

NOBEL CONFERENCE® 48 PREVIEW GUSTAVUS ADOLPHUS COLLEGE

OUR GLOBAL OCEAN

OCTOBER 2 & 3, 2012



THE NOBEL CONFERENCE®

GUSTAVUS ADOLPHUS COLLEGE

Established in 1862 by Swedish Lutheran immigrants, Gustavus Adolphus College is a private, liberal arts college that provides an undergraduate education of recognized excellence. The Alfred Nobel Hall of Science at the College was named as a memorial to the great Swedish inventor and philanthropist. Following its dedication in 1963—which was attended by Nobel Foundation officials and 26 Nobel laureates—the College sought endorsement from the Nobel Foundation for an annual science conference. Permission was granted and the conference, now in its sixth decade, continues to set a standard for timeliness, intellectual inquiry, and free debate of contemporary issues related to the natural and social sciences.

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GREETINGS FROM GUSTAVUS ADOLPHUS COLLEGE

OUR GLOBAL OCEAN

JULIE BARTLEY, Associate Professor of Geology and JOEL CARLIN, Assistant Professor of Biology, Co-chairs, Nobel Conference® 48

The conference theme of “Our Global Ocean” may seem strange at first glance. Our ocean? After all, we live on land—many people live their lives without seeing an ocean. And what about the “seven seas” and “oceans of the world”? How is it that we can talk about just one ocean?

Nobel 48 is a story of connections—these varied bodies of saltwater, from the Antarctic to the Mediterranean, are indeed a single system. Earth’s oceans are an interconnected system of biological, chemical, geological, and physical processes that impacts both climate and landscape. Hurricanes are born of the ocean; tsunamis have their origins in seafloor disturbances; climate change can alter the shape of nations.

It is perhaps surprising that, despite the immensity of the ocean, human activity can affect even the deepest parts of the sea. From Odysseus’ Charybdis to the impossibly ferocious white shark in *Jaws*, the unknowns of the deep have titillated our imagination. Most people, though, remain blissfully unaware of the real dangers of ocean acidification, coral reef loss, or high seas fishing piracy.

This immense and poorly understood resource is truly ours—it defines our planet’s unique status in the solar system, it is the place of our evolutionary origin, it is a factor in shaping humanity’s future, and it is ours to learn from if we choose. “Our Global Ocean” represents a new direction for the Nobel Conference. Previous

conferences have touched upon human interactions with the environment, such as the 1993 “Nature Out of Balance” conference and the recent Nobel 45, “H₂O: Uncertain Resource.” The marine realm requires a different perspective than those needed to study tropical forests or drinking water supplies. The marine world is vast: 71 percent of the Earth is covered by ocean water, and in one place the ocean is deep enough to swallow Mount Everest (and still have 2 km of water above its summit). Small wonder that Tim Flannery famously suggested that we know more about the surface of the moon than we do about the ocean’s depths.

This vastness is also temporal. Life originated in the ocean more than 3 billion years ago; in the ocean, more than half a billion years ago, animals exploded in diversity. New crust produced at the seafloor records the movement of continents across millennia, and our interactions with the ocean and climate may cause the sea to swallow entire nations tomorrow. Understanding, harnessing, and protecting our global ocean demands technology rivaling any science-fiction movie and, more importantly, requires that we communicate science to a public that is impacted and fascinated by this intricate underwater world.

The Nobel Conference opens with **DAVID GALLO** of the Woods Hole Oceanographic Institute. David is interested in both land-sea interactions and in ocean exploration. It is for his work in the latter he is perhaps most famous, and we look forward to hearing about his knowledge of underwater robotics, mapping, and deep-sea submersibles. We are extremely fortunate to have a co-discoverer of the Titanic’s resting place in this, the 100th anniversary year of its sinking. Beyond the headlines, marine exploration technology is a vital link to discovering and understanding natural resources, new ecosystems, and deep impacts of human activity.

The topics of marine exploration and the deep ocean continue with the next speaker, **MAYA TOLSTOY**. Maya is a marine geophysicist—that is, she looks at how energy moves across the seafloor and through the water itself.

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Maya's first passion is learning how and why volcanoes erupt deep on the seafloor, and what happens to the energy that is generated. The geophysics of the deep sea intersect with the interconnected ocean system in many dimensions; Maya's research thus spans hydrothermal vent ecosystems and the impact of human-generated noise on whales.

From the movement of immense seafloor plates, "Our Global Ocean" then considers the creatures that move about closer to the surface. Few move farther or faster than the organisms studied by **BARBARA BLOCK** of Hopkins Marine Station. Imagine wolf packs that run non-stop for days and you enter Barbara's world: the physiology of tunas, marlins, sailfish, and sharks. These big predators have unique molecules and muscles that keep their bodies warm, allowing them to actively hunt over much of the surface of our planet. With such a study subject, it is no wonder that she uses satellite mapping as well as molecular biology to understand these "wolves of the sea."

Not only do animals move across oceans, but molecules move well—sometimes too well. No one understands how molecules, particularly toxic metals, can be transported in ocean systems better than **BILL FITZGERALD**. Our Tuesday evening speaker joins the conference from the University of Connecticut, and also is the 2012 Rydell Professor at Gustavus Adolphus College. He understands what the public is only beginning to grasp: that land, sea, and sky are an interconnected system that is disturbed at our peril.

The second day of "Our Global Ocean" begins with **CHRIS SABINE** of the Pacific Marine Environmental Laboratory. Chris's work in marine acidification brings us back to the sea-sky-land interface, marine biogeochemistry. Chris, a leader in climate change research, helps nations interpret and communicate the science that traces how nutrients, particularly inorganic carbon, travel across our world. Typhoons, algae, farms, electronics, and factories all play a role in his understanding of the changing pH of the marine realm. For his efforts, Chris received special recognition as a member of the climate panel that won the 2007 Nobel Peace Prize.

The Nobel committee worries about environmental messages inherent in some of our talks. Is our situation on this planet hopeless? Is there nothing

an individual can do? We therefore greatly anticipate **KATHLEEN DEAN MOORE**, an expert in helping us re-envision where humans stand with our global ocean. A philosopher of both law and ethics, she teaches in Oregon State University's graduate program in environmental leadership.

OVE HOEGH-GULDBERG, director of the Global Change Institute at Australia's University of Queensland is our Wednesday afternoon speaker. He is an expert on coral reefs and the ways by which human activity affects them. Because of this work, he has been an avid communicator of science in print and on television. Ove works in arguably the most beautiful ecosystem visible from space—the Great Barrier Reef of Australia. Here, and across hundreds of other coral reefs, he has studied the diversity and wonder of reef life. Moreover, he has seen them fall victim to bleaching—a slow, temperature-driven cycle of starvation and coral death. We are excited to learn more about the beauty of these symbols of biodiversity and the conservation efforts that can help them.

The final speaker of "Our Global Ocean" is **CARL SAFINA** of the Blue Ocean Institute. Carl is a tireless educator of the public about overfishing and coastal changes to our global ocean. His talk will drive home how inland consumers may alter the fate of ecosystems an ocean—or two oceans—away. Carl asks us to wonder about the impacts of supplying "fresh" seafood to thousands of Minnesotans while a single restaurant pays \$736,000 for one tuna fish. Carl will remind us of the beauty of living ecosystems and their connections to our economy, geography, and climate.

When Jules Verne's immortal character Captain Nemo said, "We may brave human laws, but we cannot resist natural ones," he may have set the tone for Nobel Conference 48. The immense age and vast physical scale of the ocean make it ripe for scientific discovery—an especially important challenge as we understand the interconnectedness of land, atmosphere, and our global ocean. We hope that you and your family will find connections between the latest science and your own lives. Whether you are a child or a seismologist, we hope to inspire in you wonderful conversations and a desire to know more about our global ocean.

NOBEL CONFERENCE® 48 OCTOBER 2 & 3, 2012

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Order Nobel lecture and meal tickets and pre-order merchandise online at gustavustickets.com or by phone at 507-933-7520 (mail orders no longer accepted).

Seating in Lund Center Arena is limited to 3,000. Overflow seating will be available in Lund Center Forum, video-equipped site.

Tickets are non-refundable. Please note that a separate ticket is required for the Nobel Conference Banquet on Wednesday evening.

Ticket prices: Reserved—\$110; General Admission—\$65; Student Delegation (block of 10)—\$50.

For more information, contact the Office of Marketing and Communication at 507-933-7520 or e-mail marketing@gustavus.edu.

NOBEL CONFERENCE SCHEDULE

All lectures are held in Lund Center Arena.

TUESDAY, OCTOBER 2

- 9:30 a.m. Academic Procession and Opening Ceremony
- 10 a.m. **FIRST LECTURE: DAVID GALLO, Ph.D.**, Woods Hole Oceanographic Institution, Woods Hole, Mass.
- 11 a.m. Q & A Session
- 1 p.m. **SECOND LECTURE: MAYA TOLSTOY, Ph.D.**, Lamont-Doherty Earth Observatory, Columbia University, Palisades, N.Y.
- 2 p.m. Q & A Session
- 3 p.m. **THIRD LECTURE: BARBARA BLOCK, Ph.D.**, Hopkins Marine Station, Stanford University, Pacific Grove, Calif.
- 4 p.m. Q & A Session
- 6 p.m. Art Exhibition Opening
Hillstrom Museum of Art
- 6:30 p.m. **FOURTH LECTURE: WILLIAM F. FITZGERALD, Ph.D.**, University of Connecticut, Groton
- 7:30 p.m. Q & A Session
- 8:15 p.m. The Nobel Conference Concert
Christ Chapel

WEDNESDAY, OCTOBER 3

- 9:30 a.m. Opening Music and Welcome
- 10 a.m. **FIFTH LECTURE: CHRISTOPHER SABINE, Ph.D.**, NOAA Pacific Marine Environmental Laboratory, Seattle, Wash.
- 11 a.m. Q & A Session
- 1 p.m. **SIXTH LECTURE: KATHLEEN DEAN MOORE, Ph.D.**, Oregon State University, Corvallis
- 2 p.m. Q & A Session
- 3 p.m. **SEVENTH LECTURE: OVE HOEGH-GULDBERG, Ph.D.**, University of Queensland, St. Lucia Campus, Brisbane, Australia
- 4 p.m. Q & A Session
- 6:30 p.m. The Nobel Conference Banquet
Evelyn Young Dining Room, Jackson Campus Center
- 7:30 p.m. **CLOSING LECTURE: CARL SAFINA, Ph.D.**, Blue Ocean Institute, Cold Spring Harbor, N.Y.

The Nobel Conference is officially authorized by the Nobel Foundation, Stockholm, Sweden.

OUR GLOBAL OCEAN PRESENTERS

BARBARA BLOCK

Most people know from watching shows like *Wild Kingdom* on Animal Planet that scientists study large animals like giraffes and elephants in order to develop strategies to help maintain healthy populations of these animals. But, few of us know that scientists like Barbara Block study how the lions and tigers of the sea—tuna and sharks—survive migrating through cold oceans. She describes tuna as the athletes of the sea and if given the choice would take a tuna's heart over any other animal. Block works out of Stanford's Hopkins Marine Station, where she and her colleagues run the Tuna Research and Conservation Center, part of the Tagging of Pacific Predators (TOPP) program.

They use novel electronic tags to track large predator fish like tuna, billfish, and sharks, as they travel across the ocean. She also studies the physiology of these creatures, how and why at a molecular level muscle makes heat, in an effort to better understand how they not only survive in the cold ocean, but thrive. Her group combines these data with tracking data and genetic analyses in order to develop population and ecological models. Their goal is to help us understand these fishes' roles in the ocean ecosystem and to learn how to better manage them as a resource.

Professor Block got excited about the oceans when, as an undergraduate, she took a class in oceanography. So, as a senior, she signed up for a semester at sea with the Sea Education Association. After earning her bachelor's degree from the University of Vermont, she went on to Duke University for graduate work in zoology, earning her Ph.D. She began her teaching career at the University of Chicago while she was also a member of the research staff of the Woods Hole Oceanographic Institution. It was there that she got her passion for tuna and other warm-blooded fish from the father of tuna biology, Dr. Francis Carey. Since 1993 Block has been the Prothro Professor of Marine Science at Stanford University in California. She founded the Tuna Research and Conservation Center in conjunction with the Monterey Bay Aquarium, a unique facility that

permits physiological research on tunas. The Block lab is the only lab in the United States that keeps captive tuna for study. They also engage in research at sea and employ wildlife telemetry and molecular genetics to study the short- and long-term movements and behavior of tuna and billfishes. These fish are highly exploited in international fisheries, and understanding their biology, population structure, and selective advantage of endothermy (warm bloodedness) is necessary to develop effective management strategies.

Block spends about a third of her time at sea and usually takes undergraduate students along to help with the work.

Not only do they get to see how two-thirds of our planet functions, she says, but they also have an opportunity to develop the passion that has driven her career.

Electronic instrumentation allows them to track the movements of tagged fish in near real time, by sending data to the researchers through acoustic receivers and satellites. The TOPP (Tagging of Pacific Pelagics) website makes these data available to researcher and the public alike.

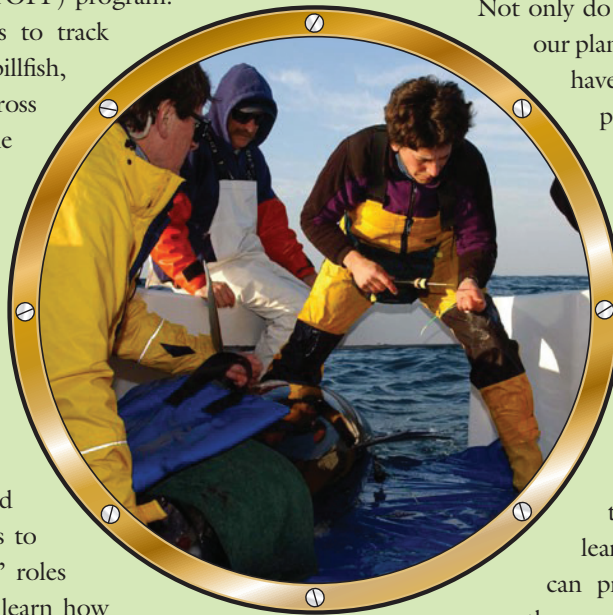
Block's group is trying to build the largest world heritage sites by learning where the animals are so they can protect the remaining populations

as the oceans change in the coming years. To

that end, it is important to understand the relationship

between ocean and atmosphere. She says that we must think integratively across disciplines, from planetary science to ocean biology, in order to solve the difficult challenges of the future.

Dr. Block loves working with wild animals—although she says that she needs stay focused when she does so. Last summer she was working with white sharks for the first time in a while, using a seal decoy with small piece of whale meat to lure a shark in close to the boat for tagging purposes. She was lucky that when the shark lunged for the decoy, which was very close to her hand, that she was able to react quickly and wasn't injured. Barbara also loves Labrador retrievers, biking, swimming, diving, and snow skiing.



WILLIAM FITZGERALD

The “Madison Declaration on Mercury Pollution” reflects the consensus of more than 1,100 scientists at the eighth International Conference on Mercury as a Global Pollutant that “three times more mercury now falls from the sky than before the industrial revolution 200 years ago.” Dr. William F. Fitzgerald, Board of Trustees Distinguished Professor of Marine Sciences, Emeritus, at the University of Connecticut and leading mercury expert, is one of the scientists warning that mercury pollution is a serious global threat and that there is a serious need to understand mercury cycling in the marine environment. While little is known about the behavior of mercury in marine ecosystems and the methylmercury contamination of marine fishes, health risks posed by mercury-contaminated fish warrant a general dietary warning to the public. At the same time, methylmercury levels in fish-eating birds and mammals in some parts of the world are reaching toxic levels. Fitzgerald’s research, which has been supported by the National Science Foundation (NSF) and the Environmental Protection Agency, has focused on mercury in ecosystems ranging from Long Island Sound to the open ocean.

Considered one of the foremost experts on the chemistry of mercury from an oceanographic and environmental perspective, Fitzgerald also explores mercury in terrestrial systems that include tundra lakes and watersheds of arctic Alaska. He was the 2011 recipient of the Kathryn R. Mahaffey Lifetime Achievement Award in Mercury Research.

Dr. Fitzgerald was born in Boston of Irish immigrant parents and grew up near Fenway Park in one of the original culturally diverse neighborhoods where everyone took care of their neighbors. That was a time, he says, “when we thought Boston was the hub of the universe and nobody dreamed of leaving.” Fitzgerald tells the story about his high school days hanging out at the Honey Donut Shop when a recent college graduate, an all-state athlete and academic, came to say goodbye before going off to his dream job of teaching in Milwaukee, Wisconsin. Fitzgerald says he wondered what would happen to *him*, if that was where top high school and college students ended up.

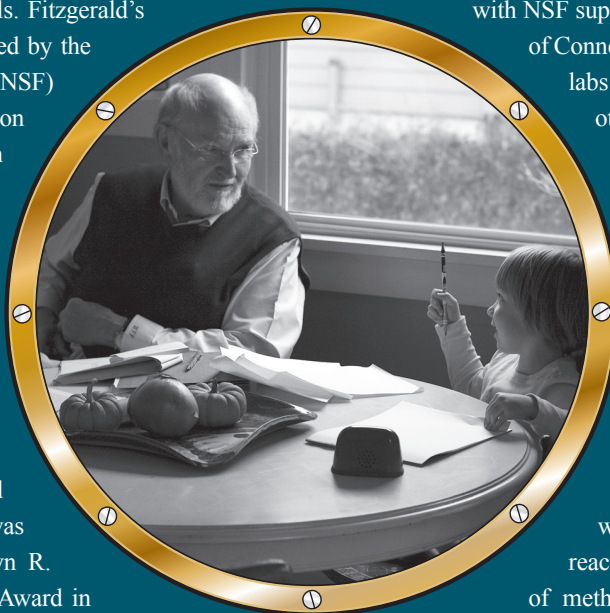
Despite his interest in the outdoors, Fitzgerald didn’t leave Boston for college, but studied chemistry at Boston College.

When, as a senior he asked the department chair about geochemistry, which would have allowed him to pursue his dream of doing chemistry in the field, he was told there was no future in it. So, he went on to a master’s program in organic chemistry at the College of the Holy Cross. As a “city boy” inspired by the romance of doing science at sea he took an entry level chemical position at the Woods Hole Oceanographic Institution (WHOI). Later he enrolled at MIT just as they were starting the Joint Program in Oceanography, Applied Ocean Science, and Engineering program with WHOI. When he heard a talk by Edward Goldberg from the Scripps Institution of Oceanography, describing the industrial poisoning from methylmercury and its devastating consequences to the fishing community in Minamata, Japan, his professional life changed and he decided to study mercury. As a beginning professor with NSF support and funding from the University of Connecticut, he started one of the first clean labs devoted to the study of mercury and other metals in the ocean.

Professor Fitzgerald is living the dream that he had as a student at Boston College. In the company of students and colleagues, he has developed sampling analytical techniques and led major environmental studies to understand how much of the mercury is natural, how much is anthropogenic, and what biogeochemical processes and reactions are leading to the accumulation of methylmercury in fish and other biota.

Although he is officially retired from teaching, he doesn’t believe that he will ever stop working on mercury-related projects. He says that he enjoys the people, the research, and teaching students in his quest to understand more about mercury in the world, and he is flattered that one of the two underwater autonomous vehicles collecting data in Long Island Sound is named “Bill” after him.

Because Dr. Fitzgerald is “retired,” he will be able to spend a significant amount of time next fall as the 2012 Robert E. and Susan T. Rydell Professor at Gustavus Adolphus College, helping to teach an oceanography course for science students. We are excited for the opportunity to connect a class directly to the conference and to involve the Rydell Professor in that process.



DAVID GALLO

Does everyone dream of diving deep under the ocean in a submarine? Dave Gallo's dream began when he read about the deep oceans in a 1976 *National Geographic* magazine. It became reality only two-and-one-half years later when he took his first dive in *Alvin (DSV2)*, the U.S. Navy-owned Deep Submergence Vehicle operated by the Woods Hole Oceanographic Institute (WHOI).

As director of special projects at WHOI, renowned oceanographer Gallo works closely with scientists and engineers at the forefront of global exploration and discovery. But, he is probably most famous for his exploration of the wreck of the *R.M.S. Titanic*, 2.5 miles under the water's surface. Researchers familiar with site say the ship's deck could collapse within 25 years, and the massive hull isn't faring much better. It's slowly being eaten away by microbes and eventually will dissolve into the ocean's floor. To preserve the underwater scene of the wreckage, an expedition coled by Gallo is under way to create an interactive, 3D map of the entire area. Their goal is to use sonar and advanced high-definition 3D camera technology to produce what is essentially a 3D view of the *Titanic* as it sits on the bottom of sea.

After several failed attempts at community college in New York, Dave Gallo sold shoes for seven years before the *National Geographic* story inspired him to go back to school. Supercharged by curiosity, he successfully passed several courses at a community college and attended the State University of New York at Albany. He never thought that he would go to graduate school, but after he got his bachelor's degree he still wanted to learn more, so he continued in a master's program at SUNY, Albany. When he was nearing the end of that program, his adviser suggested that he consider going on to a doctoral program. As a result, he went on to earn his Ph.D. in oceanography from the University of Rhode Island. In 1987 Robert Ballard invited him to come to WHOI as assistant director of the Center for Marine Exploration and to join the team exploring the *Titanic* site, which Bob had just discovered. Gallo has participated in numerous expeditions to the Atlantic, Pacific, and Indian

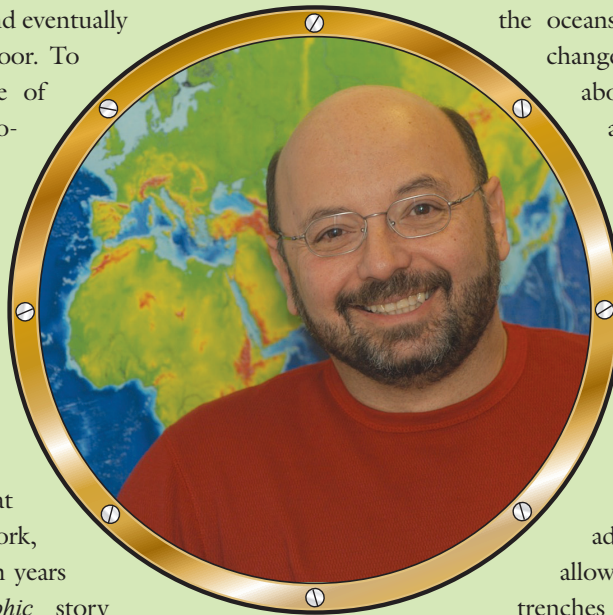
Oceans, and to the Mediterranean Sea. He was U.S. project leader of the search for missing flight Air France 447 and is a member of James Cameron's Deep Ocean Task Force.

Dr. Gallo, who has received a number of awards for his work, including a fellowship from the American Association for the Advancement of Science, is passionate about exploration and discovery and dedicated to communicating the importance of science and engineering to the public-at-large. While he maintains close working relationships with scientists, filmmakers, and media broadcasters, he also travels extensively, giving lectures nationally and internationally to audiences ranging from elementary school children through CEOs of companies. Every time he tells an ocean exploration story he sees the eyes of the audience light up and hears the gasps. Gallo says that humanity has always taken

the oceans for granted, and this needs to change. He uses the invitation to speak about the exploration of the oceans as an opportunity to talk about the state of the oceans. There may not be actual islands of trash the size of Texas floating around out there, but the chemicals that we are putting into the oceans are much worse. Even acts like washing the oil off of rocks after an oil spill can be detrimental.

While there have been great advances in technology that are allowing us to explore the deepest ocean trenches and discover the incredible beauty and diversity of the life around hydrothermal vents, only five percent of the oceans have been explored. Because the oceans are so important to all of us, Gallo believes that we need to become better at exploring them and understanding the data that we gather. And we need to understand the effects that changes in climate are having on the ocean environment.

Dave Gallo describes himself as a regular person—not an academic thoroughbred. While he enjoys his work and speaking, he can be just as interested in looking at plants in his backyard. He says he might have been a biologist if he had gotten excited about a different aspect of the oceans. He enjoys the wonder of nature and loves going for walks. He also enjoys music, cooking, and shopping.



OVE HOEGH-GULDBERG

In *Finding Nemo*, clownfish Marlin and blue tang Dory surf the East Australian Current on their way to Sydney Harbor in search of Marlin's son Nemo. Had they been less lucky, they might have ended up in one of Ove Hoegh-Guldberg's 20 fish tanks. Or as lunch for one of the lionfish that he has collected from the Current.

Ove Hoegh-Guldberg is the inaugural director of the Global Change Institute at the University of Queensland, and is well known for his work on climate change and coral reefs. He works closely with research groups from the University of Queensland and from universities around the world to understand the response of coral reefs to climate change. They simulate the environment that might be expected in future oceans, as well those of oceans from the past, when atmospheric carbon dioxide levels and ocean chemistry will be or were different.

One of the benefits of survey work in the Great Barrier Reef, which is supported by Google and Catlin Insurance, is the discovery of many new animal species, corals and seahorses primarily. As a result of his concern for the effects of climate change on ocean systems and the Earth in general, Professor Hoegh-Guldberg has also begun to work with a number of groups on problems in energy production and usage in society, in part to help them understand the limits of the biosphere.

Hoegh-Guldberg's interest in nature started when he was young growing up in the Sydney, Australia, suburb of East Lindfield. Encouraged by his parents and grandparents to satisfy his curiosity, he often wandered the bushlands and waterways near his home. He attended public schools in the Sydney suburbs, so it was not surprising that he went on to the University of Sydney, where he graduated with honors in science, majoring in marine biology. But it was a scholarship to complete a Ph.D. at the University of California Los Angeles that led to his seminal 1999 work on coral bleaching. His thesis was on the population regulation of zooxanthellae within coral, so he naturally became interested in the reasons for mass coral bleaching in Caribbean coral reefs in the early 1980s. Coral bleaching occurs when the zooxanthellae, which supply the coral with nutrients, leave them, resulting in the coral's starvation and

eventual death. This dramatically impacts other marine life, since the symbiotic system of coral and zooxanthellae gives the coral reef its color and its ability to produce calcium carbonate as well as providing an ecosystem for other marine animals. After finishing his Ph.D. in 1992, Dr. Hoegh-Guldberg took academic positions at the University of Sydney and the University of Queensland. It was during that time that he built up the Coral Reef Ecosystems group, pursuing questions from molecular to global scales.

With the realization that the current bleaching thresholds will be exceeded by even modest predictions of temperature increases due to climate change, the pressure is on scientists to extend the impact of their science using the full set of communication options. Hough-Guldberg says that this

one of the primary reasons why he maintains an active blog at www.climateshifts.org. The big challenges come down to sustainability of marine populations in a changing world, at a time when the Earth will know the highest rates of change seen in thousands or millions of years, about 100 times faster than when it came out of the most recent ice age. Hoegh-Guldberg maintains that we need to combine our understanding of the science, changes in populations, and politics to transition away from CO₂-emitting energy sources in a timely way.

In addition to his scientific research, Hoegh-Guldberg is a regular contributor to the media, working recently with ABC, BBC, and NBC to reach over 15 million people in Australia, the UK, and the USA. He has also actively collaborated with organizations such as the Great Barrier Reef Foundation, Royal Society of London, and World Bank, as well as advising government and business on the science and urgency associated with climate change.

Ove Hoegh-Guldberg enjoys bicycling, scuba diving, and art. He and his wife, Sophie, also a marine researcher, have a daughter Fiona and son Christopher, and the family sometimes manages to go on field research studies together. He says that Fiona and Christopher have an enormous knowledge of marine and natural things—they're like little seals when it comes to the ocean.



KATHLEEN MOORE

Growing up in Cleveland, Ohio, Kathleen Dean Moore often waded with her biologist parents in the rivers and marshes near Lake Erie. Later, when she watched the Cuyahoga River burn, she thought about how to reconcile humans' love of beautiful wet places and our abuse of them. In "Late at Night, Listening," from her book *The Pine Island Paradox*, Professor Moore describes the incredible diversity of the unseen world at the border of the ocean and land. As she and daughter Erin turn off their lights after perching on rock wrack at the edge, they are astounded by the sounds they hear: the soft inhale and gurgling exhale of the sea, the scratching sounds of tiny claws moving on rocks, the constant plop plop as saltwater drops off globules and tentacles—all evidence of life. When they turn on their lights to scan the water, they see hundreds of pairs of tiny yellow eyes staring back at them—bay shrimp. Moore goes on to explain how we often overlook the lives of things we can't see clearly and distinctly, the unimagined other worlds watching us in the dark.

How do we protect this ocean of life? It is the urgency to answer this question that inspires her, or, as she puts it, "scares her out of bed in the morning."

Moore is an essayist and activist who writes about cultural and spiritual connections to wet wild places. Her award-winning books include *Riverwalking*, *Holdfast*, *The Pine Island Paradox*, and *Wild Comfort*. *Moral Ground: Ethical Action for a Planet in Peril*, her newest book, gathers calls from the world's moral leaders to honor our obligations to future generations. Moore publishes in both environmental ethics and popular journals such as *Audubon*, *Discover*, and *Orion*, where she serves on the board of directors. She teaches writing workshops in beautiful places, from wilderness Alaska to the Apostle Islands.

Moore studied philosophy at the College of Wooster, and then went on to graduate work at the University of Colorado, Boulder. There, she studied philosophy and law, focusing on institutions of forgiveness as she explored how different world views may help us cope with our destructive tendencies. She teaches a variety of courses in philosophy of the environment, environmental ethics, and critical

thinking at Oregon State University, where she is currently Distinguished Professor of Philosophy.

Professor Moore's recent work focuses on finding solutions to the complex problems of the world by using an interdisciplinary approach. At Oregon State, Moore is co-author of a proposed graduate program in environmental leadership, which integrates science and humanities to provide leadership for complex times. She is also the founding director of the Spring Creek Project for Ideas, Nature, and the Written Word. Its mission is to bring together the practical wisdom of the environmental sciences, the analytic clarity of philosophy, and the emotional power of the written word to re-imagine our relation to the natural world.

She is currently working on a new ocean ethic that brings our moral understandings of our obligations to the world into concordance with contemporary evolutionary and ecological understandings of an interconnected, interdependent, resilient, finite, and very beautiful planet. If we are full citizens of this planet, entirely dependent on the workings of its hydrological systems and ecological communities, how should we live?

Science alone can't provide a solution to our problems, Moore says. We need also to affirm that it's wrong to wreck the world. We need to recognize that climate change threatens to create the greatest human rights violation the world has ever seen—a global crisis of compassion and justice. We need to create a rising wave of affirmation of the basic moral principle that we have an obligation to the future to leave a world as rich in life and possibility as our own. Consequently, Moore is working to create a national conversation about the moral costs of climate change. Her goal is to match the scientific consensus that climate change is real, dangerous, and upon us, with a moral consensus that climate change is an unforgivable wrong

When Kathleen Dean Moore is not in Oregon, she lives in a cabin where two streams and a bear trail meet a tidal cove on Chichagof Island in Alaska. There she enjoys kayaking in little boats, hiking, and wading to explore the tides of change.



CHRISTOPHER SABINE

Dr. Christopher Sabine, director of NOAA's Pacific Marine Environmental Laboratory (PMEL) in Seattle, Washington, and a member of its carbon group since 1999, doesn't do science for science's sake. He does it because he believes that it holds the solutions to important problems facing our world. For example, for 20 years he did research on how the oceans hold carbon dioxide because he understood the need to minimize CO₂ increases in the atmosphere in order to moderate the effects on the Earth's climate. Much to his chagrin, he realized that the oceans aren't the infinite sink that we believed them to be. He had an "aha moment" when he recognized that increases in CO₂ levels in the oceans have already begun to change water chemistry enough to cause serious stress on their inhabitants. As a result, his perspective changed completely and he began to search for ways to reduce the amount of CO₂ that the oceans needed to absorb.

When Chris was 15 the family fiberglass business in Mobile, Alabama, was destroyed by fire. His father sold everything, bought a sailboat, and the family sailed to the Bahamas. When they returned to the United States a year and a half later, it was to Charleston, South Carolina, where the family continued to live on the boat. By doubling up on required classes, Chris was able to skip the 10th grade and graduate from high school on time. But, his time on the ocean had a profound impact, and he decided that he wanted to be an oceanographer. Not only that, he was determined to get his Ph.D. by the time he was 25, a goal that he missed by only a few months.

Oceanography involves all of the sciences. Sabine completed his bachelor's degree in just three-and-one-half years at Texas A&M, majoring in marine science. Every summer he did internships and took classes at places like the Harbor Branch Foundation in Ft. Pierce, Florida, and the Bermuda Biological Station, where he worked with a professor from the University of Hawaii at Manoa. After graduation he continued his work in Hawaii, completing his Ph.D. in five years before going to Princeton as a post doc in Jorge Sarmiento's group. It was there that he got into chemical oceanography and began to study carbon in the ocean. His "aha moment" came in 2004 when he and

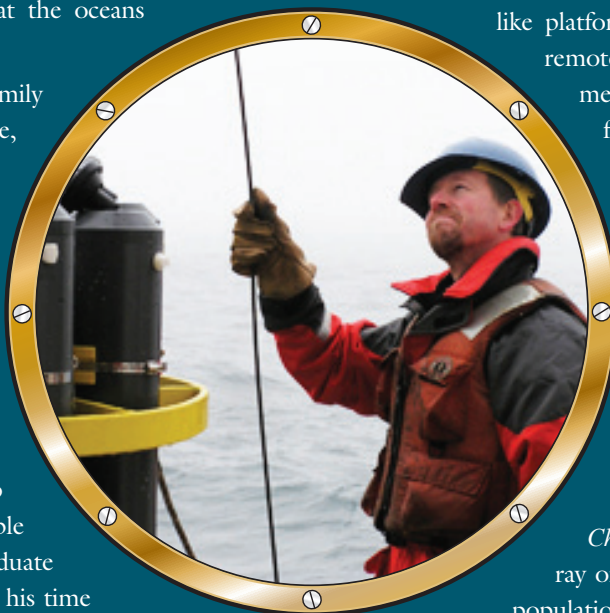
Richard Feely (a PMEL scientist) wrote a pair of papers for the journal *Science* on how much human-derived CO₂ is stored in the oceans and the impact that CO₂ is having on ocean organisms. As a result of this and subsequent work, Sabine has received numerous awards, including a share in the 2007 Nobel Peace Prize with the IPCC.

Initially Dr. Sabine worked to develop the science needed to study ocean chemistry, but more recently he has been interacting more directly with public and policy makers about the role of oceans in all of our lives. Still, he continues the science, taking the big-picture approach and using many different ways to look at the ocean—from numerical models to observations and focused experiments to prove the simulations are working properly. His group uses

data from suites of sensors mounted on surf board-like platforms powered by wave action and remotely controlled to move and make measurements. These, along with data from buoys and observations of ships traversing the oceans have provided a wealth of data for analysis.

Despite the bad news about carbon in the world's oceans, Sabine tends to be very optimistic. In fact, he was accused of smiling too much when presenting his work with Dick Feely as part of the film *A Sea Change!* But he says that he sees a ray of hope. He has faith in the human population, and now that we accept what is happening, we can fix the problem. "It's not too late. But it is not just the magnitude of CO₂, it is the rate at which we are adding it to the atmosphere. We need to slow down now to allow organisms to adapt and humanity to counteract the changes." Still, Sabine has tremendous hope, but he maintains that it has to come from younger generations. "We need to get young people interested in studying how the environment is changing and getting the world back on a sustainable path."

Chris Sabine loves the ocean and would like others to share the beauty he sees in it. Not surprisingly, he spends a lot of time on or near the water. He is an avid sailor, a member of a sailing club in Seattle that has boats on Lake Washington, Puget Sound, and in Portland. He enjoys spending time at the beach and scuba diving.



CARL SAFINA

From drumming for a living to drumming up support for our oceans, Carl Safina has come a long way. Growing up in a middle-class family in Brooklyn, New York, Safina began breeding pigeons in the family's backyard when he was in the second grade. After his family moved to Syosset, New York, he often went bass fishing with his father in Long Island Sound. He tells the story of riding his bicycle to a favorite woods one day to find it had been knocked down by bulldozers and how that inspired him to find ways to prevent it from happening again. From an early age, conservation was in the blood of this prominent ecologist who became the co-founder and president of the Blue Ocean Institute.

Blue Ocean Institute is an environmental organization based in Cold Spring Harbor, New York, that uses science, art, and literature to inspire a closer bond with nature, especially the sea. Dr. Safina has become widely known because of his PBS series, *Saving the Ocean*, which is about people solving problems that affect our oceans, like overfishing, pollution, and destruction of ocean habitat.

Safina worked his way through the State University of New York (SUNY) at Purchase by playing drums in a variety of rock and jazz bands. After earning his bachelor's degree in environmental science in 1977, he worked for the Peregrine Fund, the National Audubon Society, and the New Jersey Department of Environmental Protection before continuing to graduate school at Rutgers University. There he earned his M.A. in 1981 and his Ph.D. in 1987, both in ecology. With the National Audubon Society, Safina primarily studied hawks and seabirds. His interest in the ocean and fish began when he was collecting data on foraging terns in the waters around Long Island for his thesis. He noticed declines in other creatures—striped bass, tuna, marlin, sharks, and other fish, as well as sea turtles—and realized that fish needed just as much protection as the birds he had been studying.

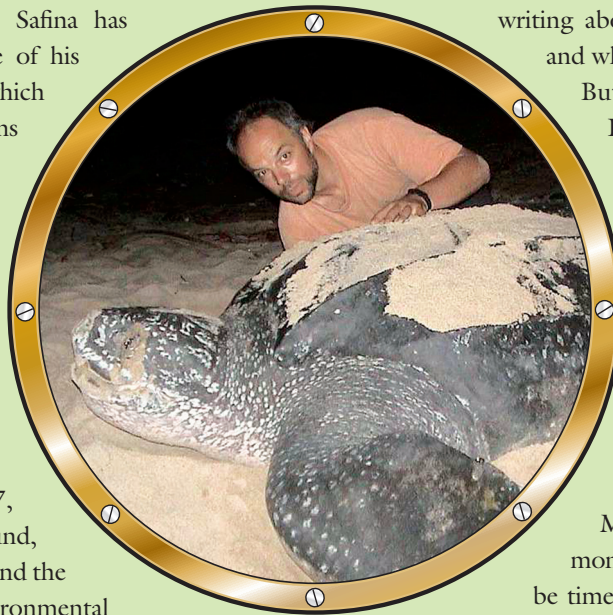
He has written six books, one on his first love, birds, and the others on the ocean and sea creatures: *Song for the Blue Ocean*; *Eye of the Albatross*; *Voyage of the Turtle*; *Nina*

Delmar: The Great Whale Rescue; *The View from Lazy Point: A Natural Year in an Unnatural World*; and *A Sea in Flames*. His books have been critically acclaimed, winning awards like the Lannan Literary Award for nonfiction, the John Burroughs Medal for literature, the National Academies Communications Award, and the Chicago Brookfield Zoo's Rabb Medal. Safina himself has received a number of prestigious awards, including Pew, MacArthur, and Guggenheim fellowships.

Dr. Safina describes his research as exciting because there is no routine at all. He did real scientific research, as he put it, during the 1980s, mostly on terns and the fish that they ate as well as their relationship with larger fish. In the 1990s he worked primarily on fisheries reform, regulation, and policy. For the last decade or so, he has been writing about how the oceans are changing and what those changes mean for people.

But, the day before the Deepwater Horizon blowout, he says that he was not sure what he would work on for the remainder of the year. As a result of the spill and his relationship with ocean conservation, he was asked to write a book about the disaster. *A Sea in Flames*, Safina's blistering account of the months-long, man-made disaster that critically affected the Gulf of Mexico, was written in only four months so that its publication could be timed to coincide with the anniversary of the disaster. He says that it's one of his jobs to make sure that we recognize that the oceans are not too big to fail. People now understand that the oceans are not inexhaustible and cannot withstand our onslaught indefinitely.

Safina lives in Amagansett, on Long Island, with Patricia Paladines and her daughter, Alexandra. They have several pets, and he still enjoys fishing, watching birds and animals, and making and listening to music. In addition to directing the Blue Ocean Institute, he is also an adjunct professor in Stony Brook University's marine program and a visiting professor in its journalism school's new Center for Communicating Science.



MAYA TOLSTOY

Most undergraduates—and many adults as well—enjoy blowing things up, which explains the popularity of explosive experiments in science demonstration shows. For Maya Tolstoy it was a little different: she got excited about blowing things up at the bottom of the ocean. Or, rather, trying to. It turns out to be difficult to do because of the pressure from all the water above. But, it also turns out to be important for understanding underwater volcanoes and earthquakes.

Dr. Tolstoy says that she has always been fascinated by power of the earth and how tiny volcanoes and earthquakes make us feel. As an undergraduate student at the University of Edinburgh, she did a summer undergraduate research experience at Scripps Institution of Oceanography. She spent ten days at sea off the coast of northern California, which hooked her on undersea research. After graduating from the University of Edinburgh, she continued her studies at Scripps, where she received her Ph.D. She enjoys traveling and being at sea, as well as the thrill of pushing the frontier, of exploring the unknown. So, her research on mid-ocean ridge earthquakes, the links between earthquakes and life at hydrothermal vent systems, seafloor instrumentation, and the impact of anthropogenic noise on marine mammals fits her quite well. She considers it a privilege to spend good parts of her day thinking about what we don't know and how we are going to learn it.

Tolstoy is associate professor of marine geology and geophysics and research scientist at Lamont-Doherty Earth Observatory of Columbia University in Palisades, New York. She was featured in the 2005 James Cameron film *Aliens of the Deep*, in which she and a team of NASA scientists explore the mid-ocean ridge, a submerged chain of mountains that band the Earth and are home to some of the planet's most unique life forms. At Lamont-Doherty she designs and executes marine seismic experiments using a variety of equipment like seismographs and hydrophones on the ocean floor, multichannel streamers, ocean bottom tiltmeters, and even submarine cables to study mid-ocean

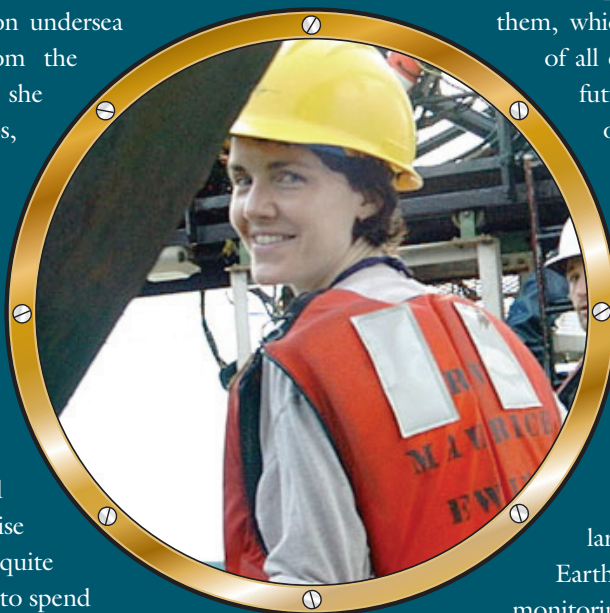
ridge structure and tectonics. She also studies the sources of underwater sound and the applications of hydro-acoustic data to monitoring of the comprehensive test ban treaty.

Tolstoy believes strongly in the importance of basic research because it leads to important discoveries and furthers our understanding of how our planet formed and how life came to exist here, which might help us to understand how life may come to be on other planets as well. People never thought that life could exist on the deep sea floor but we are now starting to see how important volcanic processes are to life around hydrothermal vents, how earthquakes near vents can tell us about these processes, and how water picks up elements as it travels through earth and supports life around the vents. Studies of undersea earthquakes have

also shown the importance of tidal forces in triggering them, which may lead to better forecasting of all earthquakes. She is excited for the future of real-time exploration of the ocean floor as fiber optic systems are put in place to collect data on a continuous basis from the Juan de Fuca Ridge, even as she faces the challenges of dealing with huge amounts of data.

While much of her work has focused on extremely small earthquakes associated with fluid flowing in the crust Tolstoy is also interested in the very largest earthquakes, so-called 'Great Earthquakes,' and in particular how monitoring the sound of their rupture in the ocean can lead to new insights into how these devastating geophysical events take place. Her work on the 2004 Sumatra-Andaman earthquake, which generated a tsunami up to 30 meters high killing almost 300,000 people, has helped show that it ruptured an area the size of the state of California moving at speeds of up to 2.8 km/sec.—faster than a cruise missile.

Maya Tolstoy enjoys spending time with her nine-year old son, Jason, who has a special place not only in Mom's heart, but also on her website. When asked if there is anything the audience should know about her, she said that they should know that she is interested in being an astronaut and that she made it to the final 47 in 2009. She is currently learning to fly and enjoys skiing and watching movies.



NOBEL CONFERENCE CONCERT 2012

'COME COLORFUL SEE'

Tuesday, October 2 | 8:15 p.m. | Christ Chapel | Free—no ticket required

The 2012 Nobel Conference Concert, “Come Colorful See,” celebrates the spirit of color through music, image, words, and movement. Coordinated by Associate Professor of Music Yumiko Oshima-Ryan, the concert features contemporary composer Takashi Yoshimatsu’s *Pavane for Water* as well as J.S. Bach’s *Italian Concerto*. Works by Claude Debussy and Gabriel Fauré are also included.

Program participants are pianist Oshima-Ryan; Minnesota poet laureate Joyce Sutphen, associate professor of English at Gustavus; violinist Peter McGuire, adjunct instructor in music at Gustavus; cellist Sharon Mautner-Rodgers, adjunct instructor in music at Gustavus; dance student Jane Chung '13; and artist David Ryan, assistant professor of art at Hamline University.

NOBEL CONFERENCE ART EXHIBITION 2012

150 YEARS OF SWEDISH ART: HIGHLIGHTS FROM THE SWEDISH NATIONAL COLLECTIONS IN STOCKHOLM (MODERNA MUSEET AND NATIONALMUSEUM)

September 10–December 2 | Hillstrom Museum of Art | Free—no ticket required

On exhibition in Gustavus Adolphus College’s Hillstrom Museum of Art during Nobel Conference 48 is *150 Years of Swedish Art: Highlights from the Swedish National Collections in Stockholm (Moderna Museet and Nationalmuseum)*, which features nearly 50 paintings that provide an overview of the history and vitality of Swedish art from around 1862 until the present. The exhibition is part of the Hillstrom Museum of Art’s celebration of the Sesquicentennial of Gustavus Adolphus College. Around half of the artworks have been lent by the Nationalmuseum, while the rest are on loan from the Moderna Museet. Although the artists represented in the exhibit are of fundamental importance in the collections of those national museums, many of them are not yet well known in the U.S. The exhibition is the most ambitious to date of the Hillstrom Museum of Art and is the result of remarkable cooperation from the Swedish museums.

The exhibition is highlighted by an important historical painting being lent by the Nationalmuseum, a well-known depiction of the *Death of King Gustav II Adolf at Lützen* (1855) by Carl Wahlbom (1810–1858). It will include other key paintings from the holdings of the Nationalmuseum by crucial and celebrated artists such as Carl Larsson (1853–1919), Richard Bergh (1858–1919), Prince Eugen (1865–1947), Gustav Fjæstad (1868–1948), Bruno Liljefors (1860–1939), August Strindberg (1849–1912), and Anders Zorn (1860–1920). More recent artworks are being lent by the Moderna Museet, including by Sigrid Hjertén (1885–1948), Isaac Grünewald (1889–1946), Dick Bengtsson (1936–1989), Karin Mamma Andersson (b. 1962), and Jockum Nordström (b. 1963).

The exhibition will be accompanied by a fully illustrated catalogue that includes texts written by leading authorities on the history of Swedish art, including Torsten Gunnarsson, former director of collections at the Nationalmuseum; Mikael Ahlund, curator of paintings and sculpture at the Nationalmuseum, and his colleagues Carl-Johan Olsson and Karin Olsson, also curators of the museum; and art historian and critic Magnus Bons, a frequent contributor to the art publication *Konstperspektiv* who has worked extensively with the collections of the Moderna Museet.



Carl Wahlbom (1810–1858), *Death of King Gustav II Adolf at Lützen/Gustav II Adolfs Död i Slaget vid Lützen*, 1855, oil on canvas, 39 3/4 x 59 7/16 inches (101 x 151 cm.), Nationalmuseum, Stockholm, 1866 transfer from the Kungliga Museet, NM 1028



Carl Larsson (1853–1919), *Portrait of Erik Axel Karlfeldt*, 1918, oil on canvas, 29 15/16 x 25 3/4 inches (76 x 65.5 cm.), Nationalmuseum, Stockholm/Statens Porträttgalleri, Gripsholm Castle, Mariefred, 1919 bequest by Karin Bergöö, widow of the artist, NMGh 2381.

CONTRIBUTORS TO NOBEL CONFERENCE® 48

The Nobel Conference at Gustavus Adolphus College, the first educational conference of its kind in the United States, is made possible through income generated by a Nobel Conference endowment and the support of annual conference contributors. The Nobel Conference Endowment Fund was created in July 1978 and is permanently secured as a result of the generous support of Drell and Adeline Bernhardson. Other gifts to the fund have been made by Russell and Rhoda Lund; the Mardag Foundation, in memory of Edgar B. Ober; and the UnitedHealth Group.

HHMI-SUPPORTED PROGRAM USES NOBEL CONFERENCE TO ENHANCE HIGH SCHOOL SCIENCE TEACHING

In 2008, Gustavus Adolphus College received a four-year \$1 million science education grant from the Howard Hughes Medical Institute (HHMI) of Chevy Chase, Md., to support a variety of programs that seek to transform the first-year student experience in the STEM disciplines (Science, Technology, Engineering, and Math)—particularly through collaboration between the Departments of Biology and Chemistry.

In addition, the grant supports a yearlong collaborative outreach program that utilizes the College's annual two-day Nobel Conference to help selected high school science teachers in the state integrate specially developed lesson plans related to the conference's speakers and topic into their teaching. It also better prepares these teachers and their students to attend the conference. The grant contributes to all costs associated with the program, including those related to tickets and transportation to attend the conference. Jim Dontje, Ph.D., director of the Johnson Center for Environmental Innovation at Gustavus, manages the program.





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The poster and graphic images for Nobel Conference[®] 48, "Our Global Ocean," were designed for Gustavus Adolphus College by **KAREN LYBRAND**, a graphic designer working out of Raymond, Maine. The illustration on the poster is a collaboration between Lybrand and marine artist **RAY TROLL**, who lives and works in Ketchikan, Alaska. The central image and other sea creatures were illustrated by Troll; the background, porthole, ocean floor, black smokers, bottomfish, reef plants, diver, and logo were drawn by Lybrand, who then executed the layout.

Lybrand and Troll are longtime associates and collaborators in design work for clients including the NOAA, National Marine Fisheries Service, the U.S. Coast Guard, American Fisheries Society, Miami Museum of Science, and other scientific organizations.

For more information, visit trollart.com and karenlybrand.com