Ocean Exploration: H.M.S. Challenger and Beyond
Online Workshop
April 19 – May 7, 2004

Goals and Objectives | Overview and Guide

GOALS AND OBJECTIVES FOR THE WORKSHOP

• To inspire educators to promote the spirit of exploration in the classroom
• Draw comparisons of oceanographic research and exploration between the 19th century and today
• Promote public awareness of the *Challenger* and other historic oceanographic expeditions
• Raise education community's awareness of the past, present and future of ocean exploration
• Promote integrated approach to teaching ocean science through various disciplines such as social studies, history, and technology
• Promote use of historical oceanographic documents as valuable, unique learning resources

After participating in this workshop you should:
* Understand the importance of ocean exploration in the past, present and future
* Use your newly-acquired or reinforced foundation of ocean-related knowledge and materials to create and use lessons plans and engaging classroom activities
* Take any of the information as it relates to your grade level and standards and build lesson plans and/or integrate the material into your existing curricula
* Promote ocean literacy to your students through teaching them ocean-related content, guiding them to student resources, engaging them in ocean exploration material, and, ultimately, motivating them to pursue ocean-related interests.
* As a professional, use the workshop series and this workshop website as a place to return and network with colleagues to share ideas, stories, and experiences, exchange lesson plans and teaching strategies, and seek out expert advice
* Know how and where to access ocean and ocean exploration resources, including archived keynotes and discussions, multimedia, Web links, books, lessons etc.

Workshop Target Audience: Anyone interested in oceanography, history of science, and environmental history of the ocean. There will be special emphasis on materials for high school and middle school educators, but should be of interest to formal and informal educators of all levels. The content includes science, social studies, literature, history, and art. Graduate students are encouraged to participate.

OVERVIEW AND GUIDE FOR THE WORKSHOP

We are presenting here a tour guide of the online workshop. It's an overview of the People, Places and Agenda, which will be there for you for the next three weeks. Through this overview process we hope to make you familiar with all the social and learning options in the workshop. We hope to entice you to spend time in this online learning community---engaging with subject matter experts and interacting with educational colleagues and availing yourself of a great variety of resources related to the history of ocean exploration.

We lay out for you a suggested approach to exploring the workshop. There are a great number of places for you to read and enjoy and a large number of links to related resources. We realize that educators are busy people and due to time constraints may not be able to visit all of our educational materials and activities. However we know too that all of you as adult learners will construct your own learning pathways according to your own needs and time available. So please enjoy your experience! May you be captured by the spirit of exploration as exemplified by the *Challenger*!

PEOPLE: This tour will identify the keynote presenters key and *Challenger* team people
PLACES: The workshop takes place online through the metaphor of an online conference center with areas (rooms) to engage in different workshop activities.
AGENDA AND TIMELINE: Workshop events and activities are listed on week by week basis.

WEEK 1 ~ April 19-23

The first week takes you through a historical overview of 19th century ocean exploration showcasing the HMS *Challenger* expedition. Through Week 1's keynote presenters the famous three-year voyage of the HMS *Challenger* will come to life. Each keynoter is an expert with in-depth knowledge of the *Challenger*. In Week 1 you will get an overview of the *Challenger*; the background, the ship, the crew, the voyage and summary of key scientific findings of the voyage.
You'll learn about the birth of oceanography and find out about pioneering efforts to learn about the deep ocean. You will be awakened to the wonderful world of the *Challenger* reports—a magnificent 50-volume accounting of the voyage with people, photos, drawings and maps of the expedition and its findings.

Introduction to the workshop:
Paula Keener-Chavis
National Education Coordinator
NOAA's Office of Ocean Exploration

Learn about the *Challenger* from our keynoters in the **KEYNOTE HALL**

Dr Eric L. Mills
"An Icon for Oceanography: The Voyage of H.M.S. Challenger"
Professor of History of Science, Emeritus
Dept.of Oceanography
Dalhousie University, Halifax, N.S., CANADA
Inglis Professor, University of King's College

Dr. Helen Rozwadowski
"Salty Dogs and Philosophers: Mid-Nineteenth Century Origins of Oceanography"
Department of History and Maritime Studies Program
University of Connecticut, Avery Point

Dr. David Bossard
"What We Can Learn from the Reports of The Exploratory Voyage of H.M.S. Challenger"
H.M.S. Challenger Volumes Digitization Project (www.hmschallenger.org)
Please go to the **KEYNOTE HALL** and read all these fascinating accounts of the *Challenger* Expedition.

