For me, it is all about answering the question “Why?”—Dr. Robert Ballard

Imagine collecting arthropods in the treetops of the Amazon rainforest canopy, measuring the temperature of flowing lava in Hawai’i, or descending in a submersible into the mysterious depths of the Sea of Cortez. At your side is a research team made up of prominent scientists, top-notch teachers, dedicated students, leading technology providers, and skilled multimedia experts. Your mission is to search for answers to science’s big questions. You are part of the JASON Project.

Twelve years ago, Dr. Robert Ballard (see box) created the JASON Project to encourage scientists and students to collaborate on research expeditions using advanced communication technology. A prominent scientist, explorer, and educator, Dr. Ballard and his visionary project have bridged the scientific and education communities by making scientific research an exciting adventure for students and teachers in the classroom. The mission of the JASON Foundation for Education, founded in 1990 to administer the JASON Project’s year-long learning expeditions, is to bring the excitement of exploration and discovery to middle-school students and teachers and help them to gain the scientific literacy and technological skills that they need for the future.

There has been much recent debate about education reform and the level of student performance in math and science. At the same time, the field of science education has experienced a rapid transformation in response to the increasing ubiquity of information technology. Amidst these heated battles and changing times, the JASON Project, like its namesake Jason of Greek mythology, is working hard not to lose sight of the Golden Fleece. The quest for knowledge—to understand earth’s systems, to study life on earth, and to understand the technology that makes this research possible—is the driving force behind the JASON Project.

I would like to share this ever-evolving experiment in science education with you by describing our experience with the JASON Project and then discuss some of the current challenges and opportunities for science educators throughout the world.

The JASON Research Expedition

Each of JASON’s annual expeditions begins with a site survey. During our current expedition, JASON XII, Hawai’i: A Living Laboratory (JASON XII), we selected several field locations in Hawai’i and built partnerships with various educational and scientific institutions. We then identified a diverse group of scientists and experts who conduct ongoing research at our field locations and could share the excitement of their work with students and teachers. Some of our team members this year include: Sam Gon, director of science for the Nature Conservancy of Hawai’i, who uses GIS (Geographic Information Systems) and GPS (Global Positioning System) tools to map and study Hawaiian ecosystems; Luanne Johnson, conservation biologist for the USGS (U.S. Geological Survey) Biological Resource Division, who manages a research and conservation project on the Palila honeycreeper; Jim Kauahikaua, geophysicist for Hawaiian Volcano Observatory, who studies how lava flows using infrared video and other tools, and Frank Howarth, an entomologist with the Bishop Museum, who studies arthropod communities living deep within Hawai’i’s lava tubes.

Dr. Robert Ballard

Dr. Robert D. Ballard founded the JASON Project in 1989 after receiving thousands of letters from school children wanting to know how he discovered the RMS Titanic. Dr. Ballard is also the founder and head of the Institute for Exploration (IFE) in Mystic, Connecticut, an explorer in residence at National Geographic, and Commander in the U.S. Naval Reserve.

Dr. Ballard has led or participated in more than 100 deep-sea expeditions using deep-diving submersibles. These included the first manned exploration of the Mid-Ocean Ridge, the discovery of warm water springs and their unusual animal communities in the Galapagos Rift, the first discovery of polymetallic sulfides, the discovery of high temperature black smokers, the discovery of R.M.S. Titanic and the German battleship Bismarck, and recent archaeological discoveries from the Black Sea floor.

Dr. Ballard has published over 50 scientific articles, written many scholarly and popular books, and participated in the production of numerous television programs.

After identifying our host experts, we transformed their research into a learning framework that conveys the richness
and complexity of their stories. Our staff gathered oral histories, data, and maps for a print curriculum, produced video footage of students and researchers conducting field research at various field locations in Hawai‘i, collected GIS data, photographs, and audio and video clips for a set of online tools, and coordinated logistics and technical details to produce a live satellite broadcast.3

To bring these multimedia tools to educators and students throughout the world, JASON relies on its collaboration with a diverse international network of universities, science and technology museums, school districts, aquariums, technology companies, and state and regional educational networks. Each partner site offers local professional development for teachers, hosts our live satellite broadcasts, and provides ongoing support to classrooms throughout the year.

