What Is From Shore to Sea About?

The distant shores of southern California are drawing you to a season of exploration and discovery! This year's expedition is about the California Channel Islands and the sea that surrounds them.

Why learn about the Channel Islands and their surrounding sea?

- This area is home to many plant and animal species, including some that are found nowhere else on Earth.
- It's up to us humans to manage and protect the natural resources of the Channel Islands area. The more we learn about the area, the better equipped we are to take care of it.
- The islands hold mysteries yet to be solved.

The Channel Islands region will be our laboratory for studying the theme of **monitoring change**, and our three main research questions:

- What are the dynamic systems of Earth and space?
- How do these systems affect life?
- What technologies do we use to study these systems, and why?

JASON XIV research stories

In the first Story, about the **geography and natural history** of the Channel Islands, you'll consider how the islands' location affects their environment. With help from host researcher Tanya Atwater, you'll also think about how the Channel Islands were formed and how they are geologically connected to the California mainland.

The second Story involves the **human history and culture** of the Channel Islands. With host researcher John R. Johnson, an anthropologist, you will explore

some of the oldest evidence of human life on the Channel Islands, and be introduced to the history of the Chumash people. Host researcher Julie Tumamait-Stenslie will introduce you to the continuing traditions of the Chumash.

In the next Story, you will learn about watersheds and how they affect ecosystems on the land and in the sea. Host researcher Gene Feldman will show you how images from satellites help biologists understand the ecological connections between land and sea. Host researcher Jenn Caselle will show you how she gathers information about coastal ecosystems. Also, host researcher Pat Coronado will show you how he is using remote-controlled airplanes to visualize the Channel Islands.

What is a **kelp forest** and what role does it play in the Channel Islands ecosystem? We'll grapple with this question in Story 4. Host researchers David Kushner and Holly Lohuis will show you how they are studying and exploring this amazing forest ecosystem that exists under the waves. You will also find out how environmental changes are affecting the health of kelp forests.

The appealing pinnipeds (seals and sea lions) are the stars of Story 5. What's the difference between a seal and a sea lion? How deep do they dive and where do they migrate? You'll learn the answer to these questions and more with help from host researchers Bob DeLong and Tony Orr.

The expedition concludes with a look at **terrestrial and marine conservation** efforts underway in the Channel Islands. Host researchers Tim Coonan and Satie Airame will be our guides to two programs that are working to protect the Channel Islands. The first program is trying to save the rare Channel Island fox from extinction. The second program involves developing marine reserves.

JASON XIV

Student Abstract

A Letter from Dr. Ballard

Have you ever wondered why life exists on Earth and if there is life on other planets in the solar system? I have. Each year students like you join my research team to discover the answers to these very big questions.

We began our exploration 14 years ago to examine whether Earth is the only planet in the solar system to support life. Our first task was to take an inventory of the Earth systems needed to support life on our planet. We've examined the lithosphere (crust), the atmosphere (gasses that surround our planet), the hydrosphere (water), the cryosphere (frozen water) and the biosphere (life) by traveling to unique and fascinating locations on the planet to study them.

Through our JASON expeditions we've traveled:

- To the crushing depths of the Sea of Cortez (using the JASON remote-operated vehicle and the submersible *Alvin*). We observed giant clams, tubeworms, and bacterial mats that feed off chemicals spewed forth by hydrothermal vents. We asked, "If these deep water vent communities can live in such hostile conditions, might life forms also exist elsewhere in the solar system?"
- To the Hawaiian Islands to witness new volcanic land forming beneath our feet. We looked to space, using NASA's infrared telescope, to ask, "Are there active volcanoes in space?" The answer was a resounding yes. Jupiter's moon Io has several very hot active volcanoes, and we saw them erupt from right here on Earth.
- To Earth's polar regions to explore how creatures survive in these frozen worlds. Knowing that water is a key ingredient in the formation of life, we asked, "Is there frozen water on other planets in space?" NASA's missions to Mars and Europa indicate that water exists, or may have existed, on other planets in our solar system.
- To the rainforests of Belize, Peru, and Washington. We asked, "Did rainforests always exist on our planet where they do now? Uncovering a 63 million year old fossil rainforest in Colorado certainly proved that our planet's climate has changed dramatically over time.

We've discovered that there is much more to life on Earth (and perhaps elsewhere) than we think!

