IPY/NSTA Symposium: Polar Climates, How Are They Changing?
Thursday, March 29, 2007

1:00 PM – 1:25 PM
Welcome, Introductions, Goals for the Symposium

Al Byers, Assistant Executive Director of Government Partnerships and e-Learning, NSTA
Sarah Schoedinger, Office of Education, National Oceanic and Atmospheric Administration (NOAA)
Flavio Mendez, Symposia and Web Seminars Program Manager, NSTA

- About NSTA Symposia
- Agenda/Goals
- Forms/Logistics/Introductions

Dr. Doug Williams, Carolina Trustee Professor of Marine and Geological Sciences, University of South Carolina, and Scientist-in-Residence, Edventure Children's Museum
Dr. Elena Bautista Sparrow, Director of Education Outreach, International Arctic Research Center and the Center for Global Change and Research Associate Professor, School of Natural Resources and Agricultural Sciences at the University of Alaska
Mike Dunn, Coordinator of Teacher Education, North Carolina Museum of Natural Sciences
Paula Keener-Chavis, Director of NOAA's Ocean Exploration's Education Program
Dr. Rhian A. Salmon, IPY Education and Outreach Coordinator
Frank Niepold, Climate Education Coordinator, NOAA Climate Program Office

1:25 PM – 1:35 PM
To Stand on the Ocean and Wonder – an Arctic Journey

Mike Dunn

Learning Outcomes

After participating in the presentation,

- Participants will list of climate change impacts on Arctic sea ice.
- Participants will name four types of Arctic wildlife.
- Participants will describe two ways scientists collect data about Arctic climate.

1:35 PM – 3:10 PM
The Arctic, Climate Change and the Earth System

Dr. Doug Williams and Paula Keener-Chavis

Learning Outcomes:

After participating in the presentation and activity,

- Participants will describe what the Earth System is, the major components of the Earth System, and how the components (subsystems) are interrelated.
- Participants will summarize in writing the types of changes being observed in the Arctic due to the impact of climate change on the Earth System.
- Participants will explain how they can use their new knowledge of the Arctic, Climate Change and the Earth System to select lessons for use in their classrooms.
- Participants will identify that the sea ice realm is a biological community of the Arctic Ocean that includes plants and animals that live on, in, and just under the sea ice.
- Participants will list two seasonal changes that take place in sea ice communities.
- Participants will identify one major factor that limits primary productivity in the Arctic Ocean.

3:10 PM – 3:25 PM
Break

3:25 PM – 4:50 PM

GLOBE Seasons and Biomes Project and Climate Change

Dr. Elena Bautista Sparrow and Mike Dunn

Learning Outcomes

After participating in the presentation and activity,

- Participants will generate a list of reasons to explain why observing vegetation phenology (for example green-up) is important.
- Participants will identify stages of green-up (includes budburst).
- Participants will explain relationships between budburst and climate factors.
- Participants will explain how plants influence weather and climate.
- Participants will describe how they and their students can conduct budburst studies in their schools.

4:50 PM – 5:10 PM

Reflections and the International Polar Year

Frank Niepold and Dr. Rhian Salmon

Learning Outcome:

After participating in the presentation,

- Participants will explain the links the Arctic and Antarctic regions have with the rest of the globe.
- Participants will describe how IPY 2007–2008 also aims to educate and involve the public, and to help train the next generation of engineers, scientists and leaders.
- Participants will summarize the 125-year history of internationally coordinated study of polar regions starting with the first IPY back in 1882–1883.

5:10 PM – 5:30 PM

Final Words

- Post-assessment form
- Evaluation form/Survey/Credit info
- NSTA Web Seminars
- Raffle of door prizes

National Science Education Standards Addressed:
Content Standards, 5-8

Content Standard A:
Abilities Necessary to do Scientific Inquiry

- Develop descriptions, explanations, predictions and models using evidence.
- Think critically and logically to make the relationships between evidence and explanations.
- Recognize and analyze alternative explanations and predictions.

Understanding about Scientific Inquiry

- Different kinds of questions suggest different kinds of scientific investigations. Some investigations involve observing and describing objects, organisms, or events; some involve collecting specimens; some involve experiments; some involve seeking more information; some involve discovery of new objects and phenomena; and some involve making models.
- Technology used to gather data enhances accuracy and allows scientists to analyze and quantify results of investigations.
- Scientific explanations emphasize evidence, have logically consistent arguments, and use scientific principles, models, and theories. The scientific community accepts and uses such explanations until displaced by better scientific ones. When such displacement occurs, science advances.
- Science advances through legitimate skepticism. Asking questions and querying other scientists' explanations is part of scientific inquiry. Scientists evaluate the explanations proposed by other scientists by examining evidence, comparing evidence, identifying faulty reasoning, pointing out statements that go beyond the evidence, and suggesting alternative explanations for the same observations.

Content Standard C:
Earth and Space Science
As a result of their activities in grades 5-8, all students should develop understanding of

- Structure and function in living systems
  - Living systems at all levels of organization demonstrate the complementary nature of structure and function.
  - Cells carry on the many functions needed to sustain life. They grow and divide, thereby producing more cells. This requires that they take in nutrients, which they use to provide energy for the work that cells do and to make the materials that a cell or an organism needs.