WEEK 2 ~ April 26-29

During this week see how the *Challenger* voyage compares to ocean exploration today. We will do this through a keynote presentation from Dr. Gwyn Griffiths and through lesson plans and curriculum that compares today's exploration with the historical expeditions and with the keynote presentations. Join exhibitors in the Expedition Hall where current expeditions will be showcased to give participants a look at current research expeditions. Also take a tour through Birch Aquarium's virtual *Challenger* exhibit, based on actual articles and artifacts from the Scripps archives and actual exhibit materials in the Birch Aquarium at Scripps.

KEYNOTE HALL

Dr. Gwyn Griffiths *Ocean Instruments and Technology: From Challenger to Europa*
Head of Underwater Systems Laboratory Ocean Engineering Division, Southampton Oceanography Centre UK

Dr. Griffiths of Southampton University in England takes us on a journey of ocean exploration from the *Challenger* and other historical ocean explorations to today's work in the field of oceanography.

After reading Dr. Griffiths' comparison, venture into our **TEACHER CENTER** to see curriculum and lesson plans that take a comparative look at ocean exploration then and now. Meet our *Challenger* team members who have worked on these lessons to bring them to you for your classroom. You will find a wealth of resources and ideas for integration in your educational setting. You'll have the chance to interact online with the developers of the curriculum and to dialogue with your colleagues about how to make this useful for your own particular needs.

The ***LESSONS*** and their Facilitators:

Three of the lessons offer a look at ocean exploration from first hand experience of team members who went on NOAA Office of Ocean Exploration's Mountains of the Sea Expedition in Summer 2003 and draw comparison to the experiences of the *Challenger*.

1) LIFE AT SEA THEN AND NOW
Audience: social studies, history and science teachers.

Experience what it was like to be on board the *Challenger* and see how that compares with being on a scientific expedition today. Find ways to make these shipboard experiences come to life for your students!

Join Melissa Ryan who was on the "Mountains in the Sea" Expedition in 2003 as she draws comparisons of her experiences online.

2) SO WHAT'S DIFFERENT? STUDYING THE SEA THEN AND NOW
Audience: Science Teachers—various science disciplines, technology.

Focus: How have the technologies used to collect basic oceanographic data such as depth, water chemistry, temperature, and organisms changed since the HMS *Challenger* expedition in the late 1800's?

Join Lance Arnold a high school teacher from Tolland, CT as he shares his experiences in completing this lesson with his class. Share your ideas for how it fits in your curriculum.

3) THE "ART" OF OCEAN EXPLORATION
Audience: Art and science teachers.

Focus: The role of scientific illustration in oceanography.

This lesson explores the history of scientific illustration and shows how some ocean technologies such as multibeam sonar play a role in helping artists document the undersea world. Students can try some simple exercises in scientific illustration.

4) NOAA'S LEARNING OCEAN SCIENCE THROUGH OCEAN EXPLORATION
This space features curriculum (see below) developed by NOAA Office of Ocean Exploration, which links to its scientific expeditions. Dr. Valerie Chase, Editor of the curriculum, will dialogue with participants on ways to use these materials and she will offer suggestions for linking it to the keynote presentations of this workshop.

ABOUT THE CURRICULUM **--Learning Ocean Science through Ocean Exploration: A Curriculum for Grades 6-12**

From bioluminescent corals to deep vent worms, from tropical underwater volcanoes to the Arctic Ocean floor, we know more about the Moon than our ocean. Bring the excitement of

current ocean science discoveries to your students using this Ocean Exploration curriculum and a CD-ROM of the Ocean Explorer Web site from the National Oceanic and Atmospheric Administration (NOAA).