Now, it's your turn to help us collect data and ask questions about the systems that sustain life on Earth. Your challenge is to examine where on the planet life is most concentrated and what people are doing to ensure that these areas will continue to support life. So, let's join the expedition team and travel to the Channel Islands region of California. There, you will find giant kelp forests, northern elephant seals, unique geologic conditions, and an outstanding group of researchers who are working hard to better understand and conserve precious natural and cultural resources.

Our research this year will be supported by outstanding partners: Channel Islands National Marine Sanctuary, Channel Islands National Park, the Santa Barbara Maritime Museum, the Santa Barbara Museum of Natural History, the University of California at Santa Barbara, and the National Aeronautics and Space Administration.

The first thing I'll ask you to do is begin a research journal. As we explore the theme of **monitoring change**, try to answer these questions in your journal:

- 1. What makes the Channel Islands region unique?
- 2. How has this region changed over time?
- 3. How do you measure these changes?
- 4. How do you distinguish natural change from change caused by humans?
- 5. Why is it important to have national parks and national marine sanctuaries?

Have a great year of exploration!

Dr. Robert Ballard

Meet the JASON XIV Team

Dr. Robert Ballard

Chief Scientist and Founder JASON Foundation for Education

Education

I earned a Ph.D. in marine geology and geophysics from the University of Rhode Island.



What do you do and what tools do you use?

I'm the JASON XIV expedition leader. I've participated in more than 100 deep-sea expeditions using several submersibles. These expeditions include the first manned exploration of the Mid-Ocean Ridge, the first discovery of polymetallic sulfides, the discovery of the high-temperature "black smokers," and the discovery of the RMS *Titanic* and the German battleship *Bismarck*.

In addition to JASON, I am president of the Institute for Exploration in Mystic, Connecticut, an explorer in residence at National Geographic, a Commander in the U.S. Naval Reserve, and a professor at the University of Rhode Island. I have published more than 40 articles in scientific journals, written many scholarly and popular books, and participated in the production of numerous television programs, including the National Geographic Explorer series.

How did JASON get started?

The idea for the JASON Project come to me in 1985 after I discovered the wreck of the ship *Titanic* on the ocean floor. I received so many letters from students showing such an overwhelming interest in the exploration that I decided to bring some of the world's best scientists into classrooms so that you can share in their research and their spirit of discovery.

Dr. Satie Airame

Scientific Advisor Channel Islands National Marine Sanctuary



Research Focus

How can marine reserves conserve biodiversity and sustain local fisheries?

Who or what inspired you to pursue your career?

I was raised on a small farm in the foothills near Yosemite National Park and, as a child, I had the opportunity to explore a magnificent wilderness. Well before I studied ecology in books, I watched wild plants grow, blossom, seed, and die back as the seasons progressed. I observed wild animals and gained respect for their knowledge, grace, and stamina.

What research projects are you currently involved in?

I have been working with marine scientists from southern and central California to evaluate the status of marine organisms in the Channel Islands region and to develop a plan to protect them from the negative effects of commercial and recreational fishing.

What were your favorite books when you were a kid? Why?

I loved books about travel and adventure. I read about Isabella Bird, one of the first European women to settle in the Colorado Rocky Mountains. I was captivated by the adventures of Karana in Scott O'Dell's *Island of the Blue Dolphins*.

Any final thoughts, words of advice, personal philosophy?

In the routine of daily life, many people forget the power of the natural world. Using technology, we build climate-controlled homes that withstand storms. We build towns and cities in the desert, where there is no water, but we move the water where it is needed. Sometimes we forget that we have physical and physiological limitations.

Dr. Tanya Atwater

Professor, Geological Sciences University of California at Santa Barbara

Research Focus

What is the plate tectonic history of western North America and how does it

relate to the area's underwater and dry land geology?

How did you end up in the field you are in today?

When I was in college, a lot of discoveries in undersea geology were being made and they really sounded exciting to me. Besides, sailing around the oceans sounded like a great adventure. The combination sounded perfect: to have fun adventures and, at the same time, to be working and earning money and making a contribution to the world.

What kinds of research have you been involved in?

The most exotic part of my career was when I was working with the tiny submarine *Alvin*. (It is so small that three of us and all our instruments and oxygen and lunch just barely fit inside.) We used the submarine to go down and study the sea floor. We could look out the portholes and collect samples with the mechanical arms and check things out. It is pitch black down there and the water is freezing cold, so we used lots of lights and wore big puffy parkas.

