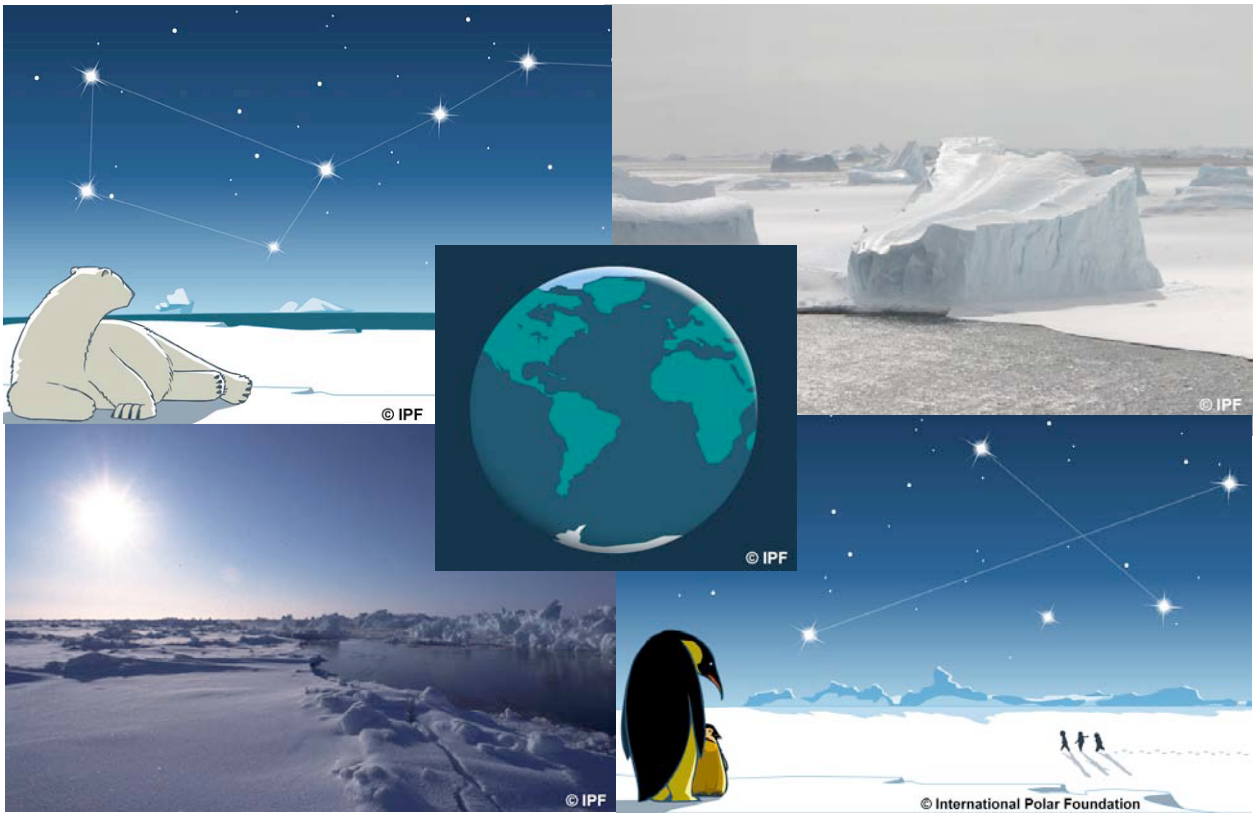
European Geosciences Union



Courtesy of the International Polar Foundation

GIFT - 2006

The Polar Regions

Geophysical Information for Teachers Workshop
Vienna, Austria, 3-5 April 2006

European Geosciences Union
GEOPHYSICAL INFORMATION FOR TEACHERS (GIFT) WORKSHOP

Austria Center Vienna
3 - 5 April 2006

The Polar Regions

Dear Teacher,

Welcome to the fourth EGU GIFT Workshop!

70 teachers from 21 countries will attend this 2 and a half days workshop. We particularly welcome teachers from Belgium, Canada, Singapore and Switzerland who are present for the first time!

The general theme of the 2006 GIFT workshop is "*The Polar Regions*" – the theme has been chosen in preparation for the International Polar Year, 2007-2008. As you will learn from the workshop, this is a major international effort to draw research and public attention to the polar regions, in particular to their role in driving global climate and in turn to the impact of climate change on the polar regions themselves. It is our responsibility to make our school children aware of the importance of the environmental impacts of global change in these regions which is the focus of research by thousands of scientists from over 60 nations.

Presentations will be given by leading scientists and by experienced science educators. But we have also scheduled presentations by the teachers themselves to their fellow teachers, following the success of this element last year. These presentations have proven very useful in stimulating collaborations among teachers from the different countries. We actually think that it is so important that we have encouraged teachers' presentations even when not directly related to the Polar Regions.

In the last part of the workshop, we provide information about teachers' oriented programs and activities. Take advantage of these new possibilities to bring real time science into your classroom! And, please, let us know how you are using the material and ideas from GIFT in your classes: this will be our reward for preparing the workshop! (The list of the members of the Committee on Education and their e-mail addresses is included in this brochure).

Finally, the GIFT-2007 workshop is already being prepared for the General Assembly of EGU, here in Vienna, April 10-15 2007. The General theme will be "Geology, Climate and Environment of large urban areas". Please advertise this workshop among your fellow teachers in your country, to make it as widely known as possible!

Carlo Laj
On behalf of the Committee on Education of EGU

Acknowledgements

The GIFT-2006 workshop has been organized by the Committee on Education of the European Geosciences Union. EGU has supported the major share of the expenses, but the workshop has also benefited of the generous help of:

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- The American Geophysical Union
- The International Programme Office of the International Polar Year (IPY)
- The Ertomis-Stiftung Fondation in Germany
- The Centre National d'Etudes Spatiales (CNES) in France
- The Associazione per la Geofisica « Licio Cernobori » in Trieste (Italy).
- The International Polar Foundation
- The Institut Paul-Emile Victor (IPEV) in France

And we thank all the speakers who have contributed to this educational workshop and their institutions!

European Geosciences Union
Committee on Education

www.copernicus.org/EGU/GIFT/committee_on_education.html

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Program

European Geosciences Union – General Assembly
GEOPHYSICAL INFORMATION FOR TEACHERS
(GIFT) WORKSHOP
Austria Center Vienna

The Polar Regions

Monday April 3, 2006

08:30 - 09:00	Opening of the Workshop
09:00 – 10:00	**FROM EXPLORATION TO SCIENTIFIC WORK: A CENTURY OF HUMAN ENDEAVOUR IN THE POLAR REGIONS** Margarete Pauls Alfred Wegener Institute Bremerhaven
10:00 – 10:30	Coffee break
10:30 – 11:30	**SCIENCE, EDUCATION & OUTREACH OPPORTUNITIES DURING THE INTERNATIONAL POLAR YEAR** David Carlson Director of the IPY International Programme Office
11:30 – 12:30	**PAST CLIMATE FROM THE ICE CORES NORTH AND SOUTH!** Valérie Masson-Delmotte Laboratoire des Sciences du Climat et de l'Environnement (LSCE) Gif-sur-Yvette, France
12:30 – 13:30	Lunch
13:30 – 14:30	**METEORITES FROM ANTARCTICA: ORIGINS FROM MARS AND THE MOON?** Stephen Macko University of Virginia, USA
14:30 – 15:30	**ALONE IN THE ARCTIC NIGHT** Stéphane Lévin Toulouse France
15:30 –16:00	Coffee break

16:00 – 17:00 **TEACHER-TO-TEACHERS PRESENTATIONS.**

Sustainable Development and Environmental Problems: a High-School Pedagogical Experience
Pascale Puppo and **Brigitte Quintard**
Collège Léon Blum, Colomiers andCollège Georges Brassens, Montstruc, France

An Exercise on Climate Change: How does it affect me?
Steve Wolmuth
Central King Rural School, Nova Scotia, Canada

17:00 – end of day **GUIDED TOUR OF THE VIENNA MUSEUM OF NATURAL SCIENCES**
Herbert Summesberger
or Visit the General Assembly of EGU

Tuesday, April 4, 2006

09:00 – 10:00 **ATMOSPHERIC CHEMISTRY AND CLIMATE IN THE ANTHROPOCENE,**
THE NEW GEOLOGICAL ERA AFFECTED, IN MANY CASES DOMINATED, BY HUMAN ACTIVITY
Paul Crutzen
Max Plank Institute for Chemistry
Mainz, Germany

10:30 – 10:30 Coffee Break

10:30 - 11:30 **GREENHOUSE GAZES NATURAL TRENDS: WHAT DO WE LEARN FROM ICE CORES ANALYSES ?**
Jérôme Chappelaz
LGGE, Grenoble, France

11:30 - 12:00 AN EDUCATIONAL CD FOR THE POLAR REGIONS

Agathe Weber
International Polar Foundation, Geneva, Switzerland

12:00 - 13:30 Lunch

13:30 - 15:00 **Hands-on Activity: GOING DOWN IN THE WEDDEL SEA - WHY DEEP WATER FORMATION IS OF VITAL IMPORTANCE"!**
Barbara Donner and Missy Holzer
Research Center Ocean Margins,Bremen, Germany
and Chatham High School, Chatham, New Jersey, USA

15:00 - 15:30 **GIFT-AT-SEA: A VIRTUAL PARTICIPATION TO TWO OCEANOGRAPHIC CRUISES OF THE R/V MARION DUFRESNE**
Catherine Kissel and Carlo Laj
LSCE, Gif-sur-Yvette, France

15:30 – 17:00 **TEACHER-TO-TEACHERS PRESENTATIONS**

A teacher's experience in Antarctica
Louise Huffman
Kennedy Jr. High School, Lisle IL USA & IPY

Project KESch: Reduction of Energy school for the purpose of reducing global warming
Annegret Schwarz
IGS Oberstufe, Germany