Teachers begin the JASON Project by participating in professional development workshops. These workshops model new methods of teaching science content using JASON’s suite of multimedia tools. They guide students into the expedition by discussing novels and conducting classroom activities about the geography, history, and culture of the expedition site. Through readings, videos, and Internet chat sessions, students make personal contact with host researchers and observe how they work. Then, through a series of inquiry-based exercises, including local field studies, gathering and analyzing data, designing experiments, and building models, students emulate the field research conducted at the expedition site and conduct their own investigations. During JASON XII, for example, students have created GIS maps of lava flows, classified fish species located in Hawai‘i’s deep reefs, participated in ecological restoration projects, transformed classrooms into lava tubes, and compared aquatic data from their local site with data from sites from around the country.

Throughout the year, teachers and students use several online tools, such as workshops, message boards, simulations, and contests, in order to facilitate year-long interactivity between scientists and our global community. One highlight of the JASON expedition is a live, two-week satellite broadcast during the late winter (this year’s expedition was January 29 – February 9). During the broadcast, a small group of researchers and teachers and students (known as Argonauts) shares its discoveries from the expedition field site with classrooms all over the globe.

The Benefits of JASON’s Expeditionary Approach

JASON’s unique expeditionary approach, made possible through partnerships with government agencies and leading global corporations,4 has led to several advances in the field of science education and successfully impacted how students learn and teachers teach.

Focusing on Learners: Student-Centered Programs

The research expedition excites and engages learners. The thrill of discovery, the risk of adventure, and the use of cutting-edge technology draw learners into the experience. Scientists and students on past JASON expeditions have pioneered new scientific discoveries and innovative uses of technology, such as the first live “ocean-to-ocean underwater communication,” the development of a common name for a new species of rainforest canopy beetle, and the discovery of new hydrothermal vent communities in the Mediterranean Sea.

During expeditions, students work to solve scientific problems. In this learning environment, mastery of scientific concepts, vocabulary, and skills is almost seamless. Dick McManus, a science and technology coordinator from New York, explains how JASON brings educational standards to life: “Students don’t even realize that they are learning…. Teachers love JASON because you are using language arts, math, and science in an integrated way. Our fifth graders show their enthusiasm to each other and with the fourth graders and the fourth graders then can’t wait to do JASON the following year.”5

As students investigate the cutting-edge work of JASON’s host researchers, such as studying lava tubes in Hawai‘i,
measuring the mass balance of glaciers and its impact on Jokuhlualps in Iceland, or observing the volcanic activity on Jupiter’s moons, they learn about science “as it happens.” This experience is not only exciting and relevant to students’ lives, but fosters critical thinking skills and helps students understand and evaluate current science news.

Each local site downlinks the live, 2-week satellite broadcast of the JASON expedition.

As students work side-by-side with researchers, students meet positive role models: real, diverse, people doing interesting work. Melissa Inouye, a student Argonaut on JASON’s fifth expedition, describes her experience: “I realized that scientists don’t have to be stuffy or overly smart or unfriendly. They’re just like me. Wherever they go, they’re always asking ‘why?’ I found out that science isn’t always easy. But I’ve never seen so many amazing things.”

Yet several challenges remain. How do we ensure that students are applying their skills and knowledge to real-life situations outside the classroom? How do we help families and communities foster their children’s curiosity and passion for exploration? How do we share our mission of inquiry-based learning, scientific discovery, and skill building with after school programs, home schools, and community service organizations? To address some of these concerns, JASON is launching a new initiative entitled JASON Beyond School. Based on our rich archive of existing multimedia content, we are developing a wide range of simple and flexible programs for a variety of contexts outside of the traditional classroom. In this model, students will guide their own learning, assisted with minimal supervision by volunteers, facilitators, or their parents.

**Modeling New Methods of Teaching: JASON’s Professional Development Programs**

Infusing current research into the classroom transforms the traditional role of science educator. Each expedition provides a framework for teachers to advance into new science content from year to year. Teachers cannot rely on antiquated textbooks to instruct their students about cutting-edge research, but must be continuously learning in their classrooms. As Theresa Spina, a teacher Argonaut from JASON X explains, “I learn right along with the students. My students know I am learning with them and it’s exciting and fun for both of us.”

The ongoing support of a global online community encourages teachers to learn new methodologies and try new content. Message boards are a popular forum for veteran teachers to mentor new teachers, try new pedagogy, and share resources. Many teachers participate in our online professional development courses during the school year, which help them stay current on issues of standards and assessment, become familiar with new educational technologies, and receive individual feedback. We design these programs to differentiate pathways for teachers to adopt technology tools, whether they are experienced technology users or beginners.