Learning Ocean Science through Ocean Exploration is a newly-developed curriculum for teachers of Grades 6-12 that takes lesson plans that were developed for NOAA Voyages of Discovery and the Ocean Explorer Web Site and presents them in a comprehensive scope and sequence through subject area categories that cut across individual expeditions. Each lesson focuses on an inquiry-based approach to teaching and learning and is correlated to the National Science Education Standards.

The curriculum themes are arranged in an order that progresses from physical science through earth science to biological and environmental science, as ocean sciences include all of these areas. Curriculum themes are based on 1) the geologic formations that cut across expeditions (seamounts, ridges and banks, canyons and shelves, and mid-ocean spreading ridges), 2) using models to understand structures and functions, and 3) using scientific data in the classroom to model scientific work and thinking. What is unique in this approach is the combination of the Ocean Explorer Web Site with each lesson presented here. Teachers and students have a direct connection to the scientists whose work they are modeling in the classroom and a direct connection to the new discoveries through NOAA ocean exploration.

EXPEDITION HALL

The place to showcase current expeditions of scientific research of partners or participants. These include:

Mountains in the Sea
(National Undersea Research Center- North Atlantic and Great Lakes)
This spring, explorers will be returning to several seamounts, or undersea mountains, in the North Atlantic in year two of the Mountains in the Sea mission, to study various aspects of deep-sea corals and other organisms living on and around these submerged mountains. The primary objectives are to map, collect, and identify deepwater corals, fishes, and miscellaneous invertebrates from the seamounts, with special attention to whether corals are most abundant at the crest of the seamount and whether they form important habitat for other species, such as benthic fishes, when the corals are particularly abundant. (Historical Note: On the Bermuda to Halifax leg, the HMS *Challenger* visited close to where the Mountains in the Sea expedition did its research in 2003) Meet Diana Payne who will discuss the Mountains in the Sea expedition and the associated educational activities of the cruise. Dr. Ivar Babb is the Director of NURC-North Atlantic and Great Lakes.

Hawaii's Deepest Corals (Hawaii Undersea Research Lab)
Although most U.S. coral reefs are located in the Northwestern Hawaiian Islands, the area's pristine deep-sea corals, submarine canyons, and seamounts are not well known. The major objectives of this expedition were to visit the region's virtually unexplored seamounts, believed to support unknown fish and invertebrate assemblages; to investigate the submarine habitat of the endangered Hawaiian monk seal with specific attention to its prey; to examine the reproductive biology and genetic composition of deep-sea corals; and to locate, map, and sample the beds of the species known as precious corals. (Historical Note: The HMS *Challenger* visited the northwest Hawaiian Islands)
Rachel Shackelford will be available to meet with participants and talk about the research activities of Hawaii Undersea Research Lab. Dr. John Wiltshire is the Director of HURL.

Science, Education, and Marine Archeology Program in Portugal
(Ocean Technology Foundation)
In April, Portuguese and U.S. explorers are using a manned submersible to dive the little-known submarine canyons off Portugal's coast. They are searching for a U-Boat scuttled during World War II and are investigating other potential shipwreck sites, some of which may be from the 14th-18th centuries. They are also studying the biodiversity of the canyons in

depths up to 300 meters. These habitats will be compared and contrasted with those of the submarine canyons along the U.S. coast in the western Atlantic Ocean. (The HMS *Challenger* visited Lisbon, the capital, and Madeira, an island that belongs to Portugal). Melissa Ryan will tell you more about this exciting project and what's happening in Portugal.

Bermuda Biological Station for Research
The HMS *Challenger* explored land and sea in Bermuda. The volumes of the Reports in the Bermuda Biological Station for Research library were our *Challenger* team's impetus for developing educational projects.

WEEK 3 ~ May 3-7

Back in the **KEYNOTE HALL** In the third and final week we have three keynote presenters who will present on the future of ocean exploration. They'll provide a glimpse of what is out there on the horizon. We also hope you will continue your dialogue in the **TEACHER CENTER** about the lesson plans and curriculum and offer ideas for how you might use these materials in your educational setting.