Project on the Climatic Impacts of the Gironde Estuaire on the Aquitaine region
Annie Carrasset
Collège Cantelande, Cestas France

Wednesday April 5 , 2006

8:30 – 9:30 **HAS THE ARCTIC OCEAN ALWAYS BEEN COLD?**
Martin Jakobsson
Stockholm University, Sweden

9:30 – 10:00 ***A teacher's view of an Arctic oceanographic Expedition***
Ruben Fritzon
Vibackeskolan, Alnö, Sweden

10:00 – 10:30 Coffee Break

10:30 - 12:15 **PRESENTATION OF TEACHERS' ORIENTED PROGRAMS**

ARGONAUTICA, A SCHOOL PROGRAM RELATED TO OCEANOGRAPHIC SATELLITES
Danielle De Staerke
CNES,
Toulouse, France

THE WINDOWS TO THE UNIVERSE GLOBAL GEOSCIENCE EDUCATOR COMMUNITY
Roberta Johnson
Education and Outreach, UCAR,
Boulder, CO USA

TEACHERS AND RESEARCHERS EXPLORING AND COLLABORATING (TREC)
Janet Warburton
ARCUS,
Fairbanks, Alaska, USA

YOUNG REPORTERS FOR THE ENVIRONMENT CAMPAIGN AND THE POLE PROJECT
Marion Cohen
French Office of the European Fondation for Education
Paris, France

12:15 – 12:30 **Presentation of the GIFT-2007 Workshop**

GEOLOGY, CLIMATE AND ENVIRONMENT OF LARGE URBAN AREAS
Francesca Cifelli, Francesca Funiciello and Carlo Laj
Geology Department, University "ROMA TRE", Italy
& LSCE, Gif-sur-Yvette, France

Speakers and abstracts

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Curriculum Vitae

Post secondary education and diploma degree in Mechanical Engineering from the Rheinisch-Westfälische Technische Hochschule (RWTH) University in Aachen.
Subsequently, research associate at the Centre of University Didactics at RWTH University Aachen, and long-time independent work in adult education, professional continuing education and as a freelance science journalist.

Since 1989, establishment of the public relations department at the Alfred Wegener Institute for Polar and Marine Research, and head of the current staff division.
Selected highlights:

- Polarstern expedition for schools (1998)
- 'Live from the Ice' – public interactive video conferences with Antarctic researchers during EXPO (2000)
- 'Ice-cold Discoveries' – a popular science book, authored by scientists of the Alfred Wegener Institute, edited by Gert Lange (2001)
- 'Year of Geoscience', nationwide year-round contribution and individual large scale event 'Ice and Ocean' (2002)
- 2005 – one year programme celebrating the 125th birthday of Alfred Wegener and the 25th anniversary of the Alfred Wegener Institute
- Winner of the competition 'City of Science 2005' by the 'Stifterverband für die deutsche Wissenschaft' – coordination of Bremen_Bremerhaven City of Science 200

From Exploration to Scientific work – a century of human endeavour in the polar regions

Margarete Pauls

Alfred Wegener Institute for Polar and Marine Research
Bremerhaven, Germany

For a very long time, the polar regions have been among the least known areas on the world's map. The Unknown, hidden under ice and snow, has inspired people's imagination in similar ways as the oceans' dark abyss. The history of Arctic and Antarctic discovery is long and diverse, it includes many tragedies, and the destiny of many individuals is intertwined with it. Among the most well known episodes in polar history are the race to the South Pole between Amundsen and Scott, Ernest Shackleton's Endurance expedition, the drift of Frithjof Nansen's Fram and the conquest of the North Pole by Peary. Among the multitude of often dramatic chronicles, today's focus will be on stories less popular than the race to the South Pole or the Endurance expedition.

Several examples will illustrate the development from first discoveries, through a gradual approach with scientific questioning, to today's technical opportunities and methods.

The Austrian Arctic Expedition with the 'Admiral Tegetthoff' from 1872-74 represents a contribution to the history of North Polar discovery. Curiosity about what the North Pole looked like was driving these people north. They endured immense hardships in their quest to explore the Arctic. Their geographical, physical and biological observations represent important pioneer work. Hence, we owe the discovery of Franz Josef Land to the Tegetthoff expedition under Carl Weyprecht and Julius Payer.

Frithjof Nansen was motivated by the question of sea ice drift across the North Pole. The vessel Fram was built specifically for this purpose and her drift through the Arctic Ocean from 1893 –96 confirmed Nansen's theory.

Alfred Wegener's Greenland expedition of 1930/31 was based on his plan to establish a station on the inland ice of Greenland in order to obtain a full year's data record. Alfred Wegener, a meteorologist and geophysicist had been a professor in Graz between 1924 and 1930. The results of his expedition which pioneered science have advanced polar research enormously.

The polar research and supply vessel 'Polarstern' works since 1982 throughout the polar seas including the pack-ice zone, one of the least explored regions, but one of the most important regarding the regulation of global climate. At the German research station in the Antarctic work began in 1980/81. Technology changed a lot during the last 25 years and now a new construction of Neumayer Station III is planned for 2007/08.

Nowadays, research in the polar regions is conducted with the global system in mind. Satellites, research stations and research vessels in polar oceans are providing significant contributions to the understanding of the system's complexity and interactions. We have already acquired much knowledge. However, the sheer size of the polar regions also demonstrates the magnitude of gaps in our understanding. There are far too few data from the Southern Ocean for instance. This represents one of the big challenges for the future and the International Polar Year.

David J. Carlson

Director
International Program Office

ipy.djc@gmail.com

David Carlson received a B.A. in Biology from **Augustana College**, Rock Island, IL (1973) and a Ph.D. in Oceanography from the **University of Maine**, Orono, ME (1981).

Dr. Carlson served on the graduate faculty in the College of Oceanography at **Oregon State University** from 1983 through 1990. While at OSU, he led research and education programs in the areas of marine chemistry, small-scale ocean physics and rheology, oceanic microbiology, and intertidal chemical ecology.

Dr. Carlson joined the University Corporation for Atmospheric Research in 1991 to lead the Tropical Ocean Global Atmosphere - Coupled Ocean Atmosphere Response Experiment (**TOGA COARE**) International Project Office. Dr. Carlson and the TCIPO staff worked with leading international scientists to plan and implement this large research experiment (~1200 people from more than 20 nations) focused on El Nino and the western Pacific tropical warm ocean pool.

From 1994 to 2003, Dr. Carlson directed the **Atmospheric Technology Division** within the National Center for Atmospheric Research. The Atmospheric Technology Division provided advanced observing systems and associated support services to university researchers for purposes of climate and weather research worldwide. Dr. Carlson led the planning, proposal, and acquisition process for an $80M aircraft, and stimulated an innovative summer undergraduate engineering internship programs.

During 2004, Dr. Carlson took a sabbatical year with the Climate and Global Dynamics Division at NCAR, working on upper ocean – lower atmosphere exchange processes.

Starting from May 2005, Dr. Carlson has served as Director of the International Programme Office for the **International Polar Year**. The IPY, planned for 2007 through 2008, represents an international effort to draw research and public attention to polar regions, particularly to the role of polar regions in global climate change and to the impacts of climate change on polar regions. The IPY International Programme Office resides at the British Antarctic Survey in Cambridge, England.

Science, Education & Outreach Opportunities during the International Polar Year

David J. Carlson
Director
IPY International Programme Office

In 2007 and 2008, a new international effort, the International Polar Year 2007 - 2008 (IPY), will focus on issues of change in polar regions and on the impact of those changes for the planet. IPY will represent the largest coordinated scientific effort since the International Geophysical Year, will involve tens of thousands of participants from more than 60 nations, and will see the launch of new observing tools such as satellites and the development of new international and multi-disciplinary science cooperation. IPY covers an enormous range of science, from the ecology of polar oceanic microorganisms to the change of massive ice sheets and their effect on global sea level. IPY includes a strong engagement with people of polar regions, enlisting their help, guidance and wisdom in confronting important human issues of cultural resiliency and sustainability. IPY, with its breadth of science, and with a large public outreach effort including films and television, blogs and podcasts, events and exhibitions, will represent an extraordinary opportunity for science education.

Valérie Masson-Delmotte

Laboratoire des Sciences du Climat et de l'Environnement (IPSL/CEA-CNRS-UVSQ), Gif sur Yvette, France
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I have pursued my University Curriculum at the Ecole Centrale Paris, (1993) (Master of Science, physics of fluids); PhD (1996) (paleoclimate modelling).

My main scientific interests are to quantify and understand the mechanisms of past changes in climate and hydrological cycles using water stable isotopes from ice cores and tree rings, and atmospheric modelling.

I have been involved in international programs dealing with the comparison of different models for simulating the evolution of climate in the past and also in programs dealing with the acquisition of data from the ice cores and their interpretation. These are the NorthGRIP (North Greenland Ice Core Project) deep drilling project in north central Greenland (75°N), and the EPICA (European Project for Ice Coring in Antarctica) with two deep ice core sites, at Dome C and Kohnen Station. At Northgrip, I was involved both in the field and laboratory work, for EPICA, unfortunately, I could not join the field work but was deeply involved in the analysis of the ice core and the climate history reconstruction.

As a scientist, I am the author or co-author of 60 publications in international scientific journals, and also member of the CLIVAR-PAGES (Climate Variability and predictability / Past Global Changes) working group, lead author of the paleoclimate chapter for the next assessment report of the Intergovernmental Panel for Climate Change (IPCC). I am also involved in the International Polar Year, within the International Partnership for Ice Core Science (IPICS).

I am also very interested in educational activity and give_ university lectures and participate to joint projects with primary to high schools on climate change and sustainable development.

I am also a co-author of a children's book on climate change : "Climat, de nos ancêtres à vos enfants" (for 9 to 12 year old children) (Mini-Pommes du Savoir, Le Pommier, Paris, 2005). Only in French for the moment!