While many educators are finding innovative uses for technology in the classroom, others are still not fully capitalizing on the potential of technology. Many teachers that have access are still slow to adopt technology other than word processing, spreadsheets and basic web research in their lessons. Continued professional development for teachers in both educational technology and science education is an international need.6

We believe that technology taught in the context of content has a far greater chance of being incorporated into a teacher’s repertoire of strategies than technology training alone. To help address the needs of our nation’s teachers, we are leading a new initiative, the JASON Academy, to augment our online offerings and provide teachers with a suite of online courses on a variety of core science topics. Building on JASON’s content expertise and existing online tools, the JASON Academy will provide educators with an efficient and inexpensive way to obtain advanced certification in science education and a set of skills that they can apply immediately in the classroom.

**The Power of Partnership: JASON’s Global Community**

The JASON Project encourages students and teachers to use technology to explore the world and make new discoveries like the Argonauts of ancient Greece. While scientists and explorers have always crossed international boundaries, not until recently, have students and teachers had the opportunity to follow. Economic and logistical barriers may preclude every student from actually going on scientific expeditions or working one-on-one with a mentor scientist. However, advanced communication technologies and innovative partnerships between corporations, government agencies, and nonprofit institutions, both at the core of the JASON Project,
help bring the excitement of scientific exploration to students and educators all over the world.

The success of our program lies in the power of our partnerships. Partner organizations throughout the United States and in countries such as Peru, Mexico, Australia, and Sweden each have worked to strengthen established programs and provide local learners access to our global community. Although we base our content upon U.S. education standards, local sites throughout the world adapt our materials to their specific educational needs. Teachers in Sweden may emphasize field studies to meet local curricular requirements, whereas classrooms in Long Island focus their studies on watershed analysis to meet New York state standards. Local partners have helped JASON develop interactive exercises that encourage student participation during our live broadcasts. Some sites invite local experts, incorporate hands-on exhibits, and display student work to further involve classrooms.

Technology tools such as online professional development courses, chat sessions with researchers, online journals, shared data collection projects, and moderated message boards all extend beyond national borders. These tools facilitate global community, not only bringing cutting-edge research to remote communities (imagine Peruvian shamans chatting with students from rural Minnesota), but enable local learners to celebrate the uniqueness of their communities. Classrooms everywhere—from deep within the Amazon to the outskirts of Australia—are using technology. JASON’s partnership with the Amazon Center for Environmental Education, our host organization during our tenth expedition, engendered a new international program that trains Peruvian teachers to use field research and multimedia tools to teach about the rainforest. This new partnership is just one of the many ways that the JASON Project has been reaching into new communities in the United States and abroad. As we look forward to a new generation of JASON expeditions, we will continue our quest for knowledge, keeping our eyes fixed on the Golden Fleece.

To learn more about the JASON Project, visit www.jasonproject.org. The author can be reached at the JASON Foundation for Education, PO Box 587, Needham Heights, MA 02494. E-mail: bram@jason.org.

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1 Bram Duchovnay is the JASON Project Content Manager. For the last four years, he has worked on a variety of curriculum development, evaluation, professional development, international, and online projects.

1 The National Science Board’s Preparing Our Children: Math and Science Education in the National Interest (page 3) explains that according to the Third International Mathematics and Science Study (TIMMS), “U.S. students are not taught what they need to know,” NSF (March 1999). For a different opinion, see W. Gibbs and D. Fox “The False Crisis in Science Education,” Scientific American (October 1999).

2 The JASON Project takes its name from the Greek hero Jason, who in the mythology of the Western world was the first great explorer to sail the seas. Over 3,000 years ago, according to legend, Jason outfitted a ship called the Argo and set out in search of a famous golden fleece, the woolly hide of a golden ram. Jason took with him a crew that included the most famous of Greek heroes and called his crew the Argonauts, a word that literally means "sailors (Greek nautes) on the Argo."

3 Some of our live broadcasts have been easier to coordinate than others. For example, during JASON X, JASON transformed two barges from the local town of Iquitos, Peru into an enormous production studio and towed them several hours up the Amazon river. Fortunately, these barges remained afloat. Nine years ago, ten days before our third expedition to the Galapagos Islands, the barge carrying most of our expedition equipment sank in 9,000 feet of water. A historic recovery effort led by the U.S. and Ecuadorian government and JASON supporters worldwide replaced the equipment and the broadcasts began on time.

4 Key government sponsors include National Oceanic and Atmospheric Administration (NOAA), National Aeronautic and Space Administration/Agency (NASA), Department of Education (DOE), and the Office of Naval Research (ONR). The CEO Report on Education and Technology reports that only 20 percent of middle school teachers were science majors in college (February 1999).