What one thing would you most like students to learn from participating in JASON XIV?

It will be your job to help humanity learn to live in balance with the Earth's life-giving systems. I am sure that you will do it. We humans are really good at figuring out what to do, once we realize that there is a problem to solve.

Dr. Jenn Caselle

Science Coordinator Partnership for Interdisciplinary Studies of Coastal Oceans, University of California at Santa Barbara



Research Focus

Where do the larvae of tropical and temperate reef fishes and marine invertebrates travel, and how does this affect their populations?

What is it about the Channel Islands region that you find unique and interesting?

The most interesting thing for me is that fact that the Santa Barbara Channel is a transition area between warm-water sub-tropical species to the south and coldwater temperate species to the north. This is the one place on the West Coast where you can find all of these species mixing. So the communities here, especially in the northern Channel Islands, are unique. We can learn so much from studying this area.

What one thing would you most like students to learn from participating in JASON XIV?

I think one of the most important things is that all things are connected in the land-ocean ecosystem. People affect land and the ocean, practices on land affect the ocean, and the ocean can even affect the land. We cannot think of these individual systems as separate.

What advice would you give to students who are interested in studying science?

I would advise students who are interested in science to find out as much as possible about the different types of science careers and also to go out and try to get handson experience. Even middle school is not too early to start getting some experience. Marine biology sounds like so much fun, but the classes and preparation you have to do for a career can be very difficult. We have to study chemistry, math, and physics; we have to be competent at writing and speaking.



Biologist National Park Service, Channel Islands National Park

Research Focus

How healthy are the ecological communities and key species on the Channel Islands? How can we monitor and manage island fox populations to bring them back to viable levels?

What research projects are you currently involved in?

I came to Channel Islands National Park to direct the terrestrial (non-marine) side of the park's long-term ecological monitoring program. Every year we check the park's populations of vertebrates, land birds, and plants. But due to a recent population crash of island foxes—a crash that was discovered by the monitoring program—I now spend most of my time directing a recovery program for island foxes on the northern Channel Islands.

What do you like best about your job?

I appreciate the chance to work with such a unique, fascinating, and beautiful species as the island fox. The fieldwork involving handling foxes was especially fun. I also like the fact that I have an opportunity to make a difference. The work we do now will help ensure that island foxes will be around for future generations to appreciate.

Where have you traveled for your work? What's your favorite place among those you've visited?

I have served in several different national parks, and have traveled to others for training. My favorite place thus far has been Canyon de Chelly National Monument, a beautiful canyon cut into the sandstone of northern Arizona, on the Navajo reservation. The archeological presence of the ancient Anasazi culture and the current presence of the Navajo make it a fascinating place.

Patrick Coronado

Engineer and Remote Sensing Scientist NASA Goddard Space Flight Center

Research Focus

How can we best obtain and compare data from spaceborne and airborne instruments? How can these data help us understand our local environment?

What research projects are you currently involved in?

I design and develop satellite ground systems for NASA satellites. These satellites send their data in the form of images of Earth; I process these data to make them usable for such purposes as fire detection, sea surface temperature monitoring, and monitoring weather. I also design and develop unmanned aerial vehicles (UAVs) that I use to explore Earth from up close. UAVs are small airplanes that carry scientific instruments to collect data about Earth's surface at a very fine resolution.

Where have you traveled for your work?

My type of work has taken me to 15 countries on six different continents. I have gone from the frigid Antarctic to the hot Amazon. In most of these places I was responsible for installing satellite ground systems for specific science applications, such as monitoring forest fires in Mongolia, forecasting hurricanes in Guam, and monitoring snow and ice in Russia.

What advice would you give to students who are interested in studying science?

List all the things you think are fun to do in everyday life and then, with the help of a counselor or parent, see which ones correspond to a science or engineering field. Also, don't study only math and science: build an interest in history, music, and social studies.

Dr. Bob DeLong

Research Biologist National Marine Mammal Lab Alaska Fisheries Science Center Marine Fisheries Service



Research Focus

Where do elephant seals and sea lions go when they migrate, how deep do they dive, and why?

What research projects are you currently involved in?

I work on three projects involving seals and sea lions. The first is a study of how seals and seal lions affect the rebuilding of endangered salmon runs. Second are studies of the seals and sea lions at San Miguel Island. Finally, I am involved in studies of cancer in California sea lions.