PAST CLIMATE FROM THE ICE CORES NORTH AND SOUTH

Valérie Masson-Delmotte
Laboratoire des Sciences du Climat et de l'Environnement (LSCE)
Gif-sur-Yvette, France

The monitoring of climate change is achieved by using instrumental records, which means direct temperature measurements from weather stations. These temperature records are quite short, ranging from 50 years to 150 years in most areas. They reveal that the temperature increase of the past century (0.8°C) is not homogeneous at the surface of the Earth. The regions undergoing the largest temperature increase are located at the high latitudes north and south : the Arctic, the Antarctic Peninsula. Locally, the recent warming can be above 2°C over the past 50 years.

Polar regions are particularly sensitive to climate change. Large-scale changes in the extent of snow and ice surfaces modify deeply the absorption of solar radiation by the earth surface. This process, known as the "albedo effect", is responsible for a polar amplification of climatic changes. Changes in the polar regions are also relevant for climate at other latitudes. The extent of sea-ice is deeply coupled to the formation of cold and salty ocean waters below the sea-ice; these dense water masses are involved in the formation of deep ocean waters and the global thermohaline ocean circulation. Changes of polar climate –the "cold point" of the Earth's heat machine, are also linked to the large-scale transport of heat and moisture by the atmospheric circulation.

The Greenland and Antarctic ice sheets represent the slowest components of the modern climate system. They will integrate the ongoing climate change over centuries to millennia and may provide a strong contribution to the future sea-level increase. Distributed over the world's oceans, Greenland ice corresponds to 7 meters of sea-level, as much as the West Antarctic ice sheet. When considering what is an "acceptable" climate change, long-terms effects associated with ice sheet destabilization must be taken into account.

The Greenland and Antarctic ice sheets are also unique archives of past climate changes. Since the 1960s, deep ice cores have been drilled at both poles and provide key reconstructions of climate and environmental changes. Although most climate archives are obtained through living organisms (pollens, tree rings, lake or marine sediments), ice cores record past climate changes in the physical and chemical composition of the ice, without passing through biological filters. Local temperature changes can be quantified using the logging of past temperature fluctuations directly in the boreholes; by analyzing the stable isotopic composition of the water and the isotopic composition of air trapped in the ice. The analysis of the dust content and the chemical composition of the ice provides key

informations on the evolution of the large-scale atmospheric composition (volcanic eruptions, content of aerosols). The analysis of the air trapped in air bubbles provides a unique archive of the past greenhouse gas concentrations in the atmosphere.

In Greenland, the longest climate record has been obtained from the NorthGRIP ice core, at 75°N (http://www.nbi.ku.dk/page25264.htm). This ice core spans the past ~123 000 years and provides a detailed record of the current interglacial, the Holocene; the full last glacial cycle; and the end of the previous interglacial period. It has revealed at high resolution how the transition from a warm period to an ice age takes place : a progressive cooling, induced by changes in the orbit of the Earth around the Sun, followed after about 5000 years by the onset of abrupt climate changes. During the last ice age, 25 such abrupt climate changes have been revealed from Greenland ice cores ("Dansgaard-Oeschger events") and correspond to rapid temperature increases (8°C to 16°C) occurring over decades to centuries. They are associated with abrupt changes of the North Atlantic ocean circulation, and an Antarctic counterpart. The last interglacial period appears to have been warmer by about 5°C than today, and the NorthGRIP ice core reveals that there was still a north Greenland ice sheet at that time. As we know that the sea level was higher than today by 3 to 7 meters, this shows that the Greenland ice sheet was not fully destabilised and that the west Antarctic ice sheet could have also significantly contributed to the observed sea-level rise.

In Antarctica, the EPICA (European Project for Ice Coring in Antarctica) has also achieved two new deep ice cores. At Kohnen Station, the bedrock has just been reached in January 2006. At Dome C, the deep ice core has started to deliver its secrets and provides a climate record covering the past 800 000 years. The succession of climatic cycles (an interglacial "warm" period lasting 10 to 30 000 years followed by an ice age lasting tens of thousands of years) reveals a variety of warm and cold periods in Antarctica. The warmest episodes correspond to temperatures 5°C warmer than today, and the coldest periods to temperatures 10°C colder than today. New insights on the relationships between changes in the orbital parameters of the Earth, controlling the solar energy distributed at the Earth surface, and past climate changes are revealed by this "oldest ice".

Stephen A. Macko

Professor of Isotope and Organic
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Stephen Macko is Professor of Isotope and Organic Geochemistry, Department of Environmental Sciences at University of Virginia since 1993.

His formation includes subjects as different as a B.S. in Chemistry, 1973, a B.A. in Psychology, Carnegie-Mellon University; a M.S. in marine chemistry, in 1977 at University of Maine; and a Ph.D., 1981, marine organic geochemistry,

His major areas of interest include: the estimation of structure and modification of marine and terrestrial food chains through stable isotopes; ancient human interactions assessment using stable isotopes; organic carbon preservation and sequestration; development of molecular level stable isotope tracers; biogeochemical cycles of nitrogen and carbon; the conditions on the prebiotic Earth for the origins of life and Elementary to High School education/outreach including advanced technology (teleducation) applications.

His recent projects include: studies on chemosynthesis at cold seep sites and hot vents using the Johnson Sea Link and Alvin submersibles for sample acquisition; interpretation of ancient human diet (mummies); tracking fires and aerosols from sub-Saharan Africa and establishing the organic geochemical conditions of the Earth prior to the origins of life. Scientist/ Chief Scientist for 28 oceanographic expeditions, in addition to 5 field campaigns to the High Arctic on the Canadian Ice Island.

He has been the major advisor to 38 advanced (MS and PhD) degree students; advisor to 9 graduate students in residence, and he is author/coauthor of over 250 articles published in major international scientific journals.

Featured on Discovery and National Geographic Channel programs (The Ultimate Guide to Mummies, The Moche Murder Mystery, The Mummy Road Show) as well as a number of public and commercial radio and television interviews about his research on mummies, meteorites and deep sea life.

Meteorites from Antarctica: Origins from Mars and the Moon?

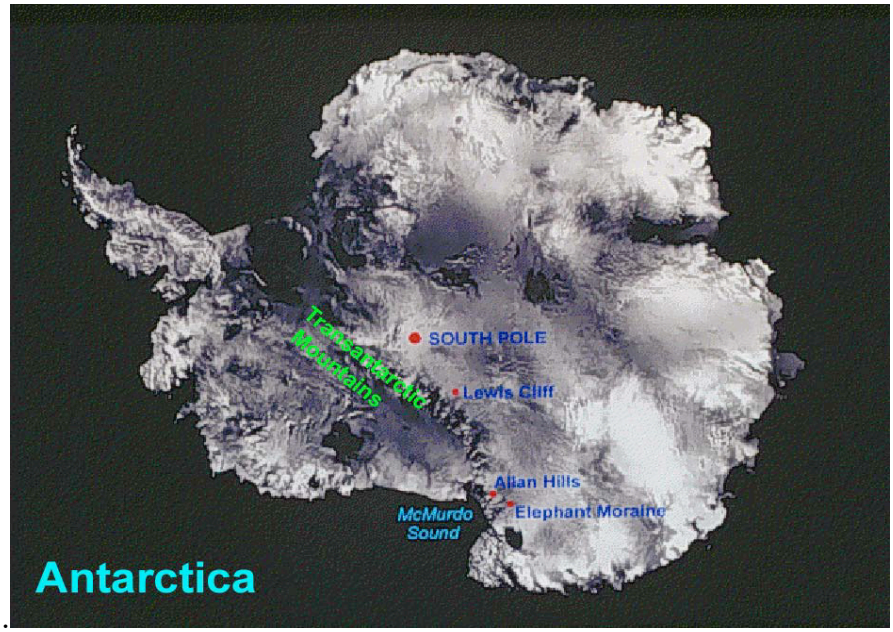
Stephen A. Macko

Department of Environmental Sciences
University of Virginia, USA

Meteor showers, fireballs or "shooting stars" are a constant source of wonderment to all observers. Perhaps 100,000 metric tons of this space debris is thought to impact the Earth's atmosphere each year. If large enough, and not so large so as to cause it to disintegrate, these surviving rocks from space, or meteorites, allow us to begin to ask the scientific questions as to what they are and from whence they came. In the past, even the most learned scientists of their day, among them Sir Isaac Newton, could not believe that these objects were derived from anywhere in the cosmos, which was thought to be empty. The most distant sources were then described as atmospheric materials that had coalesced following volcanic eruptions or lightning strikes. It was only with a publication by Ernst Chladni, in 1794, was the extraterrestrial origins of meteorites successfully argued.

Prior to 1969, meteorites were commonly acquired through the occasional, rare observation of an actual "fall" and its retrieval, or more commonly as a "find" of an unusual rock with a special crystalline structure or density. These meteorites were named according to the location of the find or fall, and categorized according to one of three types: irons, stony-irons, and stones, based on their proportions of metal and silicate minerals. Some stones, or chondrites, contain sphere-like structures or chondrules, which are thought to be condensation products of early solar system materials. In the 500 years of meteorites being collected before 1969, about 2600 rocks had been classified. A few of the falls did not fit the general description or age of the other meteorites, the Shergotty, Nakhla and Chassigny, and were classified in a unique grouping (SNCs).

In 1969, Japanese geologists working in Antarctica came across nine meteorites lying on the ice. Thinking they were a single meteorite event, they collected them, and returned them to Japan for analysis. They eventually discovered that the nine stones represented portions of multiple falls of meteorites, not a single event. Since that time more than 25,000 meteorites have been collected from across Antarctica, chiefly along the Transantarctic Mountains, representing, when paired with similar stones, over 3500
events.