Content Standard D:
Earth and Space Science
As a result of their activities in grades 5-8, all students should develop understanding of

- Structure of the Earth System
  - Clouds, formed by the condensation of water vapor, affect weather and climate.
  - Global patterns of atmospheric movement influence local weather. Oceans have a major effect on climate, because water in the oceans holds a large amount of heat.
  - Living organisms have played many roles in the earth system, including affecting the composition of the atmosphere, producing some types of rocks, and contributing to the weathering of rocks.

Content Standard E:
Science and Technology
As a result of activities in grades 5-8, all students should develop

- Understandings about science and technology
  - Science and technology are reciprocal. Science helps drive technology, as it addresses questions that demand more sophisticated instruments and provides principles for better instrumentation and technique. Technology is essential to science, because it provides instruments and techniques that enable observations of objects and phenomena that are otherwise unobservable due to factors such as quantity, distance, location, size, and speed. Technology also provides tools for investigations, inquiry, and analysis.

Content Standard F:
Science in Personal and Social Perspectives
As a result of their activities in grades 5-8, all students should develop understanding of

- Natural Hazards
  - Internal and external processes of the earth system cause natural hazards, events that change or destroy human and wildlife habitats, damage property, and harm or kill humans. Natural hazards include earthquakes, landslides, wildfires, volcanic eruptions, floods, storms, and even possible impacts of asteroids.
  - Human activities also can induce hazards through resource acquisition, urban growth, land-use decisions, and waste disposal. Such activities can accelerate many natural changes.
- Risks and Benefits
  - Students should understand the risks associated with natural hazards (fires, floods, tornadoes, hurricanes, earthquakes, and volcanic eruptions), with chemical hazards (pollutants in air, water, soil, and food), with biological hazards (pollen, viruses, bacterial, and parasites), social hazards (occupational safety and transportation), and with personal hazards (smoking, dieting, and drinking).
  - Important personal and social decisions are made based on perceptions of benefits and risks.

Content Standard G:
History and Nature of Science
As a result of their activities in grades 5-8, all students should develop understanding of

- Science as a human endeavor
  - Women and men of various social and ethnic backgrounds--and with diverse interests, talents, qualities, and motivations--engage in the activities of science, engineering, and related fields such as the health professions. Some scientists work in teams, and some work alone, but all communicate extensively with others.
- Nature of science
  - In areas where active research is being pursued and in which there is not a great deal of experimental or observational evidence and understanding, it is normal for scientists to differ with one another about the interpretation of the evidence or theory being considered. Different scientists might publish conflicting experimental results or might draw different conclusions from the same data. Ideally, scientists acknowledge such conflict and work towards finding evidence that will resolve their disagreement.

Content Standards, 9-12

Content Standard A:
As a result of activities in grades 9-12, all students should develop
Understanding about Scientific Inquiry

- Scientists usually inquire about how physical, living, or designed systems function. Conceptual principles and knowledge guide scientific inquiries. Historical and current scientific knowledge influence the design and interpretation of investigations and the evaluation of proposed explanations made by other scientists.

- Scientists rely on technology to enhance the gathering and manipulation of data. New techniques and tools provide new evidence to guide inquiry and new methods to gather data, thereby contributing to the advance of science. The accuracy and precision of the data, and therefore the quality of the exploration, depends on the technology used.

Content Standard D:
Earth and Space Science
As a result of their activities in grades 9-12, all students should develop understanding of

- Energy in the Earth System
  - Heating of the earth's surface and atmosphere by the sun drives convection within the atmosphere and oceans, producing winds and ocean currents.
  - Global climate is determined by energy transfer from the sun at and near the earth's surface. This energy transfer is influenced by dynamic processes such as cloud cover and the earth's rotation, and static conditions such as the position of mountain ranges and oceans.

Content Standard E:
Science and Technology
As a result of activities in grades 9-12, all students should develop

- Understandings about science and technology
  - Scientists in different disciplines ask different questions, use different methods of investigation, and accept different types of evidence to support their explanations. Many scientific investigations require the contributions of individuals from different disciplines, including engineering. New disciplines of science, such as geophysics and biochemistry often emerge at the interface of two older disciplines.
  - Science often advances with the introduction of new technologies. Solving technological problems often results in new scientific knowledge. New technologies often extend the current levels of scientific understanding and introduce new areas of research.

Content Standard F:
Science in Personal and Social Perspectives
As a result of their activities in grades 9-12, all students should develop understanding of

- Natural and human-induced hazards
  - Human activities can enhance potential for hazards. Acquisition of resources, urban growth, and waste disposal can accelerate rates of natural change.
  - Some hazards, such as earthquakes, volcanic eruptions, and severe weather, are rapid and spectacular. But there are slow and progressive changes that also result in problems for

individuals and societies. For example, change in stream channel position, erosion of bridge foundations, sedimentation in lakes and harbors, coastal erosions, and continuing erosion and wasting of soil and landscapes can all negatively affect society.

Ocean Literacy Standards:

3. The ocean is a major influence on weather and climate.

a. The ocean controls weather and climate by dominating the Earth's energy, water and carbon systems.

f. The ocean has had, and will continue to have, a significant influence on climate change by absorbing, storing, and moving heat, carbon and water.

7. The ocean is largely unexplored.

d. New technologies, sensors and tools are expanding our ability to explore the ocean. Ocean scientists are relying more and more on satellites, drifters, buoys, subsea observatories and unmanned submersibles.