What tools/technology do you use?

The advent of the microprocessor has opened endless possibilities for field researchers over the past decade. We use small microprocessor event recorders to study diving behavior and migration of pinnipeds.

What do you like best about your job? What do you like the least?

I really love to watch and handle big critters. We have great respect for seals and sea lions and it is a joy to be able to work with them. I have a great deal of administrative work to do in my position. Some of it is fun but a lot of it is pretty dull stuff that needs to be done so the research work can be conducted.

What did you think you were going to be when you grew up?

I thought I would grow to be a dairy farmer like my father. But he gave me the advice I needed, and that was to pursue what I wanted to do for the rest of my life and not what I thought he might want me to do.

Any final thoughts, words of advice, personal philosophy?

When you look forward to a career, look first for something that brings you joy, work very hard to develop good working relationships with your associates, because then you can share the excitement of their successes as well as you own.

Dr. Gene Feldman

Oceanographer NASA/Goddard Space Flight Center

Research Focus

How can satellite images of the ocean be used to create scientific models that

will help us measure, understand, and predict complex biological processes in the sea?

How did you end up in the field you are in today?

As a kid, I spent summer mornings with my grand-father as he fished along the surf line at the beach, and would wonder what lay beneath the waves and over the horizon. After college, I spent 3 incredible years as a Peace Corps volunteer on the South Pacific islands of Samoa. When I sailed my small boat out into the ocean, I found large concentrations of fish in some places and absolutely none in others. It got me wondering why this was so.

What research are you currently involved in?

I'm an oceanographer at NASA. I collect satellitederived ocean color data sets. Color satellite images provide scientists with information about the role of the oceans in global change. They let us monitor the biological consequences of that change—see how the things we do, combined with natural variability, affect Earth's ability to support life.

What was the most incredible thing that happened to you while you were conducting your work?

During my Peace Corps years, I experienced first-hand the way the people of the South Pacific fish for shark. Imagine being perched at one end of a leaking, 18-foot outrigger canoe in the middle of the ocean while a 12-foot shark thrashes about madly in the middle of the boat, snapping its giant jaws.



Curator of Anthropology Santa Barbara Museum of Natural History

Research Focus

When did the earliest Paleo-Indians arrive in the Channel Islands and what can we know about them?

How did you end up in the field you are in today?

When I was in high school, I joined an archaeology group. We went on some very interesting field trips, participating in archaeological fieldwork under the direction of professional archaeologists. My first trip was to Santa Catalina Island, and that experience hooked me on southern California archaeology. We also went to New Mexico, where we worked with the archaeologist Michael Glassow. I later served as Dr. Glassow's field assistant for three summers of excavations; I also studied with him in college, and he chaired my Ph.D. committee. Besides his work in the American Southwest, Dr. Glassow has specialized in the archaeology of the Channel Islands, and I have followed in his footsteps in my work on the culture and history of the Chumash and their predecessors who lived in the Santa Barbara region. We have remained close friends and colleagues for 35 years.

What research projects are you currently involved in?

I am currently involved in several research projects pertaining to Chumash prehistory. We have recently conducted excavations at the Arlington Springs site on Santa Rosa Island, where three human bones were found buried more than 30 feet below the surface back in 1959. We used recently developed refinements on the technique of radiocarbon dating to determine that the bones belonged to a woman who lived 13,000 years ago. These are the oldest dated human bones from anywhere in North America.

David Kushner

Marine Biologist Kelp Forest Monitoring Project Channel Islands National Park

Research Focus

How can we monitor plants and animals living in the kelp forests of the Channel Islands?

Who or what inspired you to pursue your career? My parents have told me that I was fascinated with

the sea and the outdoors since I was 5. Aquatic systems were always of interest to me because it seemed to me that no one knew much about them, they were mysterious. Throughout high school I became more interested in the ocean, and realized that I wanted to go to college to study marine biology. Unfortunately, school was never very easy for me. It always seemed to take me hours longer to study for my classes than my friends, and they often had higher scores. I just barely had grades and SAT scores good enough to get into the college I wanted to go to (which had an aquatic biology program). Throughout college I worked for several different professors on research projects that included research in lakes and streams, work on fish populations and what they eat on Santa Cruz Island, and even some work on parasites.

What research projects are you currently involved in?