Prior to the recoveries of meteorites from Antarctica, few scientists had suggested that meteorites could have been the result of a volcanic eruption or an impact event on another planet or on the moon, the fragments of which would then have to be transported across space and come in contact with the Earth. In 1981, a meteorite found in the Transantarctic Mountains, a portion called the Allan Hills, appeared to have a lithology nearly identical to the lunar specimens brought back by the Apollo astronauts. On further examination of other meteorites, not only did some have similarities with lunar rocks, but the mineralogy, age and chemistry of six Antarctic meteorites were nearly identical to analyses (including trapped noble gases) of the rocks studied by the Viking Landers of Mars, and to the SNC meteorites. They were relatively young in geological age and the included gases were close to what was found in the current atmosphere of Mars. One particular stone, the first meteorite analyzed from the 1984 collection of the Allan Hills region, ALH84001, has received significant attention worldwide because not only is it suspected to be of a Martian origin, but it is also the first one to contain abundant secondary minerals. The secondary minerals are almost entirely carbonates; furthermore, this meteorite also has crystalline structures (organized microstructures) suggestive of fossils, as well as organic compounds called polycyclic aromatic hydrocarbons. This information, taken together, led those authors (McKay, et al. 1996) to suggest that primitive life forms may have been present on Mars.

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- Arctic and Greenland
- Women International Space Simulation for Exploration 2005

Member of French Explorer Society

Expedition:

Sahara
Amazon
Magnetic North Pole 2001: 500 km on sea ice
Polar Night 2002-2003: solo unsupported expedition 121 days – High arctic

Education

Master of geology: Toulouse
ENIS: engineer school of geology (SFAX: Tunisia)

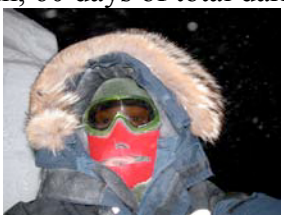
Educational activities

Various scientific and educational school programs
“Voyagers of Sciences 2006-2008”: high school scientific and expedition program

Lecture by Stéphane Lévin

Part one: My first unsupported expedition **on sea-ice to Magnetic North Pole** (80° North) in 2001 by skis and sledge: the beauty and the dangers of sea-ice, incredible amounts of ice, pressure ridges, faults, snow and blizzard;

Part two: then I'll introduce my second expedition in Canadian high arctic: **a solo unsupported expedition: "Alone in Polar Night 2002-2003**" (75° North)
121 days alone, 106 days without sun, 60 days of total darkness



A scientific expedition in extreme conditions, in order to plan next long term flight to Mars: 1 year and half of medical, psychological and technical training.
The extreme conditions of high arctic during the polar night: extreme coldness, blizzard, wind-chill factor, storms, life with my two dogs to prevent polar bear attack

Part three: my current expedition NANOOK 2005-2006, a photo-reportage in Greenland for ice-cap, glaciers for **global warming** subject and the way Greenlandic people are taking over this global warming

- a photo-reportage in Nunavut (Canada) 68° North, to meet the polar bear, observe the first formation of sea-ice and live with my Inuit friends, hunters and fishermen, **trying to resist to global warming**.

The lecture will **emphasize** the link with **educative programs, scientific programs** for kids that I'm directing since 2000 in various schools, including my next expedition with 6 French students (14 years old) in Canada with Inuit people.

Sustainable Development and Environmental Problems: a High-School Pedagogical Experience

Pascale PUPPO[1] and Brigitte QUINTARD[2]
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Authors reference:
Teachers of physic and chemistry (7th, 8th and 9th grade)
High-School Scientific Workshop
Members of EEDD academic commission (EEDD corresponds to Sustainable Development and Environmental Education)

Abstract
This presentation relates the experience of High-School Scientific Workshops organized on the topic of sustainable development and environmental problems. They were based on a direct participation among the students of scientists coming from research institutions (University, CNES, CNRS). Two pedagogical experiences have been particularly interesting. They were based on two Arctic expeditions, one named «Mission Banquise » led by Jean-Louis ETIENNE in 2001-2002, and the other, «Mission Nanook » currently led by Stéphane LEVIN.
The key feature of these pedagogical experiences is the direct implication of the students in the *preparation* and the *development* of the expeditions, including the different scientific questioning. These scientific activities, based on many personal investigations by the students themselves, in close connection with the scientific world, offer the opportunity to discover scientific curiosity and practice the scientific method. They also require autonomy and sense of responsibility, as well as the aptitude to collective work.
In addition, the workshops were of course the occasion to make the students aware of all the issues linked to sustainable development and global change.

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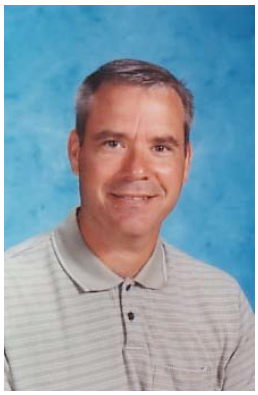

Teaching Experience: 13 years
Education: B.A, B Ed., M Ed.
Academic

Areas of Interest: Volcanism, Global Climate Change and Astronomy

Other Interests: Coach: Track and Field (Athletics)

Presentation Description: An Exercise on Climate Change: How does it affect me?

This exercise will allow students to graph present and paleoclimate data in an effort to understand the changes in climate change. Students can then connect these changes with local, regional and global impacts on the environment and the human population.

Dr. Herbert Summesberger

Naturhistorisches Museum Wien
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A Guided Tour of the Vienna Museum of Natural Sciences

Born in 1939 (Vienna, Austria), highschool (Baden; Austria). PhD (1966, University of Vienna; main subjects: geology, palaeontology, petrology). Thesis on structural geology, stratigraphy and palaeontology in the Northern Calcareous Alps. Since 1966 curator of the Museum of Natural History, Vienna. Retired in 2004. Research on mesozoic ammonites and stratigraphy. Studies in the United States, Oxford/UK. Organisation International Symposia "Cephalopods Present and Past", Vienna 1999; “Cretaceous Symposium Vienna 2000”. Leader of the Working Group on Geosciences, School and Public Relations of the Austrian Geological Society. Member of the Board of the Friends of the Museum of Natural History. Exhibitions, seminars for highschool teachers (Biology & Environmental Sciences). Highschool books. Vienna city guide fo building and decoration stones. Excursions for students, international specialists, teachers, Friends of the Museum. 1985 Installation of the P.R. department at the museum. 1999 Initiation of a volunteers’ system. 1999 Foundation of the museum’s magazine “Das Naturhistorische”.

Paul J. Crutzen,

Max Planck Institute for Chemistry, Mainz, Germany.

Born in Amsterdam in 1933, Paul J. Crutzen was trained as a civil engineer and worked with the Bridge Construction Bureau of the City of Amsterdam. In 1959 he joined Stockholm University to study mathematics, mathematical statistics, meteorology and atmospheric chemistry. His research has been especially concerned with the natural and anthropogenically disturbed photochemistry of ozone in the stratosphere and troposphere. Thereby he also identified biomass burning, especially in the tropics, as an important source of widespread air pollution, especially during the dry season, with potential impacts on Earth climate. He served as Director of Research at the National Center of Atmospheric Research in Boulder, Colorado, 1977-1980, and thereafter until his retirement in 2000, at the Max Planck Institute for Chemistry in Mainz. He also conducts research at the University of California, San Diego, Scripps Institution of Oceanography. Crutzen received the Nobel Prize for Chemistry in 1995 for his research on atmospheric ozone.

Atmospheric Chemistry in the Anthropocene, the new geological era affected, in many cases dominated, by human activities

Paul J. Crutzen,

Max Planck Institute for Chemistry, Mainz, Germany.

Supported by great technological and medical advancements and access to plentiful natural resources, the expansion of mankind, both in numbers and per capita exploitation of Earth's resources has been astounding (1). To give some major examples:

During the past 3 centuries human population increased tenfold to 6000 million, growing by a factor of four during the past century alone (2). This growth in human population was accompanied e.g. by a growth in cattle population to 1400 million (2) (about one cow per average size family). Urbanisation has even increased 13 times in the past century. Similarly large were the increases in several other factors, such as world economy and energy use (see Table 1). Industrial output even grew forty times (2). More than half of all accessible fresh water is used by mankind. Fisheries remove more than 25 % of the primary production of the oceans in the upwelling regions and 35 % in the temperate continental shelf regions (3).

In a few generations mankind is exhausting the fossil fuels that were generated over several hundred million years, resulting in large emissions of air pollutants. The release of SO_2, globally about 160 Tg/year to the atmosphere by coal and oil burning, is at least two times larger than the sum of all natural emissions, occurring mainly as marine dimethyl- sulfide from the oceans (4). The oxidation of SO_2 to sulphuric acid has led to acidification of precipitation and lakes, causing forest damage and fish death in biologically sensitive regions, such as Scandinavia and the northeast of North America. Due to substantial reduction in SO_2 emissions, the situation in these regions has improved in the meanwhile. However, the problem is getting worse in east Asia.

From Vitousek et al. (5) we learn that 30-50 % of the world's land surface has been transformed by human action; the land under cropping has doubled during the past century at the expense of forests which declined by 20 % (2) over the same period. Coastal wetlands are also affected by humans, having resulted for instance in the loss of 50 % of the world's mangroves.

More nitrogen is now fixed synthetically and applied as fertilizers in agriculture than fixed naturally in all terrestrial ecosystems. Overapplication of nitrogen fertilizers in agriculture and especially its concentration in domestic animal manure have led to eutrophication of surface waters and even groundwater in many locations around the world. They also lead to the microbiological production of N_2O, a greenhouse gas and a source of NO in the stratosphere where it is strongly involved in stratospheric ozone chemistry. The issue of more efficient use of N fertilizer in food and energy production has recently been summarized in a special publication of Ambio (volume 31, number 2, March 2002).

The release of NO into the atmosphere from fossil fuel and biomass combustion likewise is larger than the natural inputs, giving rise to photochemical ozone ("smog") formation in extensive regions of the world.