Dr. Richard A. Cooper
"Undersea Systems of the Future"
Founder and Chief Scientist, Ocean Technology Foundation

Dr. Steven Miller
"The Future of Coral Reefs in Florida"
Center Director, National Undersea Research Center
UNCW Center for Marine Science

Dr. John Orcutt
"Ocean Observatories - A Paradigm Shift in Ocean Exploration"
Ocean Research Interactive Observatory Networks
Professor of Geophysics, and
Director of the Cecil H. and Ida M. Green Institute of Geophysics and Planetary Physics
Scripps Institution of Oceanography in La Jolla

ONGOING SPACES for all three weeks

RECEPTION

The place for: introductions, overview, HELP desk, announcements, and a "welcome"!

VIRTUAL EXHIBIT—BIRCH AQUARIUM.

Liz Winant, Managing Director of the Birch Aquarium
Miriam Polcino, Website Developer for the Virtual Exhibit
The Birch Aquarium at Scripps has an Oceanographic Exhibit called "Exploring The Blue Planet." The goal of this exhibit is to introduce the oceans in terms of their formation and importance to life on earth. The exhibit experience emphasizes that understanding the oceans is key to understanding our planet as a global system. The first section of this exhibit is History of Oceanography and one component of this features the 1872-1876 voyage of the HMS *Challenger*.

The Birch Aquarium has been developing a virtual *Challenger* exhibit and creating accompanying web based educational materials. The exhibit depicts a scientific lab that was set up just below the upper deck in the *Challenger*. Highlights in the exhibit include: specimen bottles and reagents showing that creatures were brought back from the ocean saved in "spirits of wine," and *Challenger* discovered 4,417 new species of living things; two specimen jars with the same fish from markedly different ocean locations demonstrating what scientists noticed for the first time, that animals and plants from water of the same temperature were

very similar even if they were collected thousands of miles apart; a sample of a "weird" fish showing scientists that fish could live in almost total darkness and that some fish glow in the dark; manganese nodules, something scientists had never seen before, taken in a bottom sample at a depth of nearly 5 km.; a microscope showing that plant and animal life was abundant in many surface waters, and samples from sea floor sediments revealing microscopic skeletons allowing *Challenger* to collect and identify 3,508 new species of radiolaria; newspaper clippings showing the public curiosity and pride in this voyage very similar to the USA Apollo landing in 1969; a map showing details of one of the 360 stations where a standard set of data was collected, the data being water depth, temperature at various depths, weather conditions, water currents at surface, seafloor samples, water samples, samples of plant and animal life at various depths; a map showing the distance traveled by *Challenger* entering all the oceans except the Arctic.

Another part of the exhibit displays the work that had to be done after the voyage to analyze and publicize the results and bring this new knowledge to the scientific community and the general public. The studies were summarized in the 50 volumes of the *Challenger* Reports and one of these original volumes is on display. The Scripps Library has all 50 volumes of these reports. Scripps also has letters from a 19-year-old seaman Joseph Matkin, who wrote to his family describing the entire voyage. One of these is displayed showing the "cross writing" style of the day used to save paper. These letters provide important insights about working techniques and shipboard life during the voyage. Web based educational materials for this portion of the exhibit will be based on selected digitized material from the *Challenger* Reports.

GRADUATE CREDIT ROOM

This space is for participants who wish to get graduate credit. It will be managed by Lynn Whitley of University of Southern California Sea Grant.

SOCIAL SPACE

An informal space for participants to talk socially on a variety of topics. They can start their own “item” to engage others on a particular topic. Relax, have a cup of virtual coffee and talk!

BOOK STORE

The book store will identify and describe books related to the topics of this workshop. Some of these will link to Amazon.com if you would like to purchase them.

RESOURCE CENTER

A number of related resources will be suggested for use by participants. These will include web links, suggested articles and books and other resources. The resources will be correlated to the keynote presentations as well as being suggested for background information and classroom usage.

SUMMARY
We hope this guide will help you make the best use of your time in the online workshop. Don’t hesitate to email our team with questions if you should need help navigating through our online learning community! support@coexploration.net

College of Exploration Challenger Team:

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