I am currently in charge of a long-term kelp forest monitoring project for Channel Islands National Park. We conduct all of our monitoring underwater using scuba and an array of techniques. Most of the work we do involves low-tech equipment like meter tapes and squares made out of plastic pipes. The most high-tech pieces of equipment we use are GPS receivers for locating underwater sites and remote temperature loggers to record temperature.

Holly Lohuis

Marine Educator and Naturalist Island Packers, Inc.

Research Focus

What types of plants and animals can be found in the kelp forests? What can

be learned by studying life on the Channel Islands and in the surrounding ocean?

Who or what inspired you to pursue your career? I did a report in 5th grade on Dr. Sylvia Earle, a female marine biologist. I cut out magazine pictures of her diving in all her neat deep-sea equipment and reported on all her exciting travels and her pursuit of being the deepest-diving female in the world. I thought that was really cool, especially since she was truly exploring unknown regions in a field that was dominated by males.

What was the strangest or most incredible thing that happened to you while conducting your work?

One winter, I traveled to Baja to film Pacific gray whales. It was a dream come true to see these magnificent 45-foot animals close up after years of working as a naturalist on whale watching trips and usually seeing tail flukes from a distance. The whales were in Baja to give birth and protect their young in the remote lagoons. I will never forget making eye contact with a 40-ton mother as I leaned over the side of the boat with a mask on and looked under water. Absolutely splendid!

What advice would you give to students who are interested in studying science?

The science field is limitless, with so many options to pursue. I work with extremely skilled boat captains and crew who enjoy the lifestyle of being one with the sea. As a marine educator, one could work for a museum or an aquarium, or be a schoolteacher. One could be a marine biologist, a field biologist, or a lab technician, just to name a few possibilities.

Tony Orr

Research Biologist National Marine Mammal Lab Alaska Fisheries Science Center Marine Fisheries Service



Research Focus

What types of prey do pinnipeds feed on, and where in the ocean do they feed on them?

How did you end up in the field you are in today?

As an undergraduate I majored in zoology and minored in French. After I graduated, I moved to South Carolina and researched the effects that a nuclear reactor cooling reservoir had on the local fish species. I then moved back to Ohio and worked for a pharmaceutical company.

But I realized that I was not content just working in a laboratory, so I moved to California to attend graduate school. As a graduate student, I conducted research on species from nudibranchs to leopard sharks and seals to whales. During graduate school and immediately afterwards, I was involved in outreach programs and projects to clean and protect watersheds in coastal central California. Currently, I work with seals and sea lions along the west coast of the United States.

What were your favorite books when you were a kid? Why?

I remember reading classics like *Robinson Crusoe*, *Alice in Wonderland*, and other fictional stories. Reading those stories provided a great source of entertainment and enhanced my imagination, though I must admit that I primarily read non-fiction nowadays.

Any final thoughts, words of advice, personal philosophy?

Live your life to the fullest. Try not to take things for granted and enjoy the gifts that you have been given. Appreciate your family and friends. Do not prejudge people or situations. Try to focus on what is positive—life is too short for negativity. Do your part and do your best—works speak louder than words.



Julie Tumamait-Stenslie

Chumash (Ventureño/Cruzeño) Storyteller

Research Focus

What do oral narratives and archeological records tell us about how Chumash people lived?



How did you end up in the field you are in today? It really wasn't until I was in my 30s that I had opportunities to get involved in my culture. That's when I started working with archaeologists. I also started working with my father, a Chumash storyteller and singer. I learned songs and stories from him and accompanied him on many of his talks. I started reading a lot of books on Chumash anthropology and archaeology. I read about where the Chumash lived, what they ate, what they wore, how they celebrated, and what their religious beliefs were. In 1992 my father died. At his funeral, another Chumash elder presented me with a ceremonial pipe: it was now my responsibility to carry on the work that my father had started. I was shocked—usually this honor is giving to the eldest son in the family. I was the youngest and a woman!

What work are you currently involved in?

I teach elementary school students about Chumash culture. I also research the Chumash using archaeological records, interviews from the early 1900s, and baptism records from missions.

What one thing would you most like students to learn from participating in JASON XIV?

The most important thing is that what they see and hear is true, that if they ever come here they can feel it, see it, taste it, and hear it. I hope that JASON inspires students to learn about their own homeland and its beginnings. I also hope that this project will show students how to find out about their own heritage and culture and learn to find their own family stories.