Human activity has increased the species extinction rate by thousand to ten thousand fold in the tropical rain forests (6). As a result of increasing fossil fuel burning, agricultural activities, deforestation, and intensive animal husbandry, especially cattle holding, several climatically important "greenhouse" gases have substantially increased in the atmosphere over the past two centuries: CO_2 by more than 30 % and CH_4 by even more than 100 % (see Table 2), contributing substantially to the observed global average temperature increase by about 0.5°C that has been observed during the past century. According to the reports by the Intergovernmental Panel of Climate Change in 1995 (4): "The balance of evidence suggests a discernable human influence on global climate" and in 2001: "There is new and stronger evidence that most of the warming observed over the last 50 years is attributable to human activities". Depending on the scenarios of future energy use and model uncertainties, the increasing emissions and resulting growth in atmospheric concentrations of CO_2 are estimated to cause a rise in global average temperature by 1.4-5.8°C during the present century, accompanied by sea level rise of 9-88 cm (and 0.5-10 m until the end of the current millennium). Major anthropogenic climate changes are thus still ahead.

Furthermore, mankind also releases many toxic substances in the environment and even some, the chlorofluorocarbon gases ($CFCl_3$ and CF_2Cl_2), which are not toxic at all, but which nevertheless have led to the Antarctic springtime "ozone hole" and which would have destroyed much more of the ozone layer if no international regulatory measures to end their production by 1996 had been taken. Nevertheless, due to the long residence times of the CFCs, it will take at least another 4-5 decades before the ozone layer will have recovered.

Considering these and many other major and still growing impacts of human activities on earth and atmosphere, and at all, including global, scales, it thus is more than appropriate to emphasize the central role of mankind in geology and ecology by using the term "anthropocene" for the current geological epoch. The impact of current human activities is projected to last over very long periods. According to Loutre and Berger (7), because of past and future anthropogenic emissions of CO_2, climate may depart significantly from natural behaviour even over the next 50,000 years.

To assign a more specific date to the onset of the "anthropocene" is somewhat arbitrary, but we propose the latter part of the 18th century, although we are aware that alternative proposals can be made. However, we choose this date because, during the past two centuries, the global effects of human activities have become clearly noticeable. This is the period when data retrieved from glacial ice cores show the beginning of a growth in the atmospheric concentrations of several "greenhouse gases", in particular CO_2, CH_4 and N_2O (4). Such a starting date also coincides with James Watt´s invention of the steam engine in 1784.

Without major catastrophes like an enormous volcanic eruption, an unexpected epidemic, a large-scale nuclear war, an asteroid impact, a new ice age, or continued plundering of Earth's resources by partially still primitive technology (the last four

dangers can, however, be prevented in a real functioning noösphere) mankind will remain a major geological force for many millennia, maybe millions of years, to come. To develop a world-wide accepted strategy leading to sustainability of ecosystems against human induced stresses will be one of the great future tasks of mankind, requiring intensive research efforts and wise application of the knowledge thus acquired in the noösphere, now better known as knowledge or information society.

Hopefully, in the future, the "*anthropocene*" will not only be characterized by continued human plundering of Earth's resources and dumping of excessive amounts of waste products in the environment, but also by vastly improved technology and management, wise use of Earth's resources, control of human and domestic animal population, and overall careful manipulation and restoration of the natural environment. There are enormous technological opportunities. Worldwide energy use is only 0.03 % of the solar radiation reaching the continents. Only 0.6 % of the incoming visible solar radiation is converted to chemical energy by photosynthesis on land and 0.13 % in the oceans. Of the former about 10 % go into agricultural net primary production. Thus, despite the fact that humans appropriate 10–55 % of terrestrial photosynthesis products (8), there are plenty of opportunities for energy savings, solar voltaic and maybe fusion energy production, materials' recycling, soil conservation, more efficient agricultural production, et cetera. The latter makes it even possible to revert extended areas now used for agricultural to their natural state.

There is little doubt in my mind that, as one of the characteristic features of the "*anthropocene*", distant future generations of "*homo sapiens*" will do all they can to prevent a new ice-age from developing by adding powerful artificial greenhouse gases to the atmosphere. Similarly, any drop in CO_2 levels to too low concentrations, leading to reductions in photosynthesis and agricultural productivity would be combated by artificial releases of CO_2. With plate tectonics and volcanism declining, this is not a scenario devoid of any realism, but of course not urgent in any way. And likewise, far to the future, "*homo sapiens*" will deflect meteorites and asteroids before they could hit the Earth (9). Humankind is bound to remain a noticeable geological force, as long as it is not removed by diseases, wars, or continued serious destruction of Earth's life support system, which is so generously provided by nature cost-free.

Exciting, but also difficult and daunting task lies ahead of the global research and engineering community to guide mankind towards global, sustainable, environmental management into the anthropocene (10).

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Table 1: A partial record of the growths and impacts of human activities during the 20th century.

Item	*Increase Factor, 1890s-1990s*
World population	4
Total world urban population	13
World economy	14
Industrial output	40
Energy use	16
Coal production	7
Carbon dioxide emissions	17
Sulfur dioxide emissions	13
Lead emissions	≈ 8
Water use	9
Marine fish catch	35
Cattle population	4
Pig population	9
Irrigated area	5
Cropland	2
Forest area	20% decrease
Blue whale population (Southern Ocean)	99.75% decrease
Fin whale population	97% decrease
Bird and mammal species	1% decrease

J. R. Mc Neill, Something New Under the Sun, Norton, 2000.

Table 2: Composition of Dry Air at Ground Level in Remote Continental Areas.

CONSTITUENT	*FORMULA*	*CONCENTRATIONS 1998/pre-industrial*	*GROWTH (%/Year) average (1990-1999)*
Nitrogen	N_2	78.1%	
Oxygen	O_2	20.9%	
Argon	Ar	0.93%	
Carbon dioxide	CO_2	365/280 ppmv	+ 0.4
Methane	CH_4	1.745/0.7 ppmv	+ 0.3–0.5
Ozone	O_3	10–100/20(?) nmol/mol	variable
Nitrous oxide	N_2O	314/270 nmol/mol	+ 0.25
CFC-11	$CFCl_3$	0.27/0 nmol/mol	< 0 (decline)
CFC-12	CF_2Cl_2	0.53/0 nmol/mol	< 0 (decline)
OH (HYDROXYL)	OH	$\approx 4 \times 10^{-14}$	?

Jérôme Chappellaz

Laboratoire de Glaciologie et
Géophysique de l'Environnement
(LGGE)
Grenoble, France

Jérôme Chappellaz has obtained his PhD in Geosciences in 1990 at Grenoble,France. He produced the first long-term record of atmospheric methane changes during glacial-interglacial cycles from the Vostok ice core (Antarctica). He then worked at the NASA / Goddard Institute for Space Studies (New York,USA) to develop quantitative estimates of the past CH4 budget based on modeling.

He has pioneered the use of continuous-flow isotopic-ratio analyses on trace gases in the French community and he is responsible of a mass spectrometry laboratory at LGGE.
CNRS Director of Research since 2002, he is the Deputy Director of LGGE since 2003.

He has been involved in several tens of research projects, including numerous European projects under the 4th, 5th and 6th frameworks.

He is co-author of 82 publications, among them 61 in high-ranked scientific journals. Jérôme Chappellaz is a member of the CNRS hiring committee in ocean and atmosphere sciences, and of two International Geosphere Biosphere Program scientific committees : PAGES (Past Global Changes) and AIMES (Analysis,Integration and Modeling of the Earth System). He was awarded the Bronze medal of CNRS in 1993 and the Jaffé Price of the French Academy of Science in 2001. The Institute for Scientific Information awarded him as a French laureate for the internationally most-cited publications (8 articles) in Geosciences between 1981 and 1998.

Greenhouse gzes natural trends : what do we learn from ice core analyses ?

J. Chappellaz

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Understanding the complex relationship between climate, biogeochemical cycles and greenhouse gas atmospheric mixing ratios requires observations at various time scales of all parameters and reservoirs involved. On this regard, past climatic changes experience at the Earth surface over the last hundred of thousands of years are particularly relevant, as one can simultaneously access to spatial and temporal patterns of some climatic variables, to greenhouse gas mixing ratios in the atmosphere (based on ice core studies) and to a lesser extent to ecosystem distributions and characteristics.

In this presentation, we will present the state-of-the-art of past greenhouse gas mixing ratios, i.e. CO2, CH4 and N2O, as reconstructed in the course of the Holocene (last 11,500 yr), the last deglaciation, the abrupt climate changes during the last glaciation and the last six climatic cycles as depicted by the newly drilled EPICA / Dome C european ice core. We will first consider the role played by greenhouse gas changes in the sequence of climatic changes observed over these time scales. We will then discuss the possible causes considered to explain their variability and the information that one misses to better constrain the past interplay between climate, the biosphere and greenhouse gas levels.

Agathe Weber

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An Educational CD for the Polar Regions

The 26 animations contained in this CD- ROM bring answers to numerous questions about polar regions and climate change through fun and interaction: Can penguins fly? Which animal lives in the Arctic: the Moose, the Stag or the Reindeer? Who discovered Antarctica? What is an “ice shelf”? Why is it cold at the poles? etc.

This presentation will take you on a short trip in this interactive polar world: while you’ll enjoy running with a polar bear on the sea ice or marvel at ancient explorers’ feats, you’ll be given a short overview of scientific and factual information underlying the animations, linking polar regions and climate change.

The animations are aimed first and foremost at children and young people, but can also be used as teaching support material when tackling difficult or abstract subjects (movements of the earth, climate history, etc.) when no visual support is available.

“Teaching dossiers” which can be used in conjunction with the CD-ROM are available for free on the educational website of the International Polar Foundation and will also be presented during this session.

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Barbara Donner
Research Center Ocean Margins
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Missy has been teaching high school science in the United States for 20 years and loves her job as much today as she did when she first started. Her philosophy in education includes using hands-on, minds-on inquiry activities as a way to promote life-long learning in her students. Her students use real-time and original data and data tools in their pursuit of understanding Earth System Science. Missy enjoys field research immensely and has assisted in data collection in places such as Nicaragua, Kenya, Ecuador, Jamaica, 250 miles off the coast of Oregon. Back in the classroom she uses her field experiences to develop units of study that will inspire students to get out and explore their natural world. Outside her classroom she enjoys working with teachers and collaborating on ideas for new and exciting educational materials.

Barbara did her PhD in biology in Germany, some 20 years ago, then moved to the field of marine geology where she started working as a micropaleontologist. “Reconstruction of former climate and oceanographic conditions with the help of microfossils” is the major objective of her research work now Field work here is extraordinary and always makes non-scientists envious: expeditions on research vessels to all parts of the oceans!
Barbara appreciates the interdisciplinary orientation of geosciences in total, seeing here a chance to motivate school kids for natural sciences. Therefore, besides lecturing for University students, Barbara is giving special courses on geological research highlights in schools for kids (several levels) and advanced training courses in marine geology, paleoceanography and paleoclimate for teachers.

By combining their research and teaching talents to create this presentation, Barbara, Missy and Steve (you already know him from the "meteorites") hope that the teachers present at the EGU GIFT workshop will find deep ocean circulation a topic that can easily fit in their curriculums.

Going down in the Weddell-Sea: Why deep water formation is of vital importance

Barbara Donner, Margaret Holzer and Stephen Macko

Bremen University, Germany, Chatham High School, USA, University of Virginia, USA

1. Modern ocean circulation

Ocean currents are masses of oceanic water that flow from one place to another. They can occur at the surface or deep below the surface.
Surface currents serve to transfer heat from warmer to cooler areas on Earth, just as the major wind belts of the world do. Ultimately, the surface currents are driven by radiant energy from the sun and closely follow the pattern of major wind belts of the world: they are *wind-driven*.
Deep currents have a significant vertical component and account for the thorough mixing, thus influencing about 90% of ocean water. Deep currents are set in motion by slight increases in density: they are *density-driven*. Although these density differences are usually small, they are large enough to cause denser waters to sink. Changes that increase water density normally are changes in temperature and salinity, so this circulation is referred to as **thermohaline** (*thermo* = heat, *haline* = salt) **circulation**.
The water involved in deep-ocean current movement (thermohaline circulation) is initially formed in high-latitude regions at the surface. The northern Atlantic contributes about half of the global total **deep water production**, the northern Pacific none at all. Roughly the other half forms along the margins of the Antarctic continent – in Weddell Sea and Ross Sea. Here rapid winter freezing produces very cold, high-density water that sinks down the continental slope and becomes Antarctic Bottom Water, the densest water in the open ocean.

2. How long has the motor existed?

When was modern deep water formation initiated, when did the modern thermohaline circulation start?

At any time the nature and flow directions of ocean currents were and are influenced by the distribution of continents. But shape and location of the continents change through time.
45 Ma ago, the position of the continents to each other was different from today. Because of the drift of the continents to northern directions (simplified!), ocean passages opened in the polar regions and were closed in the subtropical regions.
The closure of the Panamanian gateway caused a substantial reorganization of ocean surface and deep ocean circulation. It played a major role in the initiation and intensification of the Gulf stream, transporting heat, salt and moisture to

higher latitudes of the **northern hemisphere**. The formation of deep water in the Arctic region was considerably enhanced with the start up of the Gulf stream (4.6 Ma ago).
As a consequence of the opening of ocean gateways on the **southern hemisphere** (Drake Passage and Tasmanian Passage), the Antarctic circumpolar current developed. On its way around Antarctica this current kept on cooling down with the effect that inland glaciation on the isolated continent was initiated. Formation of sea ice, sequestration of salt and the mixing with cold surface waters then could produce very dense waters that were able to sink and form bottom water (modern situation since about 8 Ma).

3. What could stop the motors?
Deepwater formation and thermohaline circulation are affected as soon as there are no longer significant density contrasts in stratified watermasses, i.e. by drop of salinity or rise of temperature at the ocean's surface.
In other words: Ocean stability may not hold under future global warming, which will certainly alter the water cycle and hence the freshwater budget. The Atlantic with the highly sensitive areas of deepwater formation in the north (Arctic Region: Norwegian-Greenland Sea, Labrador Sea) and in the south (Antarctic Region: Weddell Sea) will be extra crucial.

4. Classroom experiments
Deep water formation can be simulated in small glass water tanks in a classroom experiment that can easily be reproduced. Starting with the demonstration of stratified water masses, students determine the cause of the stratification. A discussion ensues about the causes of stratification where temperature and salinity differences are key reasons for the density differences in ocean water, thus creating density-driven deep ocean circulation. A hydrometer can be used to measure the specific gravity and therefore the density of ocean water. Together with the temperature of the water, salinity can be determined. These instruments may be purchased or simple hydrometers can be made with a drinking straw and clay. After determining the salinity of the ocean water, the students take this idea of stratification and employ it in determined how ocean water is layered in a particular location.

Optionally, a short film sequence will explain the deep water formation in polar regions.

Catherine Kissel and Carlo Laj

(here with their colleague Pinxian Wang of Tongji University, Shanghai, choosing a coring site on the Marion Dufresne)

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We have been working together for the last 25 years. We are both paleomagnetists (paleomagnetism is the study of the magnetic properties of igneous and sedimentary rocks) with a background in structural geology for Catherine and solid state physics for Carlo.

Years ago, we have pioneered the paleomagnetic study of the Cenozoic evolution of the Central and Eastern Mediterranean, then moved to South America to study the mechanisms of formation of the deflexions of the Andean Cordillera.

In the last 10-15 years we have moved from the Continents to the Ocean (note that this is in the opposite way to evolution some million years ago!) and have applied magnetic methods to the study of marine sediment cores with different objectives. The magnetic properties of the sediments may give access to continuous records of the intensity of the magnetic field of the Earth in the past, thereby providing information on the dynamics of the Earth's core. They also allow to perform precise correlation between sedimentary sequences on a global scale. Finally, they may also provide information on the source and transport of the sediments to the coring site and allow to retrace the changes of marine deep currents (such as the huge thermohaline circulation) and, more generally, to reconstruct past environmental changes of the study areas.

Gift-at-Sea: a Virtual Participation to two Oceanographic Cruises of the R/V Marion Dufresne

Catherine Kissel and Carlo Laj
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In May – June 2006 the Research Vessel Marion-Dufresne of the French Polar Institute (Institut Paul-Emile Victor or IPEV) will conduct an oceanographic cruise called Marco Polo, from Shanghai (China) through the Okinawa Trough and the Philippines Islands, and end in Indonesia. A second cruise of the Marion-Dufresne, called PACHIDERME, will take place in January - February 2007 along the Chilean margin. Both cruises are devoted to the study of the most prominent climatic factors affecting the two regions, the Monsoon (East Asia) and the changes in time of the dynamics of water masses along the Chilean Margin and their climatic impact.

During both of these cruises, teachers and their classes wishing to virtually participate to the cruises will be in contact with the ship via e-mail. They will receive regular updates on the progress of the cruise, answers to their different questions about the work done on board to meet the scientific objectives of the cruises, and information about the daily life of the scientists on board. Digital photographs of the work done on board (essentially coring) will also be regularly provided.

Teachers and their classes will also be able to ask questions about the practical aspects of the cruise (i.e. who drives the boat? who takes care of the food? How is the social life on a boat on which almost 100 people live together during the cruise?)

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TEACHING EXPERIENCE: Teaching since 1973 with experience in K-12 special education; regular ed. 1st, 3rd, 4th, 5th, 7th and 8th grades in all academic areas including gifted ed.

PROFESSIONAL EXPERIENCE:

- Teacher/Researcher, Teachers Experiencing Antarctica, McMurdo, Antarctica
- Member International Polar Year Educational Outreach Committee
- Convener/organizer of NSF Midwest Regional Polar Science Workshop, Benedictine University, Lisle, IL
- Adjunct Faculty, Benedictine University, Lisle, IL
- Faculty of Golden Apple Summer Science Workshops for Teachers, Benedictine University, Lisle, IL and the University of Chicago, Chicago, IL
- Presenter, National Science Teachers Assoc. Convention
- Co-convener, Midwest Regional Science Workshop, Crystal Lake, IL
- Faculty in summer "Science on Ice", University of Wisconsin, River Falls, WI
- Presenter, "Inquiry Science," American Museum of Natural History, NY

- Member International Design Team--World School for Adventure Learning--online environmental project circles--Hamline, University, St. Paul, MN
- International Design Team of the World School for Adventure Learning--St. Paul, MN
- Facilitator of teacher workshop--**Antarctica**--Chicago Msm of Sci. and Industry
- Presenter for class at the Antarctic Institute, Hamline, University, St. Paul, MN

Honors, Awards, and Publications

- National Science Foundation/TEA grant to convene Midwest Regional Polar Science Workshop—held March 12, 2005, at Benedictine University, Lisle, IL
- Chosen by National Science Foundation as a Teacher Experiencing Antarctica
- Won the IL Golden Apple Award
- Listed in **Who's Who Among America's Teachers**; **Who's Who Among Women**, **Who's Who in America;** **Who's Who in the Midwest** and **Who's Who in the World**
- Two time winner ISTA Award of Excellence in Science Teaching--named one of top ten elementary science educators in Illinois--nominee for the Presidential Award
- Co-author--**Antarctica: A Living Classroom**, Chicago Msm of Sci &Industry

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Science on Ice: Bringing the Poles to Your Classroom

For the coldest places in the world, the Polar Regions are a hot topic today in education. The International Polar Year (IPY) offers teachers the opportunity to engage students in current science using students' natural curiosity about regions which are foreign to most. Changes in the Polar Regions act as "canaries in the coal mine," warning us of environmental consequences for the whole planet. The IPY is an important chance to educate the next generation of stewards of the earth.

This session will demonstrate how one teacher has taken a field research experience in Antarctica and developed activities to engage learners in authentic science activities. It will also give specific ways in which teachers of all levels can connect their students to scientists in meaningful ways. Teachers will leave the session with a comprehensive hand-out of experiences they can put into effect tomorrow.

Dr. Annegret Schwarz

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School:
Integrierte Gesamtschule Mainz
Hans-Böckler-Str. 2
55128 Mainz
Germany
Type: comprehensive school, junior high und high school

Professional Responsibilities:

- Teacher: Geography, English
- Head of the Geography Department at school
- Regional Adviser for Geography teachers at 46 high schools in the area: regular teachers' training programs in Geography, conferences at the various schools, excursions with teachers, duties at the federal Ministry of Education and Cultural Affairs in Mainz.
- Responsible for the scholarship programs
- Annual exchange projects with Slovakia, Eastern Europe

Sustainable Development: Manager for project "KESch":

My school IGS (Integrierte Gesamtschule Mainz) was one of the first schools of this project starting in 1997. I am responsible for activities to save energy at school. Contests among the classes and courses are organized. Reports in staff meetings, in the school magazine as well as on the local administrational level in Mainz are given. Doing research helps me to develop new ideas in order to improve the given circumstances at school. There are negotiations on new equipment, better heating or lighting regulations with the janitors of our school as well as with the representatives of the city's administration which owns the school buildings. The reduction of energy is rewarded by an amount of money which depends on the savings of heating energy, water, and electricity. We have used this extra money to purchase additional saving equipment and a small solar energy plant on the roof of the school. Thus we do not only save energy, but produce non-polluting electricity from solar energy as well.

My Presentation:
Sustainability is the major topic of my presentation. Energy is central to achieving sustainable development goals. Therefore, the report is based on the school's program KESch and a geographical project on reducing energy to stop the global warming. The geography course is in grade 11 (upper secondary level) and consists of 23 students. Using teaching methods which concentrate on the students' activities this project hopefully supports a learning behaviour by the students that places a stronger emphasis on the careful consumption of energy.

Hello my name is Annie CARRASSET, I'm a French teacher of Biology and Geology. My students are from 12 to 15 years old and our college takes place near Bordeaux in the South West of France.
We are working since 2 years with the GLOBE program and participating in the Calipso mission. This new project called Calisph'air used specific activities from the Calipso and Globe education program.

Martin Jakobsson

Associate Professor
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Martin is an Associate Professor at Stockholm University. He worked for four years at the Center for Coastal and Ocean Mapping/ Joint Hydrographic Center, University of New Hampshire after completing a Ph.D. in 2000 at the Department of Geology and Geochemistry, Stockholm University. His thesis was titled "Mapping the Arctic Ocean: Bathymetry and Pleistocene Paleoceanography". Besides Paleocenography and seafloor processes of the Arctic Ocean Martin's research include development of robust techniques for combining historical and contemporary bathymetric data sets, tracking uncertainty in gridded bathymetric models and the use of Geographic Information Systems (GIS) for handling and analyzing marine geological/geophysical data. He has participated in a number of marine expeditions, in particular to the Arctic Ocean where he visited the North Pole 1996, 2004 and 2005. From November 2004, Martin has a Research Fellow position from the Swedish Royal Academy of Sciences.

Has the Arctic Ocean always been cold?

Martin Jakobsson

Department of Geology and Geochemistry, Stockholm University, Sweden
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Recent observations are indicating that the Arctic environment is presently undergoing rapid and profound changes in response to global warming. These observations include break up and disintegration of the last large Arctic Ocean ice shelves off Ellesmere Island, enhanced surface melting of the Greenland Ice Sheet and increases in the velocity of its fast-flowing glacier outlets, changes in the extent of sea ice cover and melting of permafrost. Predictions of the Arctic future climate evolution include accelerated rates of change with the almost complete disappearance of Arctic Ocean summer sea ice cover in this century. These predictions are indeed of concern since the Arctic responds sensitively to climate perturbations and act as an amplifier of global climate change. For example, the generation of deep-water in the Norwegian-Greenland Sea drives the global thermohaline circulation, which controls heat flux from low to high latitudes. Moreover, the Arctic Ocean sea ice cover strongly influences the Earth's albedo and exerts an important cooling influence on the global climate system. **But has it always been so? For how long has a perennial Arctic Ocean sea ice cover existed that could play an important role in the climate system? For how long has generation of deep water in the Norwegian-Greenland Sea been driving a thermohaline circulation?**

This presentation will discuss the Arctic's climate evolution over the last 56 million years in light of new results primarily from two recent expeditions: the successful drilling on the Lomonosov Ridge, central Arctic Ocean, in 2004 and last summer's icebreaker transect from Alaska to Svalbard via the North Pole. The drilling in 2004, *Arctic Coring Expedition (ACEX)*, was carried out under the auspices of the Integrated Ocean Drilling Program (IODP) and recovered a >400 m stratigraphic section from the Lomonosov Ridge near the North Pole encompassing the most part of the Cenozoic era. The icebreaker expedition of 2005, *Healy-Oden Trans-Arctic Expedition 2005 (HOTRAX'05)*, comprised a joint Arctic Ocean transect between Swedish icebreaker Oden and US Coast Guard Cutter Healy. Along the transect 29 piston cores were retrieved averaging nearly 12 meters in length providing a critically needed sample cache to study the Arctic climate history. The results from these two expeditions provide some new insights into the Arctic's environmental change that took place from the "greenhouse" world of the Eocene (56-34 Ma) to the "icehouse" world of today.

Ruben Fritzon

Vibackeskolan, Alnö
Sweden

A teacher's view of a scientific cruise in the Arctic Ocean

My name is Ruben Fritzon. I work as a science teacher on an island in the Baltic Sea called Alnö, 400 km north of Stockholm. Normally I teach children from 12 to 16 years in math and science.

Last summer a scholarship given by the Swedish Polar Research Secretariate gave me the opportunity to participate in the third leg of the Arctic expedition, Beringia 2005. For nearly two months I lived onboard the American ice breaker USCGC Healy. We started in Dutch Harbour, Alaska, crossed the Arctic Ocean, passed the North Pole and finally ended our adventure in Longyearbyen, Spitsbergen.

Being a part of this expedition was not just a great opportunity to visit the remote Arctic. It also gave me a unique chance to see real scientists in action.

The Swedish Polar Research Secretariate, which is a governmental organisation, has given similar scholarships for many years. They hope to increase the interest of science and especially the inter est of polar science. Hopefully this experience will help me inspire students to become scientists, maybe even polar scientist!

Danielle De Staerke

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France
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Education:
EPF Engineer school (Paris)
Paris Jussieu University
Ph.D. in Oceanography and Meteorology; Institut Français du Pétrole Rueil Malmaison (France) and NASA-JPL Pasadena Ca (USA)

Educational activities:

• Responsable for School Programs related to Environmental Space Studies (ARGONAUTICA School Program, related to the oceanographical satellite, JASON…)

• Cooperation with various Space Agencies and Sea Institutes. *I am currently working with NASA co builder of the oceanographical satellite JASON…and with country coordinators of the Educational program of EUR-Oceans*

• Direct interaction with schools to help them building their projects.

Argonautica, a school program related to oceanographic satellites

Danielle De Staerke
Centre National d'Etudes Spatiales
Toulouse, France

This presentation is about Argonautica, an ongoing educational project whose objective is to show how satellites are helping to improve our knowledge of the oceans and protect the marine environment. The project involves students at the primary, middle and high school levels and includes lectures, communication, and hands-on activities.

Students are able to use real time satellite data to track buoys drifting in the major ocean currents and to view and analyse the world's great animal migrations. The project also makes it possible for students to communicate with scientists and engineers through a worldwide network.

The 2005-2006 Argonautica operation is organized in the southern ocean. During the operation, two ships: the Polarstern, a research vessel; and a boat tracing the journey of the first Antarctic expedition will be relied upon for support. Student-built buoys built will be released from the ships during their journeys. Both boats will sail beneath the Jason-1 satellite track and students will have the opportunity to process data from the buoys and correlate the information with Jason-1 data.

Dr. Roberta Johnson

Director of Education and Outreach, University Corporation for Atmospheric Research

Research Scientist, High Altitude Observatory,

National Center for Atmospheric Research

Roberta has a PhD in Geophysics and Space Physics from UCLA and has published over 30 papers in the area of upper mesosphere and lower thermosphere research as well as on educational programs.

She is the PI on the award-winning Windows to the Universe website (sponsored in part by NASA and the NSF), which brings scientific background content and new research results to the public, students and educators in English and Spanish. She has extensive experience advising NASA, NSF, and professional societies and serves on numerous advisory boards for projects in education, outreach, and diversity. Dr. Johnson was responsible for development of the Education and Outreach component of the NASA OSS Sun-Earth Connection Roadmap in 2001-2002.

She was formerly the Chair of the American Geophysical Union (AGU) Committee on Education and Human Resources (CEHR), focused on development of resources, programs, and services for students at all levels, educators, the public, as well as young scientists involved in establishing their career in the geosciences. As CEHR Chair, she initiated a Subcommittee to CEHR on Diversity, and served as a member of the subcommittee, tasked with developing and implementing a plan to increase the diversity of the geosciences.

Prior to her service on CEHR, she was Chair of the Space Physics and Aeronomy Education Committee of the AGU. She was a member of the American Meteorological Societies Education Advisory Committee. She recently chaired the Earth Science Education Roadmapping activity and was a member of and education representative on the NASA Earth Science Enterprise ESSAAC committee. As Director of the UCAR Education and Outreach Program, she oversees services and resources for the students, educators, and the public, including professional development programs for educators, web resources for students, educators, and the general public, event programming, exhibit development, and opportunities to increase the diversity of the geosciences.

The Windows to the Universe Global Geoscience Educator Community

Roberta Johnson
University Corporation for Atmospheric Research
National Center for Atmospheric Research, Boulder, CO, USA

The Internet can be a powerful tool for reaching the general public as well as supporting formal and informal education. Using the Web to support science education, The Windows to the Universe Project (www.windows.ucar.edu) was launched in 1995. The bilingual (English and Spanish) site's easy-to-use design and science concepts presented with a broad perspective and connections to the humanities make Windows to the Universe a unique resource. An innovative multi-level approach to content, with each topic written at a beginner, intermediate and advanced level, makes Windows to the Universe accessible for individuals of various ages and learning styles. Over its 10-year span, the size of the site has grown to approximately 7000 pages of content. Traffic to this educational resource has also grown so that a large audience from around the world regularly uses the web site. Over 11 million users accessed Windows to the Universe in 2005; approximately half of users were from outside the United States.

In Fall 2005, the project initiated a new opportunity for educators around the world to register as "Windows to the Universe Educators", and join our growing international Earth and space science educational community. As of January 2006, over 1500 teachers have signed up from around the world from over 80 countries. Teachers get a free monthly newsletter, in either English or Spanish, which highlights aspects of the website, new resources, upcoming professional development events and curriculum activities as well as seeks feedback from them on important issues such as classroom application, educational standards, and resources and content they would like to see added to the site. In response to surveys of these Windows to the Universe Educators, we have recently implemented the opportunity for educators to share ideas, teaching methods, and curriculum resources with the rest of this global community through the newsletter. More information about how to sign up for the newsletter is available at http://www.windows.ucar.edu/cgi-bin/registration/registration.pl .

Janet Warburton
Education Project Manager

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Janet with Landon (3.5 yrs) and Kalena (1.5 yrs)

Janet Warburton has lived in Alaska for over 20 years with most of that time living and working in the Arctic. After working for 10 years for the U.S. Fish and Wildlife Service as a wildlife biologist, she turned her focus from wildlife biology to education. In Kotzebue, Alaska she worked for the school district designing work-study programs and writing science curriculum.

Ms.Warburton joined Arctic Research Consortium of the United States (ARCUS) in October 2000 and moved from Kotzebue to Fairbanks, Alaska. At ARCUS, her primary focus as Education Project Manager is education-related projectssuch as Teachers and Researchers Exploring and Collaborating (TREC), Arctic Alive, and the Connecting Arctic Researchers and Education (CARE) network. Ms. Warburton has been designing and implementing education programs for over ten years and has extensive experience in curriculum development and strong connections to the both the education and arctic research communities.

Teachers and Researchers Exploring and Collaborating (TREC)

Janet Warburton

Arctic Research Consortium of the United States (ARCUS)
Fairbanks, AK U.S.A

TREC is a program in which Elementary to High School teachers participate in arctic research, working closely with scientists as a pathway to improving science education through teachers' experiences in scientific inquiry. TREC builds on the outstanding scientific and cultural opportunities of the Arctic to link research and education through intriguing topics that will engage students and the wider public.

The main components of TREC include:

1) a field research experience, whereby TREC teachers participate in field research for two or more weeks in the spring or summer.

2) connecting with classrooms and the broader public through use of Internet tools and real-time presentations from the field.

3) professional development opportunities for teachers who participate in field research projects as well as educators who connect through the Internet.

4) ongoing support to extend the experience beyond field research through traditional workshops, Internet seminars, an e-mail list serve, and teacher-to-teacher peer groups.

This presentation will be about TREC and highlights how teachers and classrooms can participate in upcoming expeditions.

For further information, please contact Janet Warburton, at ARCUS
and visit the TREC website at:
http://www.arcus.org/trec

Marion Cohen

In charge of the YRE polar mission
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Marion started her formation studying history at the Sorbonne University where she obtained a Master degree. She, then, studied political science at the Institut de Sciences Politiques de Paris. She first worked as a consultant in Socially responsible Investment for Terra Nova Conseil. She joined the of-FEEE's team, in March 2005, to animate the French Young Reporters for the Environment (YRE) campaign. This campaign aims at promoting environmental education within secondary schools (pupils aged 15-18). Presently, 500 schools from fifteen countries participate in the project. The network works as a press agency specialized in producing and delivering articles and photos about the environment. In the course of her mission, she was brought to intervene in an international workshop on "trends in ICT in environmental education & communication for sustainable development" (BONN October 2005). She is now in charge of developping a special project about poles in the YRE network.

Presentation of the Young Reporters for the Environment campaign and the pole project

Marion Cohen

Office français de la Fondation pour l'Education à l'Environnement en Europe

Young Reporters for the Environment (YRE) is a programme designed to promote environmental education within secondary schools (pupils aged 15-18). Presently, 500 schools from 16 countries participate in the project. The network works as a press agency specialised in producing and delivering articles and photos about the environment. You can visit the YRE Press agency (www.youngreporters.org) where the young reporters display their projects, link to each other, cooperate, produce articles and photos, inform the public…

There are two levels of participation in the programme:
* local investigation: Assisted by their teacher, pupils carry out journalistic inquiries on local problems linking environmental and scientific issues. There are seven main topics in the press agency: agriculture, cities, coastline, energy, waste, water, and climate change. After their investigation, they inform the local public with any media used in a journalistic way (local press, radio, TV, conference, exhibition...).
* International investigation: In addition to those activities, pupils can co-operate with other Young reporters working on projects similar to their own. This work is done, via Internet, thanks to tools specially designed for the network.

Every week, best articles are published online, delivering environmental information to the whole network. Every month, a newsletter is sent to the network. Every year national coordinators select a set of articles and photos that constitute The annual YRE book edited and disseminated in the international network. This set of articles and photos is also presented to an international jury that meets to award the most interesting articles and photos. Lastly, international missions are organised regularly : 26 international missions have been organised so far.

The YRE International coordination is based in Paris, France. Its partners are the French Ministry for Ecology and Sustainable Development, the French Ministry for research, the Rhône-Alpes region. The technical partners are the UNESCO, The Cousteau Society, the International Federation of Environmental journalists, the European Environmental Press.

On the occasion of the International Polar Year, the YRE campaign aims at developing a special project about poles. This project will have two objectives:
- To make documentation and tools about the poles' issues to help teachers integrate this subject in their lessons.
- To develop field projects linking local behaviours to global consequences using the YRE methodology.

Francesca Cifelli
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Francesca Funiciello
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Both at; Geology Department; University of ROMA TRE
Roma; Italy

Francesca Cifelli is a paleomagnetist with a geologic formation. She has studied in Roma and obtained her University degrees and PhD there.

Her major research interests deal with the geodynamics of the Mediterranean Basin, with magnetic fabric analysis of sediments and also with high-density macroseismic investigations in urban areas. She has a particular interest in the Calabrian Arc and Sicily (Italy), Betics (Spain), the Moroccan Rif and the area around Roma. She has published 15 articles in international scientific journals.

Her educational activities include university lectures and practical teaching in the paleomagnetic laboratory,

Francesca Funiciello has earned her PhD in Geophysics at the Institute of Geophysics, ETH Zurich (Switzerland) after undergraduate and graduate studies at the University of Roma 1.

Her research interests include the dynamics of subduction zones, mantle convection, back-arc extension and magmatism, mantle plumes, post-glacial rebound and high-density macroseismic surveys in urban areas.

She is particularly interested in the Mediterranean, Japan and South America. She is the author of 20 articles in international scientific journals.

Her educational activities include University lectures and practical courses on laboratory modeling. She is responsible of the refreshers course “Scuola Sicura” for teachers of secondary public schools in Roma and province.

Both Francesca’s are active together in special training in scientific management of Science Museums and Sciences Center (these are organized by the “Centro Musei delle Scienze Naturali and “Città della Scienza” Napoli.

And both are scientific advisors to the Museo Storico-Naturalistico, Riviera Parco d’Ulisse (Gaeta, Italy).

GIFT – 2007: General Theme

Geology, Climate and Environment of Large Urban Areas

Francesca Cifelli, Francesca Funiciello and Carlo Laj

Geology Department, University "ROMA TRE", Italy
& LSCE, Gif-sur-Yvette, France

Increasing population density can give rise to increased risks to people and property in the face of man-made, environmental and natural hazards. The impact of anthropogenic factors are continuous, being large urban settings daily exposed to pollution created by human activities, such as thermoenergetic installations (emission of CO_2, CO, NO SO_2, soot), traffic (CO_2, CO, SO_x, hydrocarbons, noise), industrial plants, wastes and residual waters. While risks and relative effects of anthropogenic factors are easily apprehended by the general public because they influence (lowering) the quality of daily life, it is not always obvious to evaluate how geological and natural factors influence our daily life because of their stochastic nature (hurricanes, floods, earthquakes, volcanic eruptions) and because nature is often completely hidden by the urban setting.

The purpose of the GIFT-2007 workshop is to illustrate how all these different factors interact and influence the life of inhabitants in large urban areas. The workshop is dedicated to make the teachers and their students, and through them, the general public aware of the complexity of the environmental and geological problems in large urban areas.

We have selected 4 towns (Istanbul, Lisbon, Rome, S. Francisco), which for their historical heritage, geographic/geological location and high concentration of inhabitants, represent areas where exposure and vulnerability to environmental and natural hazards are disproportionate.

For each town, the geological and natural setting will be discussed at length and in detail, together with the historical and the modern problems, such as water adduction problems, air-water-soil pollution caused by the high density of population, traffic congestion and local transportation, and the planning that urban authorities use to mitigate them. Other examples of large urban areas (such as Paris) will be also described. Actions that can be undertaken by teachers in their classrooms to make their students aware of these problems and to stimulate actions to reduce energy consumption to a minimum will also be an important aspect of GIFT-2007.