and analysis in polarized light.

Tony Gow
Peter Wasilewski
Allen Lunsford

8:30am – 8:45 am Travel to Mirror Lake

8:45AM – 9:30 AM MIRROR LAKE SAMPLING

9:30 –9:45 TRAVEL TO LAKE PLACID

10:00 AM-11:45 AM **LAKE PLACID ICE SAMPLING AND TEMPERATURE PROFILE**

11:45am – noon Travel to Northwood School

Noon – 1:00pm LUNCH in Cafeteria

1:00pm – 1:30pm Travel to Cascade Lake

Tuesday, February 17 Snow Pit and Ice Sampling Field Work at Cascade Lake

1:30pm – 4:30pm **Cascade Lake – Ice Sampling and Snow Pit** ***Tony Gow*** ***Peter Wasilewski***

We will core ice, measure ice thickness, dig a snow pit and determine the characteristics of the snow using the learned protocols in order to decipher the history of winter recorded in the ice and snow.

Cascade Lake- Vernier Tools and THERMOCHRON

Participants will measure temperature profile and dissolved Oxygen etc using Vernier Tools and the THERMOCHRONs will also be used to determine the temperature profile.

Allen Lunsford

4:30pm – 5:00pm **Travel to Northwood School**

Tuesday, February 17 Northwood School Cafeteria

5:00pm – 6:30pm DINNER/FREE TIME in Cafeteria

6:30pm – 9:00pm Team/Reflection and Summarization of Day
Participants discuss the day's activities, complete journal entries, and discuss implications for inquiry based science as it relates to follow-on activities. Kathy Bender will work with teachers to consider how to integrate the HOW experience into their school science/math/technology curriculum.

WINTER ECOLOGY AND ADAPTATION

WEDNESDAY, FEBRUARY 18 NORTHWOOD SCHOOL CAFETERIA

7:30am – 8:30am BREAKFAST in Cafeteria

9:00 am- 10:15 am **Winter Ecology as experienced across the Globe** ***Mary Hindelang***
Winter: an ecological handbook by James C. Halfpenny and Roy Douglas Ozanne will be used. The emphasis will be on the basic ideas about adaptation and contrast in a Pole to Pole context with Latitude and Altitude considered.
- Winter Ecology explores the natural processes, energetics, and phenomena of organisms in cold environments.
- At higher elevations and latitudes, winter is the season of chilling energy deficits that demands the most conservative and remarkable of physical and physiological adaptations in terrestrial and aquatic plants and animals.
- In some regions, winter is the principal architect of life-form and

habitat. In geographic areas where temperatures are low enough and of sufficient duration, snowcover on land and ice thickness on water is critical for overwintering success.
- Humans, as adaptable organisms, experience interactions with their environments and can use their own bodies and minds to learn about the stresses of winter that they and all other organisms experience.

10:15am – 10:30am Break

10:30am - noon **Ecological aspects of snowcover and ice on ponds** ***Mary Hindelang***
Having been introduced to Lake Ice in New England and being aware of the thermal structure of ice covered lakes based on the field experiments we will learn about how this affects life in the Lakes. Additionally snowcover does not bring life to an end but rather modifies hoe life happens until the springtime . We will consider the effects of snow and ice on the ecosystem.

WEDNESDAY, FEBRUARY 18 NORTHWOOD SCHOOL CAFETERIA

NOON – 1:00pm LUNCH in Cafeteria

1:00 pm – 1:30 pm Travel to Cascade lake

WEDNESDAY, FEBRUARY 18 ICE CLIMBING AT CASCADE LAKE

1:30pm - – 4:30pm **Cascade Lake – Ice Climbing** ***Jeff Martin***
Jeff will instruct and supervise participants in an ice climbing adventure
Peter and Tony will sample the ice to enable a history of the ice curtain to be determined.
http://epod.usra.edu/archive/epodviewer.php3?oid=85216

4:30pm – 5:00pm Travel to Northwood School

WEDNESDAY, FEBRUARY 18 NORTHWOOD SCHOOL CAFETERIA

5:00pm – 6:00pm DINNER in Cafeteria

6:30PM – 9:00PM **TEAM MEETING WITH MARY HINDELANG ABOUT WINTER ECOLOGY**

TOGETHER WITH KATHY BENDER AND ROSEMARY MILLHAM THE MANNER OF INCLUSION OF WINTER ECOLOGYINCLUDING TOPIUCS ABOUT SNOW AND ICE IN FOLLOW-ON ACTIVITY WILL BE DISCUSSED

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CLIMATE AND ICE THIN SECTION STUDIES

THURSDAY, FEBRUARY 19 NORTHWOOD SCHOOL CAFETERIA

7:30am – 8:30am BREAKFAST in Cafeteria

THURSDAY, FEBRUARY 19 WHITEFACE OBSERVATORY

8:30am – 9:00am Travel to Whiteface Observatory

9:00am – 10:00am **Whiteface Observatory – Climate/Weather** ***Doug Wolfe,***
To provide participants with an overview of winter weather in the Lake Placid region with a specific focus on Whiteface Mountain. Climate fundamentals

10:00am – 10:30 am Travel to Northwood

10:45am – 12:00 Capturing snowflakes and related activity Eric Erbe
Eric captures snowflakes and immerses them in Liquid Nitrogen Temperature thereby allowing preservation of the flakes for imaging with the Scanning Electron Microscope. This enables the incredible detail of the snowflakes to be discovered.
Snowflakes are important proxies for the temperature and moisture content of the atmosphere they fall through

THURSDAY, FEBRUARY 19 NORTHWOOD SCHOOL CAFETERIA

12:15pm – 1:00pm LUNCH in Cafeteria

1:00pm – 2:00pm **"Light and Ice"** ***Tony Gow,***
To provide participants with an understanding of how light, specifically polarized light, is used as a tool to study the crystal structure of ice.

2:00pm – 5:00pm "**Creating and Analyzing Thin Sections"** ***Tony Gow*****,**

To provide participants with an understanding of the techniques necessary to create ice thin sections and to use polarized light to observe ice crystal size and texture. This session will include an explanation about the use of the polarizer sheets, that you take with you, can be used in many ways in the classroom.

5:00PM – 6:00PM DINNER IN CAFETERIA

7:30pm – 9:00pm **Team and Personal Reflection**
Work with Rosemary Millham and Kathy Bender to review the week. Focus on topics for presentation at State and National Science teacher meetings

TEACHERS DEMONSTRATE WHAT THEY HAVE ACCOMPLISHED

FRIDAY, FEBRUARY 20 NORTHWOOD SCHOOL CAFETERIA

7:30am – 8:30am BREAKFAST

8:30AM – 9:30AM **DISCUSSION WITH TONY AND PETER AND ALLEN AND QUESTION AND ANSWER SESSION. THESE SCIENTISTS WILL BE AVAILABLE DURING THE DAY SHOULD YOU NEED THEIR ASSISTANCE**

9:30AM- NOON TEACHER TASKS -COMPLETE DATA ANALYSIS AND INTERPRETATION AND BEGIN TO ASSEMBLE REPORTS

Friday, February 20 Northwood School Cafeteria
12:00PM – 1:00PM LUNCH

1:00pm - 4:00pm Continue to Write Final Articles as Teams. ,

6:00pm - ??? **Banquet with Local Representatives**

Saturday, February 21 Departure
Departure for Home

WEB SITE RESOURCES

Snowflakes
http://www.microscopy-uk.org.uk/mag/artfeb00/eksnow.html
http://www.hudsonfalls.k12.ny.us/HOME/content/snow_science.htm
http://www.its.caltech.edu/~atomic/snowcrystals

Snow water ice experiments
http://octopus.gma.org/surfing/antarctica/salt.html
http://www.minetonka.k12.mn.us/support/science/lessonsk1/snow.html
/lessons23/snowman.html
/lessons45/somuchsnow.html
http://school.discovery.com/schoolfeatures/featurestories/earthalert/snow
http://www.snowschool.com/density.html
http://www.snowschool.com/melting.html

Short decription of the formation of the ice curtains
http://www.iceclimb.com/science.html

Scientific American-Snowball Earth
http://sciam.com/2000/0100issue/0100hoffman.html

Winter ecology
http://www.ed.mtu.edu/esmis/winter/ecology.html
/snow.html
/adaptations.html

/respiration.html
/subnivean.html
/survival.html
/standards.html

extremes in temperature and moisture
http://www.ncdc.noaa.gov/ol/climate/globalextremes.html

Snow measurement guidelines
http://www.crh.noaa.gov/lmk/soo/docu/precip_type.htm
http://www.globe.gov/sda-bin/wt/ghp/tg+L(en)+P(atmosphere/SolidPrecip)
http://www.nws.noaa.gov/om/snwguid.htm
http://www.wrds.uwyo.edu/wrds/wsc/reference/snowmeas.html
http://www.weatherwise.org/00jf.doesken.html
http://www.home.eznet.net/~vraguso/Book_2/Snow.html#11.1
http://www3.northstar.k12.ak.us/NSFPIS/snow.html

In praise of snow- an essay that should be read.
http://www.theatlantic.com/unbound/flashbks/snow/snow.htm

Wind Chill information
http://observe.ivv.nasa.gov/nasa/earth/wind_chill/chill_applet.html
http://observe.ivv.nasa.gov/nasa/earth/wind_chill/chill_moreinfo.html

making clear ice cubes
http://www.last-word.com/lastword/answers/lwa230bubbles.html
/lwa197bubbles.html
/lwa162bubbles.html

exotic microbes in ice
http://science.msfc.nasa.gov/newhome/headlines/ast12mar98_1.htm

USGS estimate of glaciers and sea level rise- Estimates from all the continents
http://pubs.usgs.gov/factsheet/fs133-99/gl_vol.html

Great sea ice site
http://www.awi-bremerhaven.de/Eistour/index-e.html

Planet seasons
http://www.msss.com/http/ps/seasons/seasons.html
http://newmedia.avs.uakron.edu/geology/ge/ch/ecs/sum.htm
http://kids.msfc.nasa.gov/Earth/Seasons/Seasons-other-planets.asp

http://www.spacescience.com/headlines/y2000/ast21jun_1.htm
http://www.spacescience.com/headlines/y2000/interplanetaryseasons.html

Classroom activity
http://www.northstar.k12.ak.us/schools/joy/creamers/Kits/lesson.html SNOWFLAKES
http://cgee.hamline.edu/snow/snowwksht.html DATA SHEET
http://cgee.hamline.edu/snow/snowequip.html EQUIPMENT
http://cgee.hamline.edu/snow/snowreport.html

http://education.gsfc.nasa.gov/snowflake/
http://educ.queensu.ca/~science/main/concept/biol/b03/G08LAB19.htm classroom examples
http://www.oswego.edu/wscp/cs-s.htm capturing snowflakes
http://sdcd.gsfc.nasa.gov/ESDCD/snowcover.html
http://www.ku-prism.org/resources/polar/icelessons.html
http://www.atozteacherstuff.com/themes/winter.shtml
http://www.gi.alaska.edu/alison/education.html
http://www.wildeducation.org/programs/below_zero/activity/snowplac.asp
http://www.taiga.net/nce/schools/lessonplans/snowstudy.html
http://www.taiga.net/nce/schools/lessonplans/snowstudy_background.html

http://www.ibutton.com/ibuttons/thermochron.html The iBUTTON